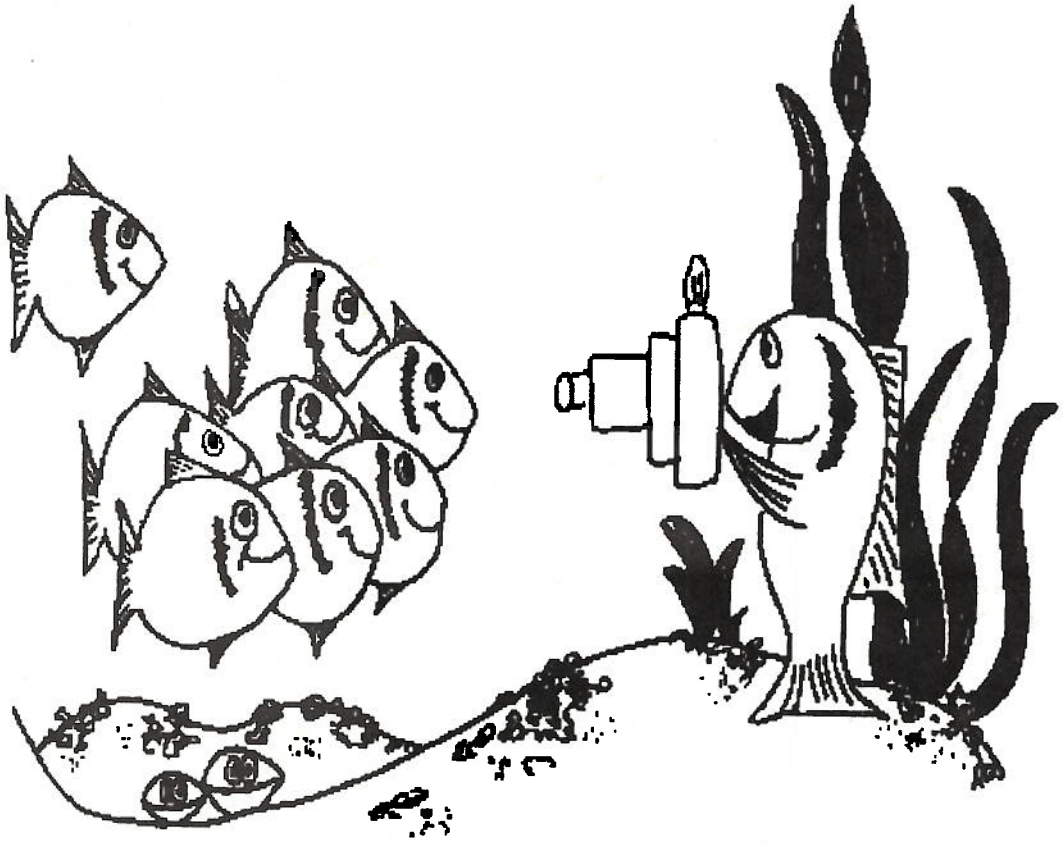
THE WET PET GAZETTE

AUGUST & SEPTEMBER 1998

THE JOURNAL OF THE
NORWALK AQUARIUM SOCIETY

THAT'S RIGHT IT'S NORWALK'S 33RD ANNUAL SHOW AND AUCTION OCTOBER 3 AND 4



NORWALK AQUARIUM SOCIETY

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N.A.S. IS A MEMBER OF THE FEDERATION OF AMERICAN AQUARIUM SOCIETIES (FAAS) AND THE NORTHEAST COUNCIL OF AQUARIUM SOCIETIES, INC. (NEC)

FROM THE PRESIDENT'S DESK

I hope everbody had a safe and happy summer, and have their favorite fish ready for our show!

That's right it's show time again! Please come out and support our club, we need the help for set up on Friday night, and our Auction on Sunday. We also need help to tear down Sunday, we can't do it alone.

I am happy to report that thanks to a joint effort between Norwalk Aquarium Society and the Greens Farm Garden Club, the pond at the nature center has been restored.

Last year Ray "Kingfish" Lucas brought it too my attention that there even was a pond out in the court yard. After talking about it at last years show, Ray sent the nature center a pond kit. After meeting with the Greens Farm Garden Club, (Greens Farm is another club that meets at the nature center), they maintain all the native flowers and plants in the court yard. A plan was set to remove several plants and install the new liner over the old leaking fiberglass pond shell.

