AQUATICA

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103 Years of Educating Aquarists

AQUATICA

VOL. XXVIX MARCH - APRIL 2014 NO. 4

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The **Brooklyn Aquarium Society Inc.** is a non-profit organization 501(c) (3) for people interested in the aquarium hobby and the study of aquatic life. The Society meets the 2nd Friday of each month except July and August at the Education Hall of the New York Aquarium at Coney Island, Surf Avenue at West 8th St., at 7:30 PM. Meetings are open to visitors. Refreshments are served. Membership is $25 per year family/$20 individual/$15 for students under 14. Send inquiries or membership checks payable to:
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Brooklyn Aquarium Society Board of Directors

Brooklyn Aquarium Society

CALENDAR OF EVENTS ~ 2014•2015

MAR 13 Gene Ritter ~ Reef Diving in NYC ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

APR 11 Rachel O'Leary ~ Freshwater Nano Diversity: The Ins, Outs and In Betweens ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

MAY 9 Giant Spring Auction ~ Freshwater fish, plants, marine fish, aqua-cultured corals & dry goods including a 55 gal. tank & stand.

JUN 13 Chuck Davis ~ Gizmos, Gadgets and Other Good Ideas ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction. BAS elections.

JULY/AUGUST – NO MEETINGS

SEPT 12 Greg Sullivan ~ Saltwater for the Squeamish ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

OCT 10 Giant Fall Auction ~ Freshwater fish, plants, marine fish, aqua-cultured corals & dry goods, including a 55 gallon tank & stand.

NOV 14 James Fatherree ~ Reef Basics ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

DEC 12 Holiday Party ~ Members, their families and friends, all you can eat sit-down dinner
• Fish Bingo & Prizes • BAS awards presentations.

2015

JAN 9 TBA Freshwater ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

FEB 13 Joe Yaiullo - Marine TBD ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

MAR 13 Discus Hans - Discus ~ Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

APR 10 Todd C. LaJeunesse - The Intriguing Evolution of Palau Corals ~Marine fish, aqua-cultured corals, freshwater fish, plants & dry goods auction.

MAY 8 Giant Spring Auction ~ Freshwater fish, plants, marine fish, aqua-cultured corals & dry goods including a 55 gal. tank & stand.

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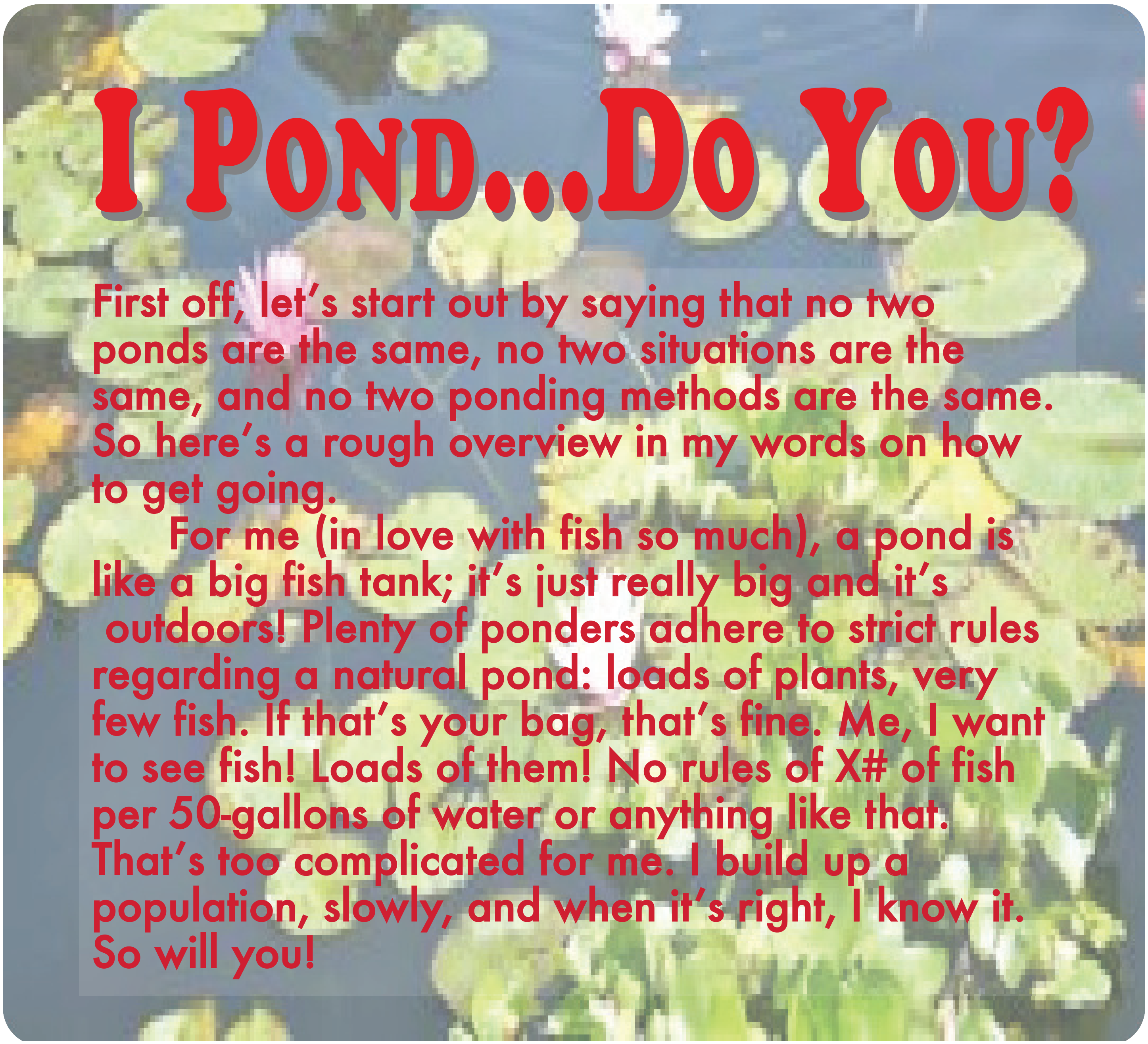
Charlie Murphy

Charlie is the forrmer owner of the legendary Tropical Fish Supermarket.
Reprinted from the January February 1998 issue of *Aquatica.*

Alas, Tropical Fish Supermarket, one of the great Brooklyn tropical fish store, no longer exists. The great feature of the store, besides it low prices and sales, was the fact that they let you net the fish you wanted yourself.

Charle loved ponds and the store had a large pond out back, so in March of 1998 he gave a talk at the BAS titled "*I Pond... Do You?*"

Here it is for those of you that are thinking of setting up your very own pond or would like a refresher course on ponds.



I Pond...Do You?

First off, let's start out by saying that no two ponds are the same, no two situations are the same, and no two ponding methods are the same. So here's a rough overview in my words on how to get going.

For me (in love with fish so much), a pond is like a big fish tank; it's just really big and it's outdoors! Plenty of ponders adhere to strict rules regarding a natural pond: loads of plants, very few fish. If that's your bag, that's fine. Me, I want to see fish! Loads of them! No rules of X# of fish per 50-gallons of water or anything like that. That's too complicated for me. I build up a population, slowly, and when it's right, I know it. So will you!

BASICS

For basics, we need, of course, something to hold the water: A tub, a kiddie pool, 1/2 a barrel, fiberglass shell or a PVC liner. I find the PVC liner to be the best solution as to ease of installation and freedom of shape.

In our climate zone, I would dig at least 2 feet down to ensure that the fish will last throughout the winter. Kiddie pools, barrels or tubs are only for the spring to early fall, cement is a nightmare to me, so I would say stay away from it. Three quarters of the people I know with cement ponds have to seal them up each year because they crack in the winter's cold, The liners, PVC, butyl or rubber, are flexible and can expand and contract with the seasons. They are the best choice in my opinion.

SHAPE

Hey, it's up to you, but here are a few pointers.

1] Do not put your pond right under a tree.

2] Do not put your pond where it gets 8 to10 hours of sunlight. It's just too much.

3] Do not put your pond in the front yard. Unfortunately, in Brooklyn, you will soon find cans, bottles, your mail and your neighbor's kids in it.

4] Do have various ledges in the pond, either around the perimeter, 6", 12", 18", to position some or all of the potted plants. Make sure the shelves are flat!

5] Do arrange tall plants on the deeper shelves, small plants on the shallow shelves to form a marshy area, or if you like a rocky beach area stepping the plants down into the pond.

6] Study the edges of various types of ponds, tilting plants slightly out, away from the pond so less mud and debris run off into the pond.

INSTALLATION

Installation is the toughest part, but no great pond or water garden ever came about through a lack of enthusiasm or work. Also. plan on where to put all the dirt. Each shovel full dug out fluffs up to 2 1/2 times the volume once out of the ground. Once the hole is dug, lay an underliner, (sold in stores) or plenty of sand all around and smooth out the rough spots. Then start spreading out the liner evenly about the hole. Try to smooth out all the wrinkles and creases as it fills with water. Yes, you must be in it to do it right and yes your, feet will freeze and remember no high heels or shoes! Bare feet only. Don't forget to leave at least one foot of extra liner around the edge of the pond. As the pond fills up with water the liner settles a bit. Wait about a day or so to do the edging and incorporate the liner somehow into the edging to create a lip around the whole pond. (*Ed Note: Big rocks or a brick trim slanted away from the pond works just fine.*) This is very important because when it rains you don't want any mud running off into the pond. If you do it wrong, you'll wind up taking up the liner and re-doing it only a few weeks later, and that's a real pain.

FILTRATION

Now do you want a big stagnant puddle of water in your yard or do you want a big outdoor fish tank? That's right, we need water movement and filtration. On this subject there is just too much to fit into this article 'cause as I originally said no two ponds are the same.

Almost all the major aquarium companies are now manufacturing pond filters, so check them out. Also loads of books are avaliable to instruct you on how to build your own pond filters. I've seen plastic sinks, buckets, boxes, etc., filled with everything from sand to hair rollers, brushed polyester, foam to... well, you name it; there are plenty of ways to filter

water. Natural ponders rely also on the plants living in the pond to clean out dirt and impurities from the water, but this leaves the early spring and later fall as dirty, algae-filled times without much pond enjoyment. When it's cold, the plants don't thrive as well as during the summer, and as a result do a poor job of cleaning the pond.

The filter in our store pond is like a big outside filter for your regular fish tank. The water passes through a pre-filter, then through some foam and carbon, then bio-balls and still more foam. The bigger you can go (as with any fish tank), the better. Try to pump the total volume of your pond water through the filter about once every 1 to 2 hours.

Also I can't recommend strongly enough the use of an ultra violet sterilizer on your pond. Pond water passed through these types of units gets zapped by U.V. radiation, thus killing off parasites, harmful bacteria and algae! Yes, dreaded algae!! You will never have that "pea soup" type of algae problem that plagues so many ponders. **Get one!**

Now you own a filter and pump, your pond is full, so how about some water movement! I love flowing water and so do fish. Some plants will not do too well in rapidly agitated water, so maybe that shallow, calmer end of the pond with all those ledges would be good to keep your lilies and marsh plants. For the deeper side, there is a whole array of fountain heads, sprays, waterfalls ideas, etc. to choose from. Make sure you do something. Agitating the water's surface helps aerate the pond. During the summer, high temperatures rob the water of oxygen. Plants cannot provide enough if you keep larger numbers of fish. The gurgling, splashing, plopping sound of water does the soul good. Listening to it is one of my favorite things about having a pond.