A week was figured for removal of the plants, then a Saturday to install the liner, only one small problem; a duck..... There seems to be a mother duck, that lays her eggs in the court yard every year. This year was no exception. Three weeks later we got to work. It went great and looks great! A special thanks to the Greens Farm Garden Club and Sal Silvestri and Don Bobour for there help.

that's about it for now. Again please come out and support our show and bring a friend to the auction.

SEE YA 3rd THURSDAY

BASIL

UPCOMING PROGRAMS

1998	
February 19	Sal Silvestri, Apisto's
March 19	Jim Duncan sponsored by Lifeguard on Ponds
April 16	Dan Katz, Killies
May 21	Bing Seto sponsored by San Francisco Bay and Ginger products on Discus.
June	Fishy Bingo
July	No meeting
August 20	Lee Finely, catfish
September 17	Mark Broadmeyer, reef keeping
October 15	To be announced
November 19	Basil Holubis, power failure
December	No meeting Happy Holidays!

NOW IN OUR 48th YEAR

NORWALK AQUARIUM SOCIETY

IN THIS ISSUE

VOL.3 ISSUE 4

THE PICTURE FEATURED ON THE COVER OF THIS ISSUE IS THE DRAWING MADE BY PETRA KORS WHITECAVAGE THAT WAS ON LAST YEAR'S SHOW BOOKLET

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EXCHANGE EDITOR
NORWALK AQUARIUM SOCIETY
P.O. BOX 84

REGULAR MEETINGS AND PROGRAMS

There are regular meetings on the third Thursday of each month except July and December. Meetings are held at The Nature Center for Environmental Activities, 10 Woodside Lane, Westport CT. Meetings start at 8:00 PM. Each meeting includes a short business meeting, program or fish event, door prizes, raffles, auction, and refreshments. All regular meetings are open to the public

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WET PET GAZETTE EDITORIAL POLICY

The views expressed in this publication are the views of the author(s), and are not necessarily the views of The Norwalk Aquarium Society.

STATEMENT OF PURPOSE

The Norwalk Aquarium Society is not for profit, all volunteer organization, dedicated to the advancement and promotion of the aquarium hobby.

Big and Beautiful

A BAP report about *Copadichromis* sp. "Yellow fin"

Don Maloney N.A.S.

June 1998

"They are called Yellow fin, and they are from Lake Malawi" that's all my friend Bob told me about the fish he gave to me as a gift. Actually, his friend at the pet store gave them to him. But I think Bob didn't have the heart to tell him he didn't want them! Anyway Bob knows I'm a Cichlidiot. Not one to look a gift horse in the mouth I thanked Bob profusely for the fish and left. As I walked down the street back to my house (Bob and I are neighbors) I held the bag of 6- 2" inch fish up in the sunlight for inspection on that bright day. "Yellow fin" yes, they do have nice bright yellow fins. All the fins are the same color and the bodies are a greenish silver, no spots or stripes of any kind. Their shape, definitely Haplochromine in nature. I think they are going to get big, really big!

The six fish were thrown into a 50 gallon breeder. The water in the tank is kept at 78f the pH around 7.6 and hardness around 180 p.p.m. They grew quickly on a diet of Cichlid red flakes, Doro-red sticks, and frozen Brine shrimp and blood worms. For shelter, I just used large pieces of thin slate leaned against the back of the tank and an over turned flower pot with a large flat piece of slate on top for the spawning rock. Once sexually active the male spent most of his time chasing the females much to their dismay. So much so the haggard females needed protection. I fashioned a divider out of a plastic light diffuser grid with holes just large enough for the females and positioned it within the tank so the male would have two thirds to roam and the females would get one third to hide in. It wasn't expensive or hard to make and it's very effective. Both the sexes quickly learned who could fit through the holes and who couldn't! This is a big fish! 50 gallon minimum for <u>one</u> male and two or three females.

Having exceeded a standard length of 8 inches the male began to distinguish himself from the females at 4 inches total length. At four inches he's gorgeous! This is a beautiful fish! His coloration rivals that of any Malawi Cichlid, metallic blue head with the typical black stripe across the cheek through the eye when courting. Main body color is gold orange when viewed broadside and metallic blue (like the face) when the fish turns away, quite striking. The dorsal is medium to dark metallic blue with a bluish white band across the top starting from the front all the way to the end, which extends to the Caudal Peduncle. The Caudal is bluish black with rounded tips and slightly concave. The Anal fin is bluish with a white edge like the Dorsal but with a green area vaguely imitating egg spots. The Pectorals are clear. The Pelvic fins are one of the major characteristic which sets it apart from others in the Genus, blue black with a white leading edge which carries down the length of the fin into a very long, flowing tip, so long it reaches to the far end of the Anal fin. Really spectacular! This is an imposing fish and should prove to be a real show stopper! Just a note, Like most Malawi Cichlids the males show best when they are busy courting females.

My experience in breeding this fish was not without difficulty. I discovered that they're more sensitive to water conditions that most other Malawians that I've spawned. Most of my fish are from Tanganyika, so I run higher pH and total hardness levels for them. What I did when I realized they were not spawning (females gravid, then nothing) I began

tinkering with the parameters of the water quality and increased water change amounts. Bingo, they spawned and the female carried to term, until I stripped her of approximately 50 young after 20 days. The fry grew quickly on a mixed diet of baby brine shrimp, chopped frozen blood worms, and crushed red flakes. As they grew they were feed whole brine shrimp, then whole blood worms.

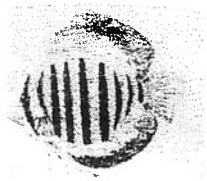
It is very exciting to know you may have a "new" fish. You know, one that is newly described or not described at all. But, on the other hand, you are dying to know, what is it? As far as a more accurate description than just "Yellow fin" I searched through my fish book library and came up with books that had some pictures of fish that closely resembled the fish swimming in my tank.

According to the writing of Ad Koning, he lists a description of a fish called *Copadichromis* sp. "Yellow fin" on page 260 in his book, *Ad Koning's Book of Cichlids and all the other Fishes of Lake Malawi*, 1990 published by T.F.H. He points out that, quote "*C.* sp. "Yellow fin" could never be caught for proper identification. Therefore it might just represent a geographical race of a described or otherwise known species". The only picture of this species is of a brooding female, and not a very good picture on page 140. The best illustrations of fish that look like mine are on page 122, *Copadachromis borleyi* (Iles, 1960) of various races. Plate 3 (male) and plate 5 (female) are the closest match to my fish.

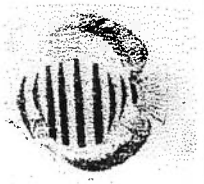
Aquarium Fishes of the World by Atsushi Sakurai, Yohei Sakamoto, and Fumitoshi Mori 1993 published by Chronicle Books. Illustrations on pg.125 plate D (best photo for color)and on pg. 128 plate C (this photo closely resembles my fish)

A species similar to *C. borleyi* is *H. quadrimaculatus*, photo pg. 136 *African Cichlids of Lakes Malawi and Tanganyika* Eleventh Edition, 1986 T.F.H and photo pg.183 fig. 241 *The Cichlid Aquarium* Dr. P.V. Loiselle 1985 Tetra Press

With that I agree with Ad Koning's assessment of *C.* sp. "Yellow fin" is a variant of another known species of Copadachromis. I think it is most likely *C. borleyi.* But I can't be sure and I'm not satisfied until I know the fishy truth. This may be part 1 of 2.



WORLD WIDE PET SUPPLY



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THE ULTIMATE FRUSTRATION - BREEDING

"Symphysodon Aequifasciata - Discus"

by Sal V. Silvestri NAS

In order to get a better prospective of my story we must go back to spring of 1986, when I was a very content hobbyist. At that time I kept mostly Lake Tanganyikan cichlids and I was quite successful with them. Little did I know that my "tranquil life was soon to come to an end. A good friend of mine "or should I say "X-friend?" called me and asked if I would be interested in purchasing Discus fry at a reasonable price. I have never kept Discus before and since I'm always looking to keep something different I replied, "SURE!". So one Saturday morning three of us took a ride to Doug Conkling's. Doug had an impressive set-up. He had many fry tanks and breeding pairs of Discus with fry eating body slime off the parents, "WHAT A BEAUTIFUL SIGHT! Who can refuse buying fry with this sight in front of you? So I bought eight. This strain was supposed to be a cross between a German turquoise and a Schmidt-Focke strain # 5, which is a red striated fish. I put all eight in a well planted 30 gallon. tank. They hid for the first two weeks but gradually they got accustomed to my presents and would approach the front of the tank when they saw me coming