As to water chemistry, I use one pound of marine salt to each 40 gallons of water. Yeah, that's right! Salt. It provides many of the minerals your fish need, kills off harmful bacteria and parasites and helps with osmosis, which is the flowing of fluids from one cell to another in your fish, (*Ed Note: What Charle is talking about is stress. A little salt helps reduce it in most freshwater fish.*) I use marine salt as opposed to rock salt or kosher salt for its mineral content (not just NaCl). Try to keep your pH in the 6.8 to 7.4 range and work at it like you do with your fish tank; check it weekly and adjust it accordingly (it usually stays pretty stable).

As with any tank, loading it up with too many fish too quickly will result in trouble.

Your pond, just like your tank, needs to go through a biological cycle, so go slow. The older your pond and the filter system gets, the more stable the water quality becomes. A population of fish can be increased step by step through the summer or even from year to year.

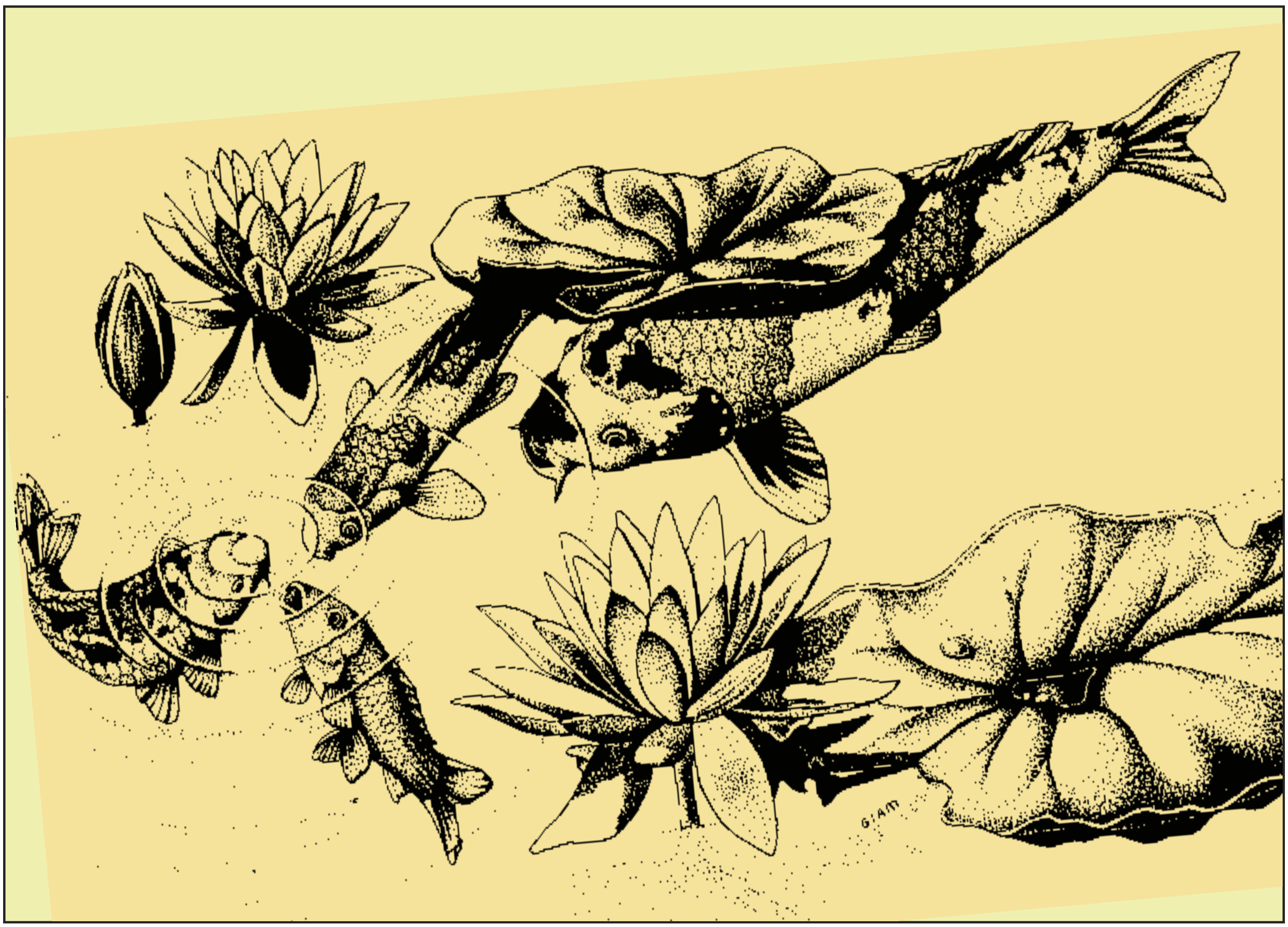
THINK LONG RANGE

Think long range. This isn't a 10-gallon guppy tank where you plan on developing different strains and such in a matter of months. Ponds are a long term project; each year something else can be added.

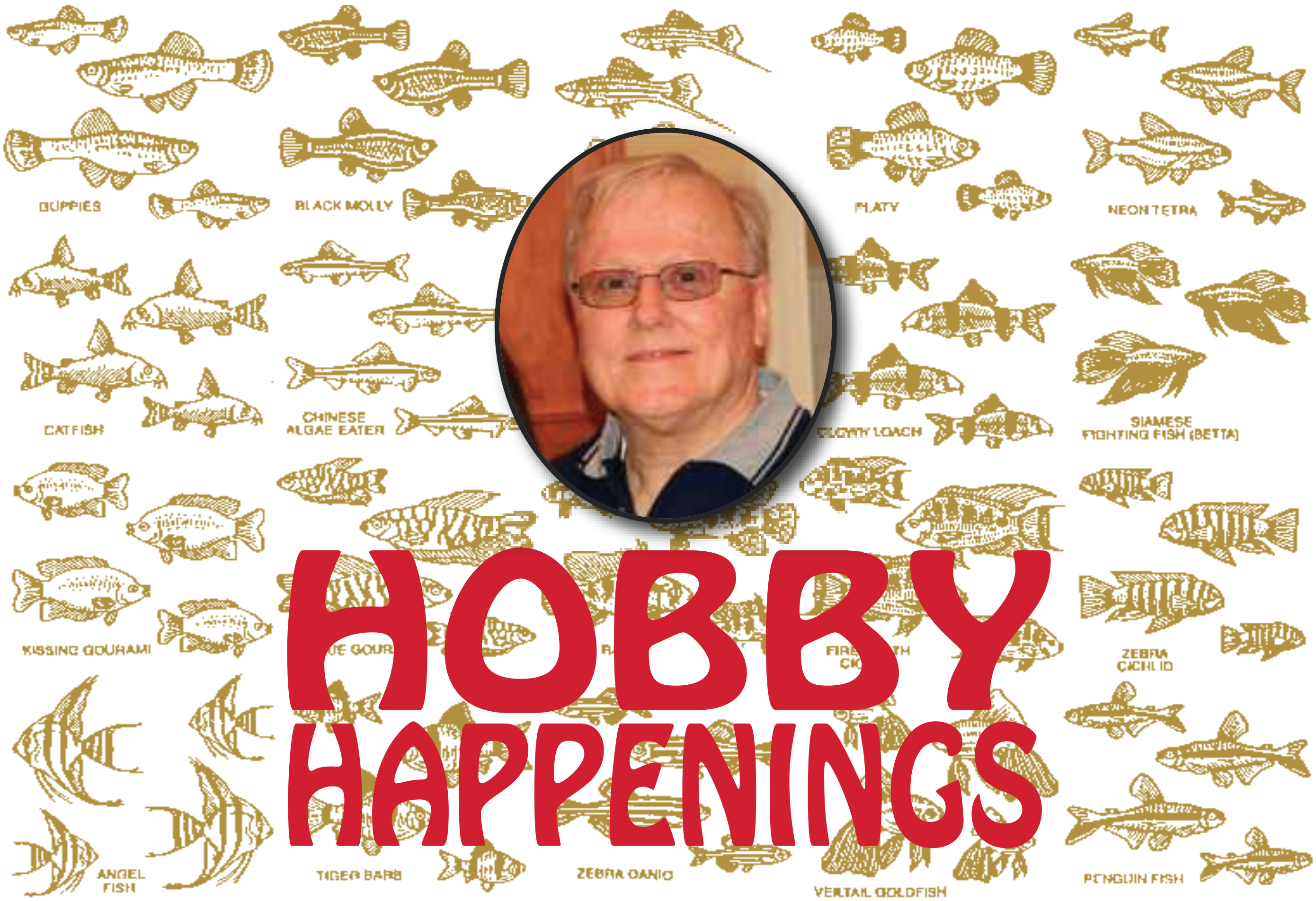
New falls, new pots of plants for a different look in landscaping. Every year our pond just seems to get better and better. The population changes just a bit; oh that fabulous koi can go in the pond and those two comets can go back into my tank inside. Or if I replant that lily in a bigger pot and fertilized it, it'll really take off and look great. Perhaps that dwarf red maple tree finally filled out, and looks great as a background for my pond, or I finally got around to painting the fence and the color looks just fine alongside the pond, etc.

Pond ideas and planning can brighten up a cold winter's day, just like planning that tomato garden, flower beds or summer vacation. Read a lot, visit other ponds to get new ideas and different viewpoints and join the fun!

Remember, I always say... it beats mowing a lawn.



Larry Jinks ~ RAS – BAS – NJAS



HOBBY HAPPENINGS

I'll start out by apologizing for not producing a column for November. I was just too burned out at that time. I find that my enthusiasm for my hobby runs to highs and lows, depending on family and other obligations that occur with life. I had a busy year getting my speaking career off the ground. I gave twelve presentations of five different talks in five different states and Canada during 2013. All this travel and hobby related interaction was tiring but opened my eyes to several things.

First, the tropical fish hobby is alive and well! I met so many great hobbyists and got to swap fish stories with so many enthusiastic fish keepers and fish breeders. I developed fish trading relationships with hobbyists in different clubs and even transported fish back from Vermont on the plane. You can do it, Larry!

I got to stay with **David** and **Janine Banks** in Vermont for a week while speaking in Vermont and Montreal, Canada. The Banks live right on Lake Champlain about a half hour from the Canadian border. Very beautiful, but a little chilly for my NC adapted blood. Janine also keeps a jungle of houseplants and introduced me to the Upwords game, which I've added to my Christmas list. I also bonded with their cats, Tanganyika and Malawi. David bagged up a pair of kribs I got at the TFCB monthly auction and some *Phalloceros caudimacuatus* fry in breather bags for me to take home on the plane with me as a carry on.

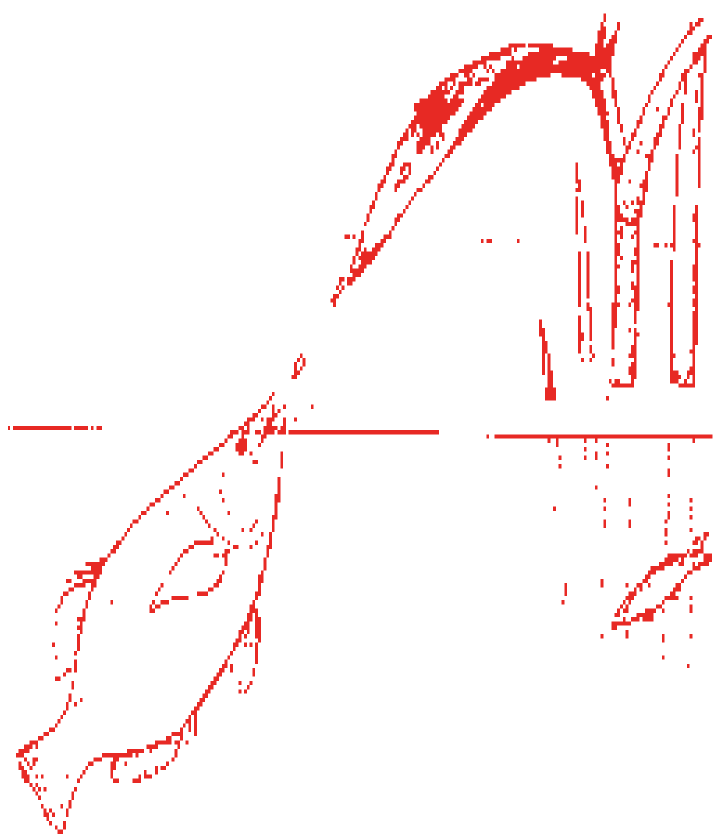
David and Janine were gracious hosts and drove me to the three clubs that brought me up there. I had dinner at the president's house before the **Otter Valley AS** meeting. We also had dinner with members of the **Montreal AS** at **Julian's** house in St. Jean before the meeting on Wednesday. I got a tour of Julian's fishroom. He is a great breeder, as is **Claude,** who was with us as well. Julian amazed me with his account of the spawning of splash tetras using a piece of slate emerging from the water!