. There are some golden rules that you have to remember when you are around discus -(1) You never make any sudden or abrupt movements and if you are Italian (like me) "tie your hands behind your back, because they don't appreciate hand gestures and (2) you never tap the glass. Failing to follow the above rules will guarantee to cause your discus to dash uncontrollably around the tank. I have seen discus smash their heads on the cover of the tank and never recover. Of course the very next thing I did was to read whatever I could find on Discus. Meanwhile I was feeding the fry mostly Tubifex worms (I didn't find out until much later on that this is a no.. no..) and occasionally I would feed some live Brine Shrimp. I fed the fry two to three times a day and kept the temperature between 80-92 degrees. The reason I'm saying this is that between my ignorance, what I read and what the so called "experts" told me I was taking my discus on a "Roller-coaster ride, "Poor fish!". What I did learn from my set-up is that plants don't really do well at high temperatures, so I removed them. Also, even as fry, discus are gluttons and you know what they say "What goes in etc. etc.". Therefore, if I wanted to keep good water quality I had to do a water change every three days. To make this task simpler I removed all the gravel. The moral to this story is - use a bare tank. The filtration consisted of a corner box filter, a sponge filter and a small outside power filter (100 gl.p/hr.) As a rule discus tend to be nervous. They usually feel more at home if you can provide them with some kind of security or a place to rest. This can be accomplished in various ways. You can give them anchored down plastic plants, make a section of the tank dark and/or paint three sides of the tank, usually black or blue color. I used a combination of painting three sides of the tank (black) with subdued lighting. On the other hand I know, for a fact, that there are other discus keepers that aren't doing any of this and are very successful in keeping and breeding discus. So keep in mind that this ONLY represents what works for me.

As I mentioned before, I didn't find out that Tubifex worms can be carriers of unwanted parasites/ bacteria until seven months later. Not wanting to take any chances, at this point I stopped feeding Tubifex worms. But before I close on this subject I must inject my experience of feeding these worms. All I can say to this theory is that my discus were about 9 months old before I stopped feeding Tubifex worms. Up to this point they grew well and never came down with any noticeable disease. "Was I just lucky? Who knows?". As adults these discus turned out to be a red bodied fish with blue striation, a good looking fish. My biggest fish, which eventually did turn out to be a male, was at least 6" in diameter. Having reached this point and having read every book on discus that I could get my hands on I started to prepare for the blessed event (SPAWNING). You see, almost all of the books and "discus experts" will tell you that most discus start to pair off as early as 9 month old and as late as two years old. Now, I knew one thing for sure -MY FISH CAN'T READ!" so I expected them to start spawning at 9 months. "I don't think that I was being too unreasonable?" To get ready for the blessed event I placed a PVC pipe, 4" in diameter and 8" high, upright in the tank. This was done because all the books tell you that discus will lay their eggs on a vertical object. Anyway, six months went by and still nothing was happening

. There was size differences in my discus so I was reasonably sure that there must be at least one pair in the bunch. I was told that the males will develop a streamer in the dorsal fin (but not always). So this was of no help to me because none of my discus developed any streamer. So I waited.

In the meantime I had the opportunity to purchase a pair of Wattley discus. I put the Wattleys with my group hoping that it would trigger something. Two weeks later I saw that all of my original group were huddled in one corner of the tank while the Wattleys stayed at the other corner near the PVC pipe. To my amazement they had laid a patch of eggs on the PVC pipe. "I was speechless!!" The egg patch measured approximately 4x6 inches and there must have been close to two hundred eggs. I immediately removed the rest of the discus and left the Wattleys by themselves. I waited to see if the eggs would stay ember (a sure sign that they were fertile) or turn white (not fertilized). To my despair, they slowly all turned white. As the eggs turned white they were eaten by the parents. One interesting fact that I did establish from these Wattleys was that the male did have an extension (streamer) at the end of his dorsal fin and the female didn't. I called some of my other fish hobbyist to find out what went wrong. Well, I was told, either the male is too young or he's shooting "blanks!! or your water is not soft enough. Since at this point I didn't have an elaborate hardness meter I tested the water hardness with a regular kit you purchase at a pet shop.