On Thursday I spoke at the Banks home club, **Tropical Fish Club of Burlington**, and met some new fish enthusiasts as well as some who had seen my talk at Otter Valley. One member of TFCB regaled me with his account of the spawning of fresh water archer fish. David also took me to the Magic Hat and Fiddlehead breweries en route to meetings. What a great trip!

I only have two talks scheduled for 2014 (**Raleigh AS** in January and **Jersey Shore AS** in May), but will probably end up with more. I'm looking forward to our Raleigh AS workshop in February. **Chuck Davis** from NJ and **Al** and **Pam Brown** from South Carolina have committed to attend and I'm trying to twist **Jack Borgese's** arm to finally get him to NC! We have a great speaker lineup, a big auction, a native fish collecting trip and a fish room tour/hospitality party at my house with Joanne doing some cooking!

That's all for now since I have some work to do. Water changes are tougher around the holidays. I'll end by wishing all happy holidays and hoping to see more of my fish friends and making new ones in the coming year!

Larry



The Kissing *Prochilodus*

Semaprochilodus insignis

The Kissing or Flagtail *Prochilodus* (*Semaprochilodus insignis*) is perhaps the most beautiful and efficient of all algae eaters. It is a member of the small family of characins called *Prochilodontidae*, or flannel-mouthed fish, which are characterized by their large flexible mouths with little sickle shaped teeth in horizontal rows on both jaws, a labyrinth organ, and two stomachs.

They can scrape algae off nearly any surface, and have one stomach full of mud to help in digestion. Their potamodromous lifestyle makes them one the few great migrators of all riverine fish.

The Kissing *Prochilodus* has a parallelogram body shape with a wide tail. It is bright metallic silver in base color with 10 alternating bright orange and ten black horizontal stripes covering the entire tail, from which it gets its name, as it looks like a military insignia. It has an orange and black striped anal fin, red pelvic fins, and a rose colored spot on the upper gill cover. It is one of most handsome of all Amazonian fish. They reach 10-14 inches in adult length, and a staple food fish where they live.

This fish lives in rivers of equatorial Ecuador and Brazil, eastern Peru, Colombia and Guyana. It is known for migrating hundreds of miles in large shoals. They migrate twice a year, the first being a spawning migration at the beginning of the rainy season when they move from black and clear water rivulets to larger rivers to spawn. Then they drift off into the nutrient rich floodplains to eat - mostly detritus, small plants, and algae. They then return to the same tributary they came from and continue feeding for about 4 months. Towards the end of the rainy season, they migrate to the nutrient rich rivers again. As water levels rise, they spawn in the mouth of the tributary they are currently in. They cannot be bred in captivity and cannot be visually sexed.

The Kissing *Prochilodus* is an omnivore, but primarily an herbivore. They eat detritus and algae both in the wild and in captivity, also small worms and insects. They are not fussy eaters in captivity, eating blanched greens, soft plants, and floating flake food which they suck in at the surface. They will eat small pellets as well. They may spend hours "kissing" algae off glass, rocks, and wood. They like temperatures of 74-84 degrees, pH 5.5 to 7.2, and fairly soft water. They are excellent community fish for a large, fairly peaceful Amazon tank (55 gallons and over).

They do well with moderate sized catfish, peaceful to mildly aggressive cichlids, knifefish, and even Arowanas. They require lots of swimming room and clean water. Although they school in their migrations, they prefer to be solitary in a tank. They will fight with conspecifics, and may get slightly aggressive towards their tank mates only if they are crowded. My Amazon 55 gallon got overrun with algae from too much sunlight last summer, and my Pleco was not doing a great job. I purchased a 3 inch *Prochilodus* and it went to work scraping algae off every surface the first day. In 3 weeks it had eaten all the algae in the tank. It is now 9 inches long 6 months later. It shares a tank with a Chocolate Cichlid, 3 adult Rainbow Cichlids, and an albino Bichir. Because they cannot be captive bred, small ones are available in good aquarium stores but are a bit pricey at $30-40 each.

The Piscatorial Philosopher:

Water Quality

Beginner's lament: "My fish died! Why?"

It's human nature to get those new fish into the new tank as quickly as possible, even before the water is "ready." Maybe that's why.

Many in "The Hobby" for a while have the same problem. Since our pets live in water, I'll discuss the part water plays in maintaining a successful aquarium where our pets only die of old age. A philosopher is a seeker of truth, but first you have to know where I'm coming from.

A parable about 4 blind men leaning against an elephant; imagine, one's against the trunk, one against the leg, one against the tail, and one against the flank. Each, based on his vantage point, describes the elephant quite differently. Having the differing descriptions would make you think each is describing a different animal.

So, too, with "Our Hobby." Everyone leans against it at a different point. I'm "leaning," at the point of least time spent, least work, lowest cost and least hi-tech. I want maximum time to watch and enjoy my fish growing, mating, maturing, collecting Social Security and dying of old age.

To begin...at the beginning. Nowhere in nature will you find fish packed as densely as in our aquaria. Whether your personal rule is 1/2 inches of fish per gallon or 6 inches per gallon (with aeration of course), our aquaria are more densely packed than any lake, river stream or ocean.The waste produced by fish, plants and food cannot be avoided and must be dealt with. Although the same wastes are produce in these very same lakes, rivers, streams and oceans, their vast sizes takes care of the problem, naturally.

> **Pis-ca-to-ri-al**
> *adj-*
> (pis-ke-tor'e-al)
> Pertaining to fish or fishing.
> From the Latin *piscātōrius*,
> from piscātor: fisherman.

Dealing with these wastes in the confines of our aquaria points up the adage about differences in QUANTITY make for differences in QUALITY. Our tanks are not small lakes, rivers, streams or oceans. The primary difference between the organic/nutrient composition in natural waters and our aquarium water is concentration and not kind.

All the toxins produced in our tanks cannot be seen, smelled or tasted. Well, maybe smelled, but by then it's toooo late! We can, however, test for their presence.

More about this later.

My water rating system is PERFECT, VERY GOOD, GOOD, PASSABLE and DEADLY. Depending on how much time, effort and money we're willing to spend. Let's go for the top three.

Our fish, plants and food produce carbon dioxide, (CO_2) and ammonia, (NH_3).

Both are toxic. "Toxic" means DEADLY!

CO_2 is produced by fish and plant respiration. Yes, plants "breathe out" just as we do. Many factors are involved in the amount of CO_2 dissolved in water and its complex interrelationship with pH, atmospheric pressure, temperature, the buffer system, plants, animals and bacteria of decay. The only fact important to us is that CO_2 dissolved in water will equilibrate with the atmosphere. The system is self-regulating with outside air. But it's SLOW. You must keep the water constantly moving as virtually all the exchange is at the water's SURFACE. How you do it is where the heated discussions begin, advertising claims kick in and confusion reigns.

No need; bubbles from an air pump or circulation by a power filter of any kind, 24 hours a day, will adequately do the job. No need to inject oxygen, CO_2, ozone or anything else. Remember where I'm leaning against the elephant! Adding CO_2, for example, to aid plant growth, will change the pH, and any additive itself must be carefully monitored as it, too, may be toxic. CIRCULATION alone will keep us in the top three.

AMMONIA:

Organic materials derived from fish, plants and food are constantly being added to the water and tend to make it acid and deadly. These organics, which contain carbon (C) are the end products of metabolism and mineralization. Mineralization is the breakdown of organic, substances derived from plants and animals and contain carbon which change into inorganics, which have NO carbon. Depending on the pH, we could have more ammonia, (NH_3), or more ammonium (NH_4). I'll treat them as one. Ammonia is DEADLY! You can't see it or smell it in the crystal clear water of your tank. But it's there... lurking. It must be changed to something less toxic or removed.

A biological filter will change it. A biological filter brings together in a continuous process water with the waste nitrogen, (N), oxygen, (O), and an ample substrate with colonies of nitrifying bacteria. (Different from bacteria of decay, called heterotrophic).

There are many types of biological filters that do this - undergravel, wet-dry and so on. Regardless of the type, if it's working properly, if you change what must be changed, clean what must be cleaned, all on a regular maintenance schedule, the ammonia will be changed to nitrite (NO_2) and then to nitrate (NO_4), all by the action of bacteria. All the necessary bacteria are everywhere and newly set-up biological filter will cycle through Nitrosomonas, Nitrosulphate, Nitrosococcus, Nitrosolobus, Nitrocysitis and all the others with which I'm not on a first name basis. No action is necessary on your part except patience. It takes 3 to 4 weeks for a new filter to become functional after you introduce a few expendable fish to start the process. An undergravel filter can speed it up if you take 10% or more of the new filter bed from an old established tank. The new filter may then be ready in a few days.

NITRITE:

Toxic! It may take a while for the bacteria to convert nitrite to nitrate. When your nitrite level drops, the new filter is ready and safe to introduce our pets. How do you know? TEST!

NITRATE:

Also toxic, but much less so. Most experts think over 150mg (150 milligrams per liter of water) is dangerous. Nitrate is NOT subject to further oxidation. You have three choices to maintain our goal of staying in the top three water categories: water change, chemical filtration or a denitrification filter. While technologically possible to reverse the whole process I just described, installing and maintaining a denitrification filter is analogous to starting a NEW hobby. The complexities and hazards make it high risk and low gain. To get some idea, check ***FAMA***, April '92, pg. 170. For yet another perspective, remember plants "eat" both nitrate and CO_2. See our own **Saul Rosenburg's** article in ***Aquatica***, December '91, page, 11. I feel most of us are not used to low density of fish population necessary to make a "natural" tank work. But work it will! I say, "Just change the damn water! Give our pets a breath of fresh..."

CHEMICAL FILTRATION:

Unless used to remove nitrate, it performs the same function as a biological filter. Redundancy is good, but more costly and time consuming. As I'm testing on a regular basis, my well-maintained biological filter is more than adequate. A test reading too far removed from my baseline will alert me that something is wrong. And I'll do something about it, PRONTO!

MECHANICAL FILTRATION:

Taking out particles not dissolved in the water will lighten the load on my biological filter and lengthen the time between water changes. A good thing: adapt the intake stem to pick up near the bottom of the tank where most of the heavier particles settle. A little jerry rigging will do this and help delay water changes by removing more of the decaying material. There are many types of mechanical filters. Whatever kind you choose must be cleaned on a regular basis. I won't tell you all the nasty things that can happen if you don't, but you may fall out of the top three.

HARDNESS:

A general turm used to describe the total amount of minerals such as calcium carbonate, $CaCO_3$, dissolved in water. Water rich in dissolved minerals is called "hard", with little, "soft." Hardness is measured in "degrees of hardness," one degree being equal to 10 mg. of calcium or magnesium oxide per liter of water.

pH:

Measures the acidity or alkalinity of water pH really measures the difference between positively and negatively charged hydrogen ions, hence pH *pondus hydrogenii*, the power of hydrogen. pH 7.0 is neutral; less acid; more alkaline. The scale is logarithmic and each point, i.e.: 7.0 to 8.0, is a ten times greater concentration than the previous point.

REAL WORLD ADVICE - WHAT TO DO:

All based on "my truth.":

1. Test your water source, probably tap for most of us. Get a baseline reading on pH and hardness, probably neutral and soft around N.Y.C. Repeat a few times a year. Surprisingly, it may vary slightly. If your tank readings are different, it's because something is going on in there.

2. Test for NITRITE, NO_2: you can get by with this test ALONE. Low levels indicate nitrite is being converted into nitrate and there is little ammonia. It was converted to nitrate in the first place. For greater peace of mind, test for ammonia. Test for nitrate NO_3. When it builds to a level you don't consider acceptable - CHANGE THE WATER! Use test kits that give consistent results. Kordon and La Motte are considered to be among the best. Test at the same time of day. Results may vary at different times. Test weekly; write down your results.

3. Test pH weekly. Learn the requirements of the fish you want before you buy them. pH can be a silent killer. Use bromthymol blue to test. It's cheap, accurate and consistent. Use drug store bought (cheap) sodium bi-carbonate (bi-carb) to reduce acidity; sodium bi-phosphate to reduce alkalinity. Use 1/8 teaspoon dissolved in warm water per 10 gallons to be treated. Wait 2 days and re-test. Remember pH 7.0 to 8.0 represents a ten fold increase. From 7.0 to 9.0 is a 100 fold increase. Make changes SLOWLY! pH is a good starting point for more freshwater fish. Check their requirements before you buy them.

4. Test hardness monthly. Too hard? Change the water using distilled water, use a "pillow" with a water softening resin, available from pet shops, or put some peat in your mechanical filter and let the water run through it. Too soft? Let your water run through marble chips or coral sand. Put them in a fine mesh bag first. Changing hardness will probably change the pH. Relax for a few days and allow your system to stabilize.

5. Add one flat tablespoon of kosher salt (cheap and no iodine) per 5 gallons of water. Good for most freshwater fish. Salt doesn't evaporate. Remember that when replacing evaporated water.

6. Change 10% - 20% of your water once a week, once a fortnight, once in the blue moon based on TEST RESULTS.Chlorine won't be a problem for partial changes. Ignore it. If you must, let the water stand for a few hours before adding to your tank.

7. Constant aeration-bubbles, power filter, anything!

8. Mechanical filtration: Any kind.

9. Biological filtration:Any kind. Experiment! Try a reverse flow undergravel using mechanically filtered water.

10. Live plants. Okay to mix with artificial ones. Lighting must be adequate to make them grow. The live ones, silly, not the fakes.

Yes, you can combine the mechanical, biological and chemical filters into one unit. But if you're going to have all three, do it right, dedicate them. One for mechanical, one for biological and one for chemical.

Following all my advice will lengthen the time between water changes. But it can't be avoided entirely! Make it much less onerous by buying one of the commercially available sink-faucet to tank hook-ups. They're great! Or make your own.

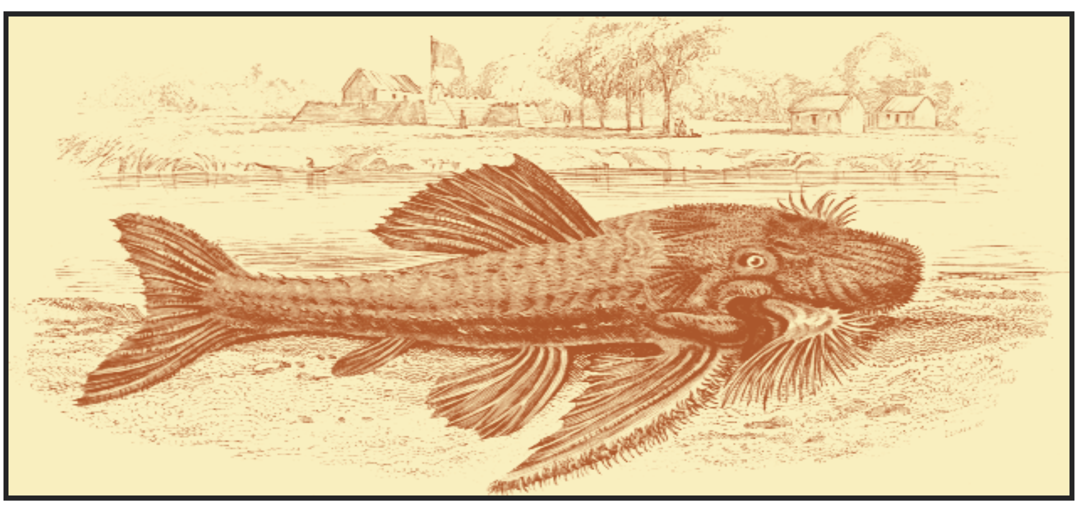
And always remember the basics: Don't overfeed, don't overcrowd and avoid sudden temperature changes.

I'm adding three new ones: TEST, TEST, TEST.

Save this article. I hope it will give you a greater feeling of control and happy, healthy fish. All with a minimum of fuss and expense.

Although I've avoided a hi-tech approach, those interested in the intricate inter-relationship between water, living fish and plants and who have some background in chemistry will find **Martin A. Moe Jr.'s** T***he Marine Aquarium Reference Systems*** and ***Invertebrates*** to be state of the art. Don't let the title fool you; fresh or salt, water is water.

And my special thanks to **Todd Urciuoli**. Had he not shared his time and expertise with me, I wouldn't have attempted to write this article.



A team of researchers led by scientists from the
American Museum of Natural History

Researchers Unveil Rich World of Fish Biofluorescence

JAN. 9, 2014 — A TEAM OF RESEARCHERS LED BY SCIENTISTS FROM THE AMERICAN MUSEUM OF NATURAL HISTORY HAS RELEASED THE FIRST REPORT OF WIDESPREAD BIOFLUORESCENCE IN THE TREE OF LIFE OF FISHES, IDENTIFYING MORE THAN 180 SPECIES THAT GLOW IN A WIDE RANGE OF COLORS AND PATTERNS. PUBLISHED TODAY IN PLOS ONE, THE RESEARCH SHOWS THAT BIOFLUORESCENCE -- A PHENOMENON BY WHICH ORGANISMS ABSORB LIGHT, TRANSFORM IT, AND EJECT IT AS A DIFFERENT COLOR -- IS COMMON AND VARIABLE AMONG MARINE FISH SPECIES, INDICATING ITS POTENTIAL USE IN COMMUNICATION AND MATING. THE REPORT OPENS THE DOOR FOR THE DISCOVERY OF NEW FLUORESCENT PROTEINS THAT COULD BE USED IN BIOMEDICAL RESEARCH.

"We've long known about biofluorescence underwater in organisms like corals, jellyfish, and even in land animals like butterflies and parrots, but fish biofluorescence has been reported in only a few research publications," said co-lead author **John Sparks**, a curator in the Museum's Department of Ichthyology. "This paper is the first to look at the wide distribution of biofluorescence across fishes, and it opens up a number of new research areas."

Unlike the full-color environment that humans and other terrestrial animals inhabit, fishes live in a world that is predominantly blue because, with depth, water quickly absorbs the majority of the visible light spectrum. In recent years, the research team has discovered that many fishes absorb the remaining blue light and re-emit it in neon greens, reds, and oranges. "By designing scientific lighting that mimics the ocean's light along with cameras that can capture the animals' fluorescent light, we can now catch a glimpse of this hidden biofluorescent universe," said co-lead author **David Gruber**, an associate professor of biology at Baruch College and a research associate at the American Museum of Natural History. "Many shallow reef inhabitants and fish have the capabilities to detect fluorescent light and may be using biofluorescence in similar fashions to how animals use bioluminescence, such as to find mates and to camouflage."

The researchers' investigations into fish biofluorescence began with a serendipitous observation of green eel fluorescence off of Little Cayman Island as Sparks and Gruber were imaging coral biofluorescence for an exhibit for the traveling American Museum of Natural History exhibition Creatures of Light: Nature's Bioluminescence.

To further explore this phenomenon, Sparks, Gruber, and researchers from the John B. Pierce Laboratory of Yale University, the University of Kansas, and the University of Haifa, Israel, along with professional photographers and video-graphers, embarked on four additional high-tech expeditions to tropical waters off of the Exumas in the Bahamas and the Solomon Islands. During night dives, the team stimulated biofluorescence in the fish with high-intensity blue light arrays housed in watertight cases. The resulting underwater light show is invisible to the human eye. To record this activity, the researchers used custom-built underwater cameras with yellow filters, which block out the blue light, as well as yellow head visors that allow them to see the biofluorescent glow while swimming on the reef.

The most recent expedition was The Explore 21 Solomon Islands Expedition, the first trip under a new Museum initiative that supports exploratory fieldwork that is multidisciplinary and heavily integrated with emerging technologies. From the research vessel Alucia, the scientists conducted technical scuba dives and descended in a three-person submersible to examine deep coral reef biofluorescence down to 1,000 meters. They also submitted the scientific paper while aboard.

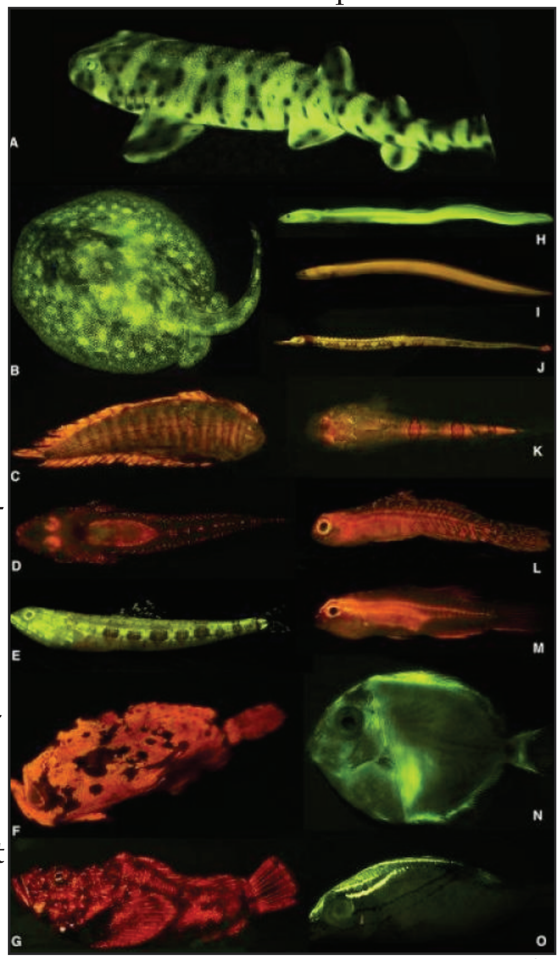
These expeditions revealed a zoo of biofluorescent fishes - from both cartilaginous (e.g., sharks and rays) and bony (e.g., eels and lizardfishes) lineages - especially among cryptically patterned, well-camouflaged species living in coral reefs. By imaging and collecting specimens in the island waters, and conducting supplementary studies at public aquariums after hours, researchers identified more than 180 species of biofluorescent fishes, including species-specific emission patterns among close relatives.

The team also noted that many biofluorescent fishes have yellow filters in their eyes, possibly allowing them to see the otherwise hidden fluorescent displays taking place in the water. Although more research is needed, this finding indicates that biofluorescence could be used for interspecific communication while remaining camouflaged to predators. This ability might be especially important during full moons, when fishes have been shown to partake in mating rituals.