My water hardness measured "moderately soft" and the pH was around 7.1. I was told that the pH should be between 5.5-6.5, but more towards the lower range. "OK, how do I do this?" Most of the books and experienced hobbyist will tell you that you can go two ways. The expensive way - which would entail buying either an RO unit(reverse osmosis) or an ion exchange unit, both will set you back anywhere between $200-500 dollars. Than you have the -cheaper way - this would entail filtering your water through peat moss or using phosphoric acid. Since the RO unit would waste approximately 90% of the water used I ruled this out because my water bill is already too high. The ion exchange unit was just too expensive and plus the fact that three years ago they weren't easily attainable. So I tried filtering my water through peat moss. What a mess! Not only does it turn the water brown but if you don't do it right (like I did!) you have this fine sediment in your water which is a royal pain to remove. But the peat moss did do the trick. The pH went down to 5.8 but the harness didn't change too much. Also there's a little twist to this method, you see if you don't monitor the pH or change the peat moss within 7-10 days the pH will do a complete turn around and jump to 7.8-8.1. Was I ever surprised! The Wattleys did spawn again, in the water from the peat moss, but the result was the same. Œ□œ□In the meantime my original bunch still had not paired off or showed any breeding activity. They were now approaching 2 yrs. old. I tried different methods to stimulate breeding like, changing 30-40% of the water and replacing it with cold water, not change water for two weeks and than do an 80% water change etc... Nothing worked! At this point I was getting pretty discouraged. Meanwhile I had joined the Discus Study Group and Helen was a great help. She told me that there are some discus strains that don't mature until they are over two years old and that NOT all males will develop that filament extension on their dorsal fin, even though most of her male discus did have the extension. Helen was also kind enough two lend me two proven males to see if they would do anything. I took one of the males and gave the other one to Don Barbour. Don was also having the same problem since he had bought the same discus.

At this time, seeing that the Wattleys were spawning but the eggs weren't getting fertilized I turned my attention back to the water quality. I figured that if I was going to be serious about breeding these fish I might as well follow the books, in detail. So I invested in an Ion Exchange unit, a digital pH meter and a microsemen meter, which measures water conductivity. Even though I was fortunate enough to split the cost of these units with Don Barbour, since he lives only 5 minutes from me, it still set me back about $350. The pair of Wattleys I finally ended up giving them to Don, because he had more room and wanted to concentrate on my original group. I also gave him the male that I've gotten from Helen since he was being harassed by my group. This male did eventually spawn for Don.

Well, another six months passed and still nothing. Despair was starting to set in! They were being kept in soft water, anywhere between 60-100 microsemen, and the PH 5.5-6.8. BY the way, when dealing with soft water you have to be very careful. You need to monitor the pH on a constant basis because soft water being unstable has a tendency for the pH to drop suddenly. My pH would go from 6.5 to 4.8 in a course of a day. If I didn't do an immediate water change it could go as low as 3.8. A sure sign that something was wrong with the water was that all the discus would show stress bars(vertical black bars) on their body. The discus fish is so sensitive to water quality that he will be your first "indicator that the water quality is not right. Given proper care and diet an adult discus, once acclimated to his surroundings, will usually be alert, show no stress bars, will have a slow rate

of breathing and will not hide.. Any deviation from this pattern usually means that something is not right. œ□œ□ A discus that stops eating and turns black is a SICK fish. I will not dwell too much on medicine in this article because that's a very broad and different subject, maybe in my next article. In general the one cure that usually worked for me when a discus exhibited the above symptoms was a salt bath for about 5-10 minutes and then I would put him in a separate 10 gallon tank, by himself, and raise the temperature to 94 degrees. When doing this make sure that you have plenty of aeration in the tank because at this temperature you run the risk of oxygen depletion.

After about a day at this set up you should start seeing some improvement in his body coloration's and at the end of the second day he should start eating again. I would start feeding on the second day. Feed very light and his favorite food. I usually feed live brine shrimp, which I soak in B-Complex liquid vitamin for about 1/2 hour before feeding. This method seems to works for me. OK, back to breeding the discus. At three years old "YES! THREE YEARS OLD!!" a pair from my group paired off. I moved them to a 30 gallon. bare tank. The water in the breeder's tank was 84 degrees, pH 5.8 and 105 microsemen. Two weeks later they spawned. "Well" I thought to myself, "I'm really cooking now! I did everything by the book and they did spawn!" "Success at last!" WRONG!! The eggs disappeared a day later. Panic set in again. WHAT NOW? But I did remember reading that this sometimes happens to young fish. "But "my fish are not young!" To inexperienced parents. "Okay, I could accept that!" Also the parents will usually eat the eggs if the eggs are not fertile. I tried to dismiss this thought from my mind because this would mean that I had a sterile male. "Noooo...., not after waiting three years!" Lastly, I could have an egg eating fish or pair. I was getting so upset that I was contemplating on having a banquet of "FRIED DISCUS". But, before I lost all my "cool" I called a couple of members from the Discus Discussion Group for HELP. As unbelievable as it may seem, they both gave me the same advise. They said that even though it was conceivable that I could have a sterile male I should stick with the same pair, at least until they had a couple more spawns. Sure enough, they spawned five more times all with the same results. I was never able to see which one ate the eggs. After the sixth spawn they took a three month break. "Discus do this you know?"