"The cryptically patterned gobies, flatfishes, eels, and scorpionfishes -- these are animals that you'd never normally see during a dive," Sparks said. "To our eyes, they blend right into their environment. But to a fish that has a yellow intraocular filter, they must stick out like a sore thumb."

In addition, the research revealed that fish biofluorescence is extremely variable, ranging from simple eye rings to glowing green mucus secreted on the outside of fishes to complex fluorescent patterns throughout the body, including internally, suggesting that the ability to glow evolved a number of times in fishes. Further study on the mechanics of this phenomenon could uncover new florescent proteins for use in experimental biology.

"The discovery of green fluorescent protein in a hydrozoan jellyfish in the 1960s has provided a revolutionary tool for modern biologists, transforming our study of everything from the AIDS virus to the workings of the brain," Gruber said. "This study suggests that fish biofluorescence might be another rich reservoir of new fluorescent proteins."



Researchers discovered a rich diversity of fluorescent patterns and colors in marine fishes, as exemplified here.
A) swell shark (*Cephaloscyllium ventriosum*)
B) ray (*Urobatis jamaicensis*)
C) sole (*Soleichthys heterorhinos*)
D) flathead (*Cociella hutchinsi*)
E) lizardfish (*Saurida gracilis*)
F) frogfish (*Antennarius maculatus*)
G) stonefish (*Synanceia verrucosa*)
H) false moray eel (*Kaupichthys brachychirus*)
I) Chlopsidae (*Kaupichthys nuchalis*)
J) pipefish (*Corythoichthys haematopterus*)
K) sand stargazer (*Gillellus uranidea*)
L) goby (*Eviota sp.*)
M) Gobiidae (*Eviota atriventris*)
N) surgeonfish (*Acanthurus coeruleus*, larval)
O) threadfin bream (*Scolopsis bilineata*).
(Credit: ©AMNH)

Izzy Zwerin ~ BAS

The Practical Plant

PROPAGATING

SAGITTARIA SUBULATA

Sagittaria Subulata is a great plant that I feel good about recommending to anyone. It is a relatively undemanding plant suitable for use as a foreground plant in medium to large aquariums. In smaller tanks, it may be used in the mid to background positions. *S. subulata* is a rosette plant native to the eastern U.S. and South America. It is adaptable to most water parameters and will be fine in moderate lighting. Once it is established it will spread rapidly via runners forming a dense carpet.

My *S. subulata* is being kept in my Discus tank. The Aquarium is a 37 gallon (22″ tall x 30″ long x 12″ wide) and is using a Coralife Compact Fluorescent fixture (130 Watts). The water parameters are 84° temperature, slightly acidic and fairly soft. I am also making use of CO_2 enrichment. A Fluval canister filter (model #303) with the output being directed through a submerged spray bar is doing my filtration. I use the Estimated Index system of fertilizer dosing. This means that once a week I perform a large water change (50-75%). This is usually done on Saturday. Do not be concerned about the large volume of water that is being replaced; your fish will love it. This large water change is necessary to reset the system. Then on Saturday, Monday and Wednesday, I dose the macro-nutrients, and on Sunday, Tuesday and Thursday I dose the micronutrients. Friday, I take the day off. The lighting is timer-controlled and on for 12 hours a day.

This plant has narrow strap-like leaves and is a bright green color. To a certain degree, it resembles a miniature *Vallisneria*. My understanding is that with enough light the plant will pick up red hues. I have not yet tested this claim. The common name the plant is sold under is “Dwarf Sag.” The plant is easily propagated by separating the plantlets from the runners. The plant is trouble free and low maintenance. It will occasionally need to be thinned out and older plants may become taller than desired. These older, taller plants may be pruned or simply removed.

John Todaro, BAS
From the Brooklyn Aquarium Society's publication
Scrumptious Meals & Live Food Treats Compiled, edited & written by John Todaro

Gordon's Gourmet Gusto Liver Dinner

Here's a recipe that is perfect for meat loving fish, high in protein and vitamins. The addition of vegetable matter is important as it helps to keep your carnivorous fish "regular." (Who wants irregular fish!)

The beauty of this recipe is that it can easily be altered to suit your fishes' dietary needs.

You can put in as much shrimp or fish roe as you wish, or chicken gizzards. Or leave them out if you wish.

The addition of these high protein foods gives your fish a variety of tastes.

RECIPE

INGREDIENTS:

1 lb. Beef liver
6 Hard boiled egg yolks
4 Multi-Vitamins
(One-a-day Vitamin capsules)
1 cup of high-protein Gerbers® Baby cereal or enough to make the mixture into a stiff paste.
Water as needed to make a stiff paste.

OPTIONAL ADDITIONS:

Spinach (fresh or frozen)
Shrimp (uncooked) chicken gizzards, fish roe.
8 oz. jars of Gerbers® baby food such as sweet potatoes, carrots, peas, etc.

DIRECTIONS:

First, skin a pound of beef liver. Remove all fibrous skin and veins. They will not liquefy and fish may choke on them. If you don't remove them beforehand, you will have to strain them out after blending - a nuisance. liquefy beef liver in blender, adding only enough water to make consistency of thick paint. Add 6 hard boiled egg yolks one at a time. Blend completely. Add the Multi-vitamin. Cut or pull apart the capsules and pour in the contents. Blend thoroughly. Add cereal or water as needed to make mixture a stiff paste. Add whatever other ingredients you wish at this point. Blend in all ingredients you have added. If you're mixing a general fish food, one or two vegetable matter foods can be added. If the food is for carnivorous fish, keep the vegetable matter low and add items such as shrimp, chicken gizzards, fish roe, etc. Be sure to blend in thoroughly. The paste is then transferred to a double boiler and cooked for about 45 minutes or until it loses its redness. Stir the mixture occasionally. When done, let cool to room temperature. Divide and place in plastic food bags. Carefully roll them flat with a rolling pin to about 1/4" inch thick and freeze. Mark bags with mixture type and date.

FEEDING:

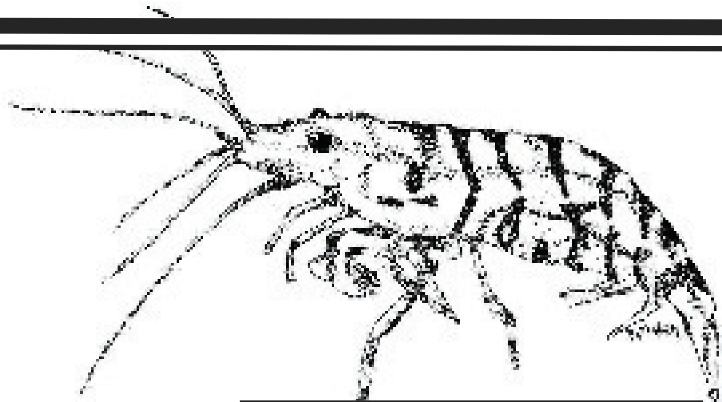
Break off only enough food to be eaten in 5 to 10 minutes.

Brad Kemp

TheShrimpFarm.com is the place to go for freshwater shrimp. The owner, **Brad Kemp**, has a new address: The Shrimp Farm USA, 11936 West 119th St., #197, Overland Park, KS 66213, U S A and has set up an Aquarium Shrimp Forum **http://theshrimpfarm.com/forum/index.php**. You can go to this forum and ask questions, talk to other shrimp nuts and discuss anything and everything related to Aquarium Shrimp.

AMANO SHRIMP

Scientific Name: *Caridina multidentata*
Other Seientific Names: *Caridina japonica*
Common Name: Amano Shrimp
Other Common Names: Japanese Swamp Shrimp, Yamato Numa-Ebi Shrimp
Origin: South East Asia
Found in the wild: Yes
pH Range: 6.5 - 8.0 — Ideal pH: 7.2
Temperature Range: 70˚ - 80˚F — Ideal Temperature: 75˚F
Hardness Range” 3 - 10 dkh — Ideal Hardness: 8 dkh
Life Span: 2 - 3 Years
Gestation Period: 30 Days
Size: 1-2 inches
Diet: Omnivore



AMANO SHRIMP HISTORY

The Amano Shrimp is often credited as starting the Dwarf Shrimp hobby in the United States. The Amano Shrimp was introduced to the American aquarium hobby around 1994. **Takashi Amano**, the author of ***The Natural Aquarium*** and noted planted tank author, wrote in his book about the effectiveness of the Amano Shrimp in controlling Algae in the planted tank. Many planted tank aquarists then started to stock them in their tanks in America and their popularity grew from there in the late 1990's.

Amano Shrimp Care

Amano Shrimp are rather simple to care for in the home aquarium. Undemanding when it comes to water parameters, as long as pH, hardness, and temperature extremes are avoided, in a well established aquarium the Amano Shrimp will grow healthy and happy.

Amano Shrimp Diet

Amano Shrimp are some of the best algae eating Dwarf Shrimp in the hobby. When the Amano

Shrimp are kept in larger groups, it is often necessary to add extra food for the shrimp. As with most other Dwarf Shrimp, the Amano Shrimp will happily accept food intended for bottom feeding fish and any aquatic invertebrates.

Breeding

The Amano Shrimp is one of the more difficult shrimp to successfully breed in the home aquarium. The young shrimp do not hatch as small versions of the adults, like a Red Cherry Shrimp does, but they hatch as larva. These larva require salt water to grow to metamorphosis and become freshwater shrimp again. The easiest way to determine the sex of an Amano Shrimp is their lowest stripe along the length of the body. Male shrimp have a line of separate dots while females have dashes almost appearing to be a broken line.

Amano Shrimp Behavior

Generally a non-aggressive Dwarf Shrimp, the Amano Shrimp can be quite a greedy feeder. They do not harm any other aquarium inhabitants, but will often steal food from smaller shrimp. When there are no predators present in an aquarium, the Amano Shrimp will be quite active, foraging and cleaning the aquarium of algae.

Special Notes

As with all aquatic invertebrates, it is important to make sure copper does not get into the aquarium. Copper is toxic to all Dwarf Shrimp. Many medications contain elevated levels of copper, so it is recommended not to medicate an aquarium with Dwarf Shrimp in it.

Brad

John Daw

Originally published as an Aquarian publicity leaflet.
Aquarticles

MARINE FISHKEEPING
THE BASICS

The keeping of marine organisms in aquaria has come a long way in a remarkably short time. For example, successful spawnings of the various species of Clownfish (*Amphiprion* spp) no longer make headlines, although the achievement (rightly) continues to rate very highly in the eyes of most aquarists. Yet, in spite of the spectacular progress that has been made, many people still feel that the marine hobby is so difficult and demands such high levels of expertise, that no one but the dedicated specialist can ever hope to be a successful marine aquarist. Experienced marine hobbyists, on the other hand, have been stressing for years that a sound, commonsense approach, coupled with a desire to seek correct advice and act upon it, is usually enough to set the beginner on his/her way.

There are three main "types" of marine aquaria: **(i)** native marine, housing species found around "home" coastlines; **(ii)** invertebrate, containing species of marine organisms lacking internal skeletons; and **(iii)** tropical marine, a term commonly used when referring to aquaria housing tropical marine fish (even though an invertebrate aquarium may well be "tropical" in nature).

Each of the above categories requires a complete Guide to itself to do it any justice. This particular Guide, therefore, concentrates on just one category, Tropical Marine Fish. Although it cannot hope to cover even this limited subject in great depth, it nevertheless attempts to tackle the main principles of this side of the hobby in sufficient detail to allow the potential marine aquarist to make an informed start.

The Aquarium

Choosing a suitable aquarium is one of the most fundamentally important decisions that need to be made. It is, therefore, well worth spending some time weighing up several possibilities before making a final choice.

As with the freshwater hobby, there are two main points to consider: the type of aquarium and its size.

It must be stressed straightaway that some of the aquaria which can be used for freshwater fish are out of the question when it comes to marine organisms. The most obvious (and potentially lethal) are old angle-iron tanks. Iron reacts with both fresh and saltwater, but marine organisms are much more susceptible to the harmful effects of these chemical reactions than freshwater organisms are. Therefore, what would normally be a tolerable level of toxic substances in freshwater, is likely to be lethal in the marine aquaria.

The best way of avoiding this is, clearly, to give this type of aquarium a miss and opt for a safer one instead. This can actually be an angle-iron tank which has been coated in such a way that there is no direct contact between the metal and the water. PVC is one such suitable coating, but there are others as well.

Plastic or Perspex aquaria obviously do not present any of the above problems. They also have the added advantages of being relatively light and inexpensive. However, counter-acting this, there are several disadvantages, such as the discoloring that occurs with age and the ease with which plastic scratches, thus spoiling the appearance of the aquarium as a whole.

The most popular aquaria today are those made entirely of glass. Their advantages are numerous, including ease of construction. This has been made possible by the development of silicone-based aquarium sealants which set in a few hours but can last, without leaks, for ten years or more.

The flexibility that this major development has brought to aquarium construction has led to all-glass aquaria of sizes, prices and shapes (including cylindrical ones) to suit virtually every conceivable need and pocket. The ease with which many of the basic shapes can be constructed has also resulted in a higher incidence of home-built aquaria, particularly amongst specialist fishkeepers. Each tube of sealant carries full instructions, so I will not take this matter further other than to stress that tanks measuring 3ft. (90 cm.) or more in length should carry at least one front-to-back strut to prevent bowing and possible disaster.

Although the range of aquarium types discussed above is not fully exhaustive, it includes those most commonly met. In addition, there are stainless steel, anodized aluminum, glass-fronted fiberglass and other types of aquaria, but space does not allow fuller consideration of these here.

Aquarium Size

However large an aquarium may be, it is still minute when compared to the natural environment in which fish normally exist. Therefore, no matter how careful or experienced an aquarist may be, conditions inside an aquarium will inevitably be artificial, to a greater or lesser extent.

As a consequence of this, there will be a build-up of certain substances and a possible lack of others which can cause serious problems if the maintenance routine is inadequate.

One factor that will help or hinder the development of an adequate routine is the size of the aquarium. The reason for this is that the smaller the volume of water present, the more susceptible it is to changes. Therefore, even a minimal amount of overfeeding will lead to serious pollution in a small aquarium. In a large one, its effects are proportionately less and should, at least, give the aquarist the margin of safety required to remedy the problem before it really gets out of hand.

Although this principle applies to both freshwater and marine aquaria, its significance is considerably greater in the latter because marine organisms are much more sensitive to water quality changes.

It, therefore, makes sense to go for the largest aquarium possible from the start. The extra expense involved will more than pay for itself in a short time, simply by the number of expensive problems that will be avoided.

In any case, a 36'"x 15" x 12" (90 x 38 x 30 cm) tank should be considered the minimum by anyone who has not kept marine fish before. Experienced aquarists can go below this without courting disaster, but not the beginner, unless (s)he is lucky or a very fast learner.

Aquarium Covers

There is a wide range of aquarium hoods on the market, ranging from simple covers to sophisticated, partitioned units designed to house lighting and other equipment. It is really up to the aquarist to decide which of the available models best suits his/her needs.

Two points, though, are worth bearing in mind. First, it is essential that there are no exposed metal parts. If there are, they will react with the saltwater and will cause, at best, distress to the fish and, at worst, their death. This can be avoided by painting the exposed metal with a non-toxic gloss paint. If this is done, several days, at least, should be allowed for the paint to dry out thoroughly. The second point referred to above concerns evaporation and splashing of water. Both are unavoidable, particularly since aeration is usually quite vigorous in marine aquaria.

The easiest way to avoid these potential problems is simply by using a condensation or cover sheet. These can be bought ready-made in plastic or can be made out of a sheet of glass cut to a size slightly smaller than the tank itself. By supporting this sheet either with glued-on strips of glass or by resting it on the back-to-front struts mentioned in an earlier section, the water will drop back into the aquarium without making contact with the hood, frame or sides.

Water Quality

Whereas one can get away to an extent with a certain degree of deterioration in water quality in freshwater, the same cannot be said of marine aquaria.

As I have mentioned earlier, marine fish are very sensitive to chemicals in the water. Some of these can be introduced by the aquarist (various ways of avoiding this have already been discussed), while others are produced by the fish themselves. Of the latter, the two most toxic ones are Ammonia and various Nitrites which can prove lethal even at very low concentrations. Maintenance of good water quality is, therefore, an absolute must in marine aquaria and the aquarist who ignores this does so at his/her own peril. The collection of seawater must be avoided, not because it is harmful in any way (!), but, rather, because it soon becomes "imbalanced" in the confines of an aquarium and can cause all sorts of problems through the introduction of unwanted micro-organisms, such as pathogenic (disease-causing) bacteria.

The following are the most significant aspects of water chemistry that need to be appreciated before a start in the marine hobby is made:

Specific Gravity, Salts and Trace Elements

Saltwater, as the name implies, carries a number of chemicals dissolved in pure water. These chemicals make the water heavier, or denser, and it is the way in which this compares to the weight of pure water at 40C that gives the figure referred to as Specific Gravity.

Saltwater from seas in which "aquarium" species of fish are found can vary from 1.020 (in parts of, e.g., the Pacific) up to as much as 1.035 (Red Sea). Most seas, however, have a S.G. value of between 1.020 and 1.022. While keeping fish in water having a higher than recommended S.G. will have deleterious effects on them in the long run; fish kept under lower S.G. conditions (provided the change is carried out gradually) can adjust and often live longer. In the aquarium, a range, between 1.020 and 1.023 is suitable for most species. This value is achieved by dissolving balanced, prepared aquarium salt mixes in the recommended amounts of water (tap water is adequate - you do not need to use pure water), and measuring the S.G. with a hydrometer.

Hydrometers are calibrated to give readings at the range of temperatures at which most tropical species are kept, i.e., around 24-260C (approx. 75~80 deg.). Aeration helps the salts to dissolve so this should be provided, particularly when time is short.

Many of the salt mixes available also contain all the essential trace elements which fish and other organisms require. This should, therefore, be checked beforehand and provided as a supplement if required.

Ammonia, Nitrites & Nitrates

These three chemicals, despite some differences, all have one thing in common - Nitrogen. For this reason, they are usually considered together as part of the Nitrogen Cycle.

Basically, they relate to each other as follows: Fish and other marine organisms break down protein as part of their normal digestive processes. Some of the nitrogen contained in the proteins is retained, but the rest will be eliminated as Ammonia. This substance is highly toxic, but is soon converted in a balanced aquarium into Nitrites by the action of bacteria, e.g., Nitrosomonas. Unfortunately, Nitrites are also toxic, but other bacteria, e.g., Nitrobacter; convert the Nitrites to Nitrates which are considerably less harmful. Some of the Nitrates can be converted into free Nitrogen while some will be assimilated by plants and algae. If these are eaten directly by fish, or indirectly by fish feeding on other animals which, in turn, have fed on the plants, the cycle will have been completed.

Clearly it is essential to keep the Nitrogen Cycle under control, with Nitrite readings at, or near, zero. This can be achieved in a number of ways, most of which involve some form of filtration (see section on Aeration and Filtration).

pH - Acidity and Alkalinity

Pure water is said to be neutral and is given a pH value of 7. Lower figures represent progressively higher degrees of acidity, while higher figures represent higher degrees of alkalinity. The complete scale runs from 0 to 14. However, it is not a linear cycle; it is logarithmic. This means that water at pH 8 is 10 times as alkaline as water at pH 7. A reading of pH 9 indicates, therefore, 10 times the alkalinity of water at pH 8 and 100 times that of water at pH 7.

This explains why even small changes in pH can have such dramatic effects, particularly if the changes are abrupt and do not give the fish a chance to adapt. The pH range for tropical marine tanks should be between 8.0 and 8.3, i.e., alkaline. This can be measured (as is the case for Nitrites) by means of reliable, inexpensive test kits. The addition of a buffer solution will help prevent abrupt fluctuations in pH and should be considered as a useful part of every aquarist's "armory."

Aeration and filtration

Aeration and filtration systems vary so much in design, complexity and price that it would be impossible to present a comprehensive review here. Basically they all aim at oxygenating the water and reducing or eliminating toxic wastes from it. Although some toxic wastes (such as Ammonia and Nitrites) occur in solution, others occur as actual particles. This applies in particular to faeces ("droppings").

Clearly at least two types of filtration are required:
(a) mechanical to remove the debris and
(b) biological (or biochemical) to remove the rest. Many of the filtration systems that are available today can do both jobs, and aerate the water, all at the same time.

a) Box filters

These channel water either under the influence of an air stream from an aerator or a water current from a motor, through a box which can be internal or external to the aquarium. In this box, various "sandwiches" of filtering medium can be arranged, e.g., filter wool, charcoal, gravel /shells, or even diatomaceous earth.

Box filters are used primarily for mechanical and/or chemical filtration.

b) Undergravel filters

These consist of a specially designed plate which is placed under the gravel and one or more air-lift tubes into which are introduced air lines connected to the aerator (pump). As the bubbles of air rise, they lift water up these tubes and drag water from the aquarium down through the filter plates. If these plates are covered with a suitable medium on which the beneficial Nitrosomonas and Nitrobacter bacteria can grow, then the water will be purified as it flows through.

A suitable medium (substratum) for this is either a mixture of crushed shells and coral sand, or layers of these, made up of one part of shell to two parts of sand. The depth of this layer is also important - anything less than 3 inches (ca. 8 cm) will not be fully effective. The chemical composition of the shells and coral sand also help maintain the pH in the required region of 8.0 to 8.3.

As the air bubbles out at the top of the air-lifts, aeration occurs. However, if the bubbles are large (rather than a "mist") or if the aerator is not strong enough, then supplementary aeration by means of diffuser stones must be provided.

c) Reverse flow filtration

This system is similar to undergravel filtration in that it uses the substratum as the filter medium. However, in reverse - flow filtration, water is forced down the air-lifts by means of a power head, power filter outlet or pump, and up through the gravel. One advantage claimed for this method is that the water can be mechanically filtered before it reaches the gravel whereas, in normal undergravel filtration, the gravel itself has to do this job.

If reverse-flow filtration is used, then aeration does not occur to the same degree and a separate aerator must, therefore, be used.

d) Power filtration

Power filtration can have all (or most) of the advantages of undergravel filtration, plus several others. For example, regular cleaning is easy and a range of filter media can be used, e.g., charcoal, filter wool, foam, shells, etc. In addition, faster flow rates allow for a vigorous circulation of water which, when combined to a spray-bar attachment, ensures efficient aeration without the need for a supplementary air pump.

One disadvantage of power filters is that they do not normally harbour as many beneficial bacteria as undergravel filters. Therefore, if the aquarium is fully stocked, there is a possibility that further water purification may be necessary. Regular monitoring of water quality by the use of test kits will soon show if this is the case. This supplementary equipment can take the form of an Ozonizer, and Ultra-violet Sterilizer or a Protein Skimmer.

e) Ozonizers, Ultra-violet Sterilizers and Protein Skimmers

(i) Ozonizers are useful in that they can restrict/control the growth of bacteria. They may also help in controlling certain diseases. Overdoses will cause serious problems.

(ii) Ultra-violet Sterilizers will kill bacteria if used in sufficient doses. It is also claimed that they will control algae, fungi and several pathogenic organisms.

(iii) Protein Skimmers produce a foam which is capable of collecting organic matter in an easy-to-clean trap. When combined to an Ozonizer, efficiency is improved even further.

f) Combined filtration System

Protein skimming, mechanical filtration, biochemical filtration and aeration are all combined in a sophisticated, effective but expensive system which has become available in recent years. The aquarist must, of course, make up his/her own mind, particularly since there are other expenses to be considered when first setting up, and other filtration/aeration systems are also highly effective when properly managed. Whichever system is adopted, one should aim for a turnover rate of around three times the capacity of the aquarium every hour.

Temperature Control

Most of the commonly available marine fish are at their best at temperatures between the mid- and high 70ºs F (24º-26º C). Although this temperature can be allowed to fluctuate slightly, these fluctuations must be gradual. Sudden changes in temperature can cause similar problems to sudden fluctuations in pH, as mentioned earlier.

The easiest method of heating an aquarium is by means of combined heater/thermostats. This is not the only way of course, but it does have one outstanding advantage over other methods in that it is very easy to set up.

Separate heaters and thermostats of various designs are also available. One of their advantages over combined units is that individual components can be replaced more easily. Separate units also make it possible to operate more than one heater from a single thermostat. In some cases, the savings thus made can be significant.

When calculating the heating requirement for an aquarium, allowances should be made for major drops in external (room) temperature. If the wattage of the heater chosen is approximately twice the figure arrived at through strict mathematical calculations, this will provide sufficient reserve power to cope with most situations. Adopting this approach, one can arrive at a reasonable wattage by applying the following rule-of-thumb: For tanks measuring approximately 24" x 12" x 12", allow 10 watts/gallon. For tanks up to 48" long, allow 6 watts /gallon. For tanks up to 72" long, allow 4 watts/gallon.

Aquarium Lighting

Aquarium lighting usually receives a great deal of attention where freshwater aquaria are concerned. However, when it comes to marine aquaria, this subject is often given no more than superficial treatment. Perhaps the fact that few, if any, marine plants are cultivated by most hobbyists has something to do with this.

Indeed, if the tank is to contain just fish, and if the aquarist dislikes seeing algal growth on the rocks and sides of the aquarium, then reduced light intensities will serve both aims satisfactorily.

However, it must be stressed that those fish which like/require/prefer algae in their diet must have this (or an equivalent) otherwise provided. Aquarian Vegetable Diet is an ideal source of high-quality vegetable food.

There are two main forms of "marine" lighting: tungsten and fluorescent. Recently high-pressure mercury vapor lights have also become available. Each of these has its own advantages /disadvantages and the aquarist must weigh these up before coming to a final conclusion.

Tungsten bulbs are cheap but hot and do not enhance the appearance of the fish as much as fluorescent tubes do. They do, however, produce light relatively rich in "red" wavelengths which are beneficial to the growth of green sea-weeds.

Fluorescent tubes exist in a number of types, each emitting its own range of wavelengths from brilliant white to deep purple. If red or brown algae are being cultivated, then those tubes emitting light close to the blue end of the spectrum will be found more suitable.

Mercury bulbs produce light of high intensity and are, therefore, particularly suitable for deep tanks or for those where good algal growth is essential. These bulbs are, however, expensive to install, but are long-lasting and relatively cheap to run.

Assuming that the lights will be switched on for an average of 14 hours per day, the following table may be used as a rough guide for fluorescent tube illumination. With marine aquaria, some experimentation is almost always necessary in order to establish adequate lighting levels to suit individual aquaria.

Wherever possible, the above wattages should be divided equally among several tubes for evenness of distribution. This also allows for combinations of tubes emitting different types of light.

Other Aquarium Requirements

In addition to the items mentioned in the previous sections, there are several other "musts": Nets, replacement heater/stats (wired up and ready to use at a moment's notice), thermometers, algae scrapers, siphon tubes, "spot" cleaners, e.g., aquarium vacuum, long forceps (for removing objects, dead fish, etc.), plastic

Approximate rating requirements

Aquarium Size	Wattage:
24x12x12	75 - 100
36x15x12	100 - 150
48x15x12	120 - 180
60x18x18	150 - 210
72x18x18	200 - 300

Approximate total wattage:

Tank Dimensions.	For viewing only.	For algae growth
24x12x12	30w	60w
36x15x12	40w	90w
48x15x12	60w	120w
60x18x18	140w	220w
72x18x18	160w	270w

buckets (for water changes), glass jars (for equilibrating temperatures prior to introduction), spare diaphragms (for aerators), etc., will all make life easier.

A selection of test kits, to include Water Hardness, pH and Specific Gravity should also be considered essential.

Foods and Feeding

Good quality commercially prepared foods, such as Aquarian, contain very little moisture and very high levels of nutrients. Therefore, a little of this food goes a long way. Some aquarists overlook this fundamental point and overfeed their fish. The results are, invariably disastrous.

Food should be consumed within a few minutes. If uneaten flakes can still be seen after, say, ten minutes, then the fish have definitely been overfed. It is worth noting that it is far more difficult to underfeed than overfeed, so it is best to start off with very small feeds and increase these gradually until an optimum level is reached. Two small feeds per day should be sufficient.

Some marine fish can be a bit awkward at first, but we have found at Aquarian (in laboratory controlled trials) that flake food is readily taken as long as it has been prepared from all-fresh ingredients, such as whole fish, minced beef or liver, or (even) rabbit. Aquarian Marine Flake contains four all-fresh ingredient flakes, plus a black vitamin and mineral flake and a green seaweed flake. Most of the other flaked foods in the Aquarian range are also avidly taken by tropical marine fish and Aquarian Vegetable Diet should be considered essential for all those marine species which require algae as part of their food. Aquarian Pacific Shrimp is a particularly good food to offer all marine fish as a regular treat.

Live foods (with two exceptions) are best kept out of the marine aquarium because of the risks of introducing pathogenic organisms; also most of the commoner types of live food are fresh-water in origin and die very quickly with awkward consequences.

The two safe ones are Brine Shrimp (newly-hatched or adult) and chopped, clean, earthworms. Even earthworms need to be treated with caution, with all uneaten bits being removed after a short time.

Filling and Stocking the Aquarium

Synthetic salt mixes carry full instructions on mixing and these must be followed to the letter to avoid problems later on.

Before placing any water (pre-mixed or otherwise) in the aquarium, the undergravel filter with its air-lifts, plus the coral sand and shell mixture/layers must be in place. At this stage, no electrical equipment is either installed or switched on.

If the salts are going to be mixed with the water inside the aquarium (instead of in a plastic bucket or other container), then it is best to do this after half the water has been added. Once the tank is half full, the complete salt complement is put in and the tank is then filled to within an inch or so from the top. At this point, the heater/stat is placed into position and switched on, along with the aerator and undergravel filter (power filtration is unnecessary at this early stage).

The aquarium can now be left with all systems running for about 24 hours by which time the salts will have dissolved completely. Specific Gravity is then checked and altered if necessary by addition of more salt (to raise the S.G.) or by the replacement of some of the aquarium water with tap water (to lower the S. G.).

Although the tank may be balanced in terms of temperature, pH, hardness and S.G., it is far too raw at this stage to accommodate any fish. The maturing process may be speeded up considerably by the addition of special water treatments that have been developed specifically for this purpose and by leaving the lights on all the time. Over the next fortnight or so, the Nitrite level should first increase well beyond the tolerance limit of most fish and then drop to around zero. When this is achieved (and assuming that pH is between 8.0 and 8.3), conditions should be suitable for the first fish to be introduced. Power filtration and /or "charcoal" (chemical filtration) can now be put into operation. Saltwater holds considerably less oxygen than freshwater. This, added to the high sensitivity of marine fish to environmental conditions, means that only relatively low numbers of fish can be kept in tropical marine aquaria. One other factor to bear in mind is that it takes anything up to six months for a marine aquarium to mature fully. Therefore, until this happens, the stocking density should be kept to around 50 percent.

When introducing fish, temperatures must be equilibrated by floating the bag in the tank for about fifteen minutes. If at all possible, debagging should occur in subdued light and no food should be offered for at least several hours.

Quarantine and Diseases

A new tank with its collection of fishes will inevitably act as a quarantine tank. However, later additions should be kept for at least a fortnight in isolation in a separate tank, until all risk of disease has passed. The expense involved in setting up this tank will more than pay for itself in a very short time.

Even when precautions are taken, fish may succumb to disease from time to time, but it must be stressed that despite the distressing effects that diseases can have, most are easy to prevent through proper water management, reasonable stocking, etc. In addition, marine fish are generally quite resistant to disease and outbreaks should, therefore, be infrequent.

Routine Maintenance

Every aquarist soon develops a maintenance regime suited to his/her circumstances, such as time availability, numbers and sizes of aquaria, numbers, sizes and types of fish, etc. However, every programme should include the following: Daily: Check on temperature; state of health of fish; feed fish in the morning and early evening; switch tank lights off ten minutes before room lights. Weekly/fortnightly: Check specific gravity pH, hardness and nitrite levels; check heater/stats for leakage; check on supplies of food and remedies; top up tank with tap water if necessary. Every three to four weeks: Clean out box, power and sponge filters; clean cover glass, scrape algae off sides of tank if necessary; check aerator and lighting equipment.

Every four to six weeks: Gently stir topmost layer of coral sand or gravel; allow mulm to settle and then remove with siphon tube; carry out a 20-25% water change; prepare the new water 24 hours in advance, aerate it vigorously and check all parameters before adding to main tank.

A note about fish

The tropical marine hobby is expanding very quickly. As it does so, more and more exotic species become available. Often, little is known about their ease/difficulty of maintenance in aquaria. If one is starting up as a marine aquarist, it is, therefore, advisable to steer clear of difficult, unknown and expensive species. There is enough color and interest among the tried-and-tested ones to provide both great enjoyment and realistic challenges for months, or even years.

Approximate recommended stocking levels

No. of fish approx. 2" long:

Surface Dimensions (inches)	New tank	Established tank
24x12	3	6
(This size nor recommended for beginners)		
36x12	4	9
48x12	6	12
60x18	11	22
72x18	14	28

GOLD TETRAS

Then Again Maybe Not!

The Gold Tetra, *Hemigrammus rodwayi*, is a small South American fish. They are lively, shoaling fish from the Amazonian river basin that prefer soft, acidic water. A small school of a dozen or so will change the appearance of a tank, as they are constantly in motion, dashing through the water column. I should change that to read flashing through the water column, as these fish look as though they've been dusted with 24 karat gold. When the light bounces off the fish just right, it's as if gold lights are blinking on and off in the tank. While researching this fish, I found that some books also refer to them as copper and brass tetras. When first purchased, I had thought that they would have been more aptly named the silver tetra, but after a few months the brilliant gold coloration became evident and the name gold tetra is more than justified.

The various books that I referenced all offer different explanations for their intense, metallic gold coloration. One purports that encysted skin parasites are responsible; another, that the skin secretes guanine* to protect the fish from skin parasites. And yet another explains that although wild specimens retain their color in captivity, the offspring never attain the lustrous gold coloration of the adults. So, the only thing that I have concluded from my research is that I have too many books! I do not know if my original fish were kidnapped from the Amazonian river basin, or hatched in suburban Tampa. I only know that while in my care the color has intensified, and what happens to the young remains to be seen. If their coloration doesn't rival that of their parents, they'll just have to masquerade as brass or copper tetras.


MALE

As I usually do with my fish, when I think they might be of breeding age, I segregate the group and see if I can distinguish the sexes. So a few months after the coloration change, I removed the school of ten golds from the community tank that they had be living in and gave them their own tank. The tank, a 15 gallon with a whisper filtration, has a layer of dark gravel, a piece of driftwood and a lot of java moss (almost half of the tank). The water is soft, acidic, with a temperature of 80°. I let the fish settle into their new surroundings and within a couple of weeks, I thought that a few appeared to be deeper bodied than the others. But I really couldn't distinguish the sexes since they were so hard to watch, especially when trying to notice some small differentiation in body shape or size. They never stopped moving! So I did the next best thing. I did nothing. Shortly thereafter, the activity level increased and there was a change in the coloration of some of the fish. The slightly slimmer fish seemed to be covered in soot and their tails and finnage took on a reddish hue. They were now gold and black with a touch of red - they were dazzling. Bingo! I now knew who was who. But for how long? Once they spawned the heavier fish would expel their eggs and the others might return to their normal coloration - and then what? Since I didn't know if they were even old enough to spawn, I again did nothing. I decided to leave them alone and just make a few observations - who chases whom, would a pair split off from the rest, would the females become fuller, would they spawn? etc., etc.

So the next day, I determined to observe something: I observed that the fish had spawned while I was at the office. So much for that! But they did spawn. There were minuscule clear eggs in the moss. Would they hatch? There were lots of eggs scattered throughout the java moss and the fish seemed to be ignoring them. But had they been feasting on tetra caviar all day? My goal at this point was just to see if anything would hatch, so I didn't bother to remove the parents from the tank.When the eggs started hatching, I knew that I had a viable spawn. I decided to leave it be and try again.

Again I couldn't tell one from the other, so my only option was to wait and see. About a week later, I thought that some were slightly bigger, so I took a chance and separated them from the others. I put the slimmer males in a plastic mesh basket

*Guanine CO HO NO O (2-amino-6-oxypurine). 1: A purine constitute of ribonucleic acid and deoxyribonucleic acid. Usual sources are guano, sugar beets, yeast, clove seed and fish scales. Colorless rhombic crystals, insoluble in water. 2: A purine base that codes genetic information in the molecular chain of DNA or RNA.

that hung in the tank and left the females in the tank proper. As it turned out, I guessed right, the ones in the tank became plumper and the fish in the basket remained the same. I had three females and seven males and a few days later when the males were released into the tank - I had bedlam! I think the females were initiating the chase, but I'm not positive since the fish were just a blur of movement in the tank. Immediately the males started to color up, showing a tinge of rusty red in their tails and fins (over time that has become their usual coloration, intensifying at spawning). I was certain that by the morning there would be eggs, as that has been the usual scenario with all the tetras I had bred so far.

Sure enough, the next morning there were plenty of eggs scattered about the java moss, so the parents were returned to their community tank. My next concern was the filter. One of the first things I did was to put a foam sleeve on the intake tube to avoid the fry from being pulled into the filter chamber. I then reduced the water flow as much as possible, preventing the young fish from being buffeted by the current, The filter was just a dribble, but anything more would have sent the fry hurling through the tank. I kept the lights off, as I didn't know if the eggs were photosensitive like neons, so the tank remained dark for the next few days. Tetra fry are incredibly small. and they run for cover when the lights are on, so I just left the light off for the first few days. It really doesn't matter; they're too small to see anyway!

Within 24 hours the fish had hatched and were hanging from the java moss. After two days, the yolk sacs being absorbed, I fed the tank microworms, and continued to do so for the next few days. I'm always amazed at how small these fish are; they're like tiny slivers of glass. As small as they are their mouths are even smaller, so I needed a magnifying glass to see if they were eating. After about a week, the fish were fed newly hatched brine shrimp and that was when I saw how many fish there were. When you spawn tiny fish in a tank with gravel and plants you cannot tell how many fish you have, since you can't see them when they are hidden away in the crevices between the gravel. But with their bellies full of baby brine, they really stand out. Hidden in full view - until the shrimp were served! My conservative estimation is that there were well over 400 fry in the spawn. Just a tad too many!

When you spawn tiny fish in a tank with gravel and plants you cannot tell how many fish you have, since you can't see them when they are hidden away in the crevices between the gravel. But with their bellies full of baby brine, they really stand out. Hidden in full view - until the shrimp were served! My conservation estimation is that there were well over 400 fry in the spawn. Just a tad too many!

So the daily routine of shrimp hatching and water changes began. At approximately four weeks old, the fish started to readily accept pulverized flake, and at two months began taking bits of frozen bloodworms.

High quality food coupled with good water equals rapid growth and it's astonishing how fast tetras grow. They've been upgraded to a 30 gallon tank and if I didn't have angels in my 50, they'd be there. At nine weeks of age, most are close to an inch long, some longer. But that's not big enough to swim with the angels from hell, eating machines that seemingly inhale skinny fish. Big fish eat little fish! It's what they do. It's their job - their only job! And these hellish beasts excel at it. But I digress. The young tetras are currently more of a dull tannish gold, but I'm noticing changes and I'm hoping that despite, what some books claim they will, like the adults, become more golden over time. Now that the adults are older and bigger an inch and a half), I can easily see who is who. Only now I don't care! A school of a few dozen would be perfect for my tanks. But this?? This is ridiculous!

So, for the time being my school of golds remain in their 30 gallon swimming laps round and round, waiting to be bagged for the next Brooklyn Aquarium Society auction. So if you should see me struggling with bags, kindly lend a hand - I just might be carrying gold!

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John Todaro ~ BAS

SPECIES PROFILE

Scientific Name: *Hemigrammus rodwayi*
Common Name: Gold Tetra, Brass Tetra
Origin: South America in Guyana, Suriname, French Guiana and Amazon basin.
Distribution: Found in small ponds.
pH Range: 6.0 - 7.5
Temperature Range: 73˚ - 80˚F
Breeding Temperature: 79.0˚F and to have soft water, a pH of 6.3, 12˚ dGH, and a temperature between 79 - 84˚F.
Ideal Temperature: 75˚F - 82˚F
Ideal Hardness: 2 - 15 dkh
Life Span: 3 - 5 years
Size: Males 1 inch - Females 1.6 inches.
Diet: Omnivore.They will eat all kinds of live, fresh, and flake foods. These fish will overeat, so keep a close eye on this fish.
Sexing: Female have a fuller stomach area. The male's anal fin is white and has more red than females. Male are more colorful.
Breeding: Fish spawn in groups of 12 with 6 males and 6 females. Feed live foods. The female will lay eggs on plants or green floss.

A separate breeding tank will help to get the best number of fry. Keep tank dimly lit. Use spawning mops or java moss so females have a place to deposit eggs. A layer of mesh also works as long as the spaces are wide enough for the eggs to pass through and small enough to keep parents out. A small air powered sponge filter is all that is really needed for filtration. Filtering the water through aquarium-safe peat is a good choice. Once a spawn is over, remove parents. Eggs will hatch within 24 - 36 hours. Fry are free swimming in 3 - 4 days. Feed infusoria type foods until they can eat microworms or brine shrimp nauplii. Fry are light-sensitive during the early stages and require it as dark as possible.

Remarks: They do best in schools of 5 or more, so a 15 to 20 gallon aquarium or larger is best. They like soft lighting and peat filtered water to simulate the black waters they come from; add a mesh bag of aquarium-safe peat to the filter. Dim lighting can be accomplished with floating plants.

Reference: Animal World.com

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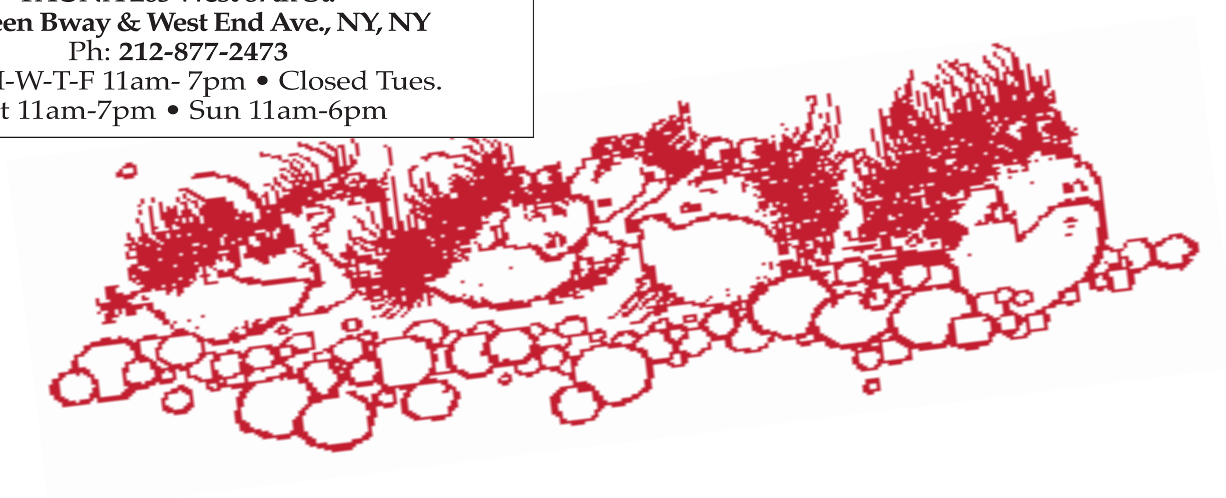

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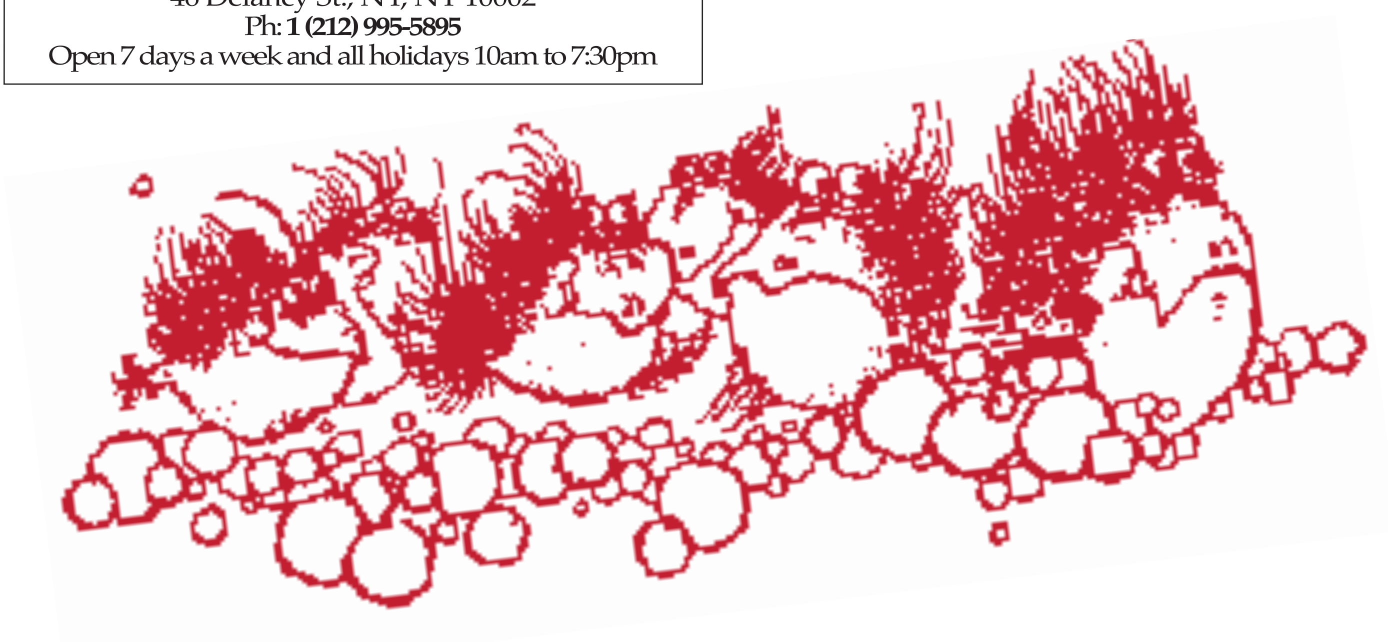

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