`At the very first spawning, after the three month break, they finally got their act together. To my amazement the eggs did not turn white on the second day and they were not eaten. Reality didn't really hit me until the third day, when I was able to see wrigglers. At this point the parents decided to give me one last "heart failure!". When I returned home the evening of the third day the oxygenator (that's where they decided to spawn) was completely clean. No sign of any fry anywhere, my *Italian temper* flared up and I think I must of called them every choice words that I've learned in the last 40 years and in three different languages. My wife, hearing this commotion, thought that I was about to kill one of my boys. But when she came down the basement and saw me yelling at the discus she almost called the "funny wagon!". After I had calmed down I noticed that both fish were still hanging around the oxygenator and the female was hiding behind it. Then I remembered that the parents will sometimes move the fry to a different location. Sure enough, she was guarding a patch of wrigglers the size of a quarter. "I apologized to them and took back everything that I called them. "œ□œ□ From the first day after they spawned I fed the parents only once a day and only blood worms. I still did my daily water change but only to the extend of removing any uneaten food and waste. The fry came off the oxygenator four days later. At this time I shot off the outside power filter, the only filtering media left were two sponge filters. At first the fry started darting all over the tank but within a couple of hours almost all were eating off the parents. "WHAT A SIGHT!!" Some fry never did find the parents and died. The first couple of days the female did most of the fry feeding but from the third day on the male took care of the fry. The female would relieve him for only a short period of time. œ□œ□ Everything was going fine and the fry grow at an extremely fast rate. On the fifth day a started spraying some live baby Brine Shrimp over the fry when they were feeding off the parent. At this stage they were large enough that they started sampling the new food source. Within a couple of days whenever I fed baby brine they would leave the side of the parent and gorge themselves on baby brine. I removed this batch from their parents 14 days after free swimming. œ□œ□ There are many theories as to how long you should leave the fry with the parents. With my first batch of fry I experienced mass mortality. It started about two weeks after I had removed them from the parents. I would lose 2-4 fry each day until only 35 fry were left from the original 100. The symptoms began with closed fins and ended with the fry simply lying on the tank floor until death. There were no visible signs of spots or fungus. Well known and acknowledged discus breeders attribute the cause to "diseases transmitted by the parents". These well known discus breeders believe that you should remove the fry 8 days after free swimming. Mainly because this will prevent the fry from picking up any "diseases" transmitted from the parents

when the fry pick up bits of food from the tank floor, it is inevitable that they will also pick up worm eggs, hexamiya, etc. I will definitely test this theory in my next batch! œ□œ□ After I remove the fry from the parents I usually like to put them in a ten gallon tank, with water from the parents tank. This way they can find the food more easily. I feed strictly baby brine for the next two weeks depending how fast they grow. For maximum growth and health the fry should be fed 4-5 times a day (if your time permits) and do a daily 10-25% water change. I don't keep them in a small tank longer than two weeks. From the small tank I'll move them to either a 30 or 55 gallon tank, depending on the size of the spawn. At about the fifth week I start feeding my (home-blend) beef heart mix together with live baby brine. At first the fry will just pick at the beef heart but eventually they will eat it with gusto.œ□œ□ Given the proper attention the fry will grow fast. What I have also experienced is that some of the fry will grow at twice the rate. These fry will become "bullies" and hinder the growth of the others. Therefore, when this phenomenon starts happening I move these larger fry to another tank. Also, if you are conscientious as to the quality of fry you put-out into the market you must CULL. There will always be some runts and/or deformed fry in a batch, as soon as can identify them I cull. It's the only way that we can assure ourselves that only quality discus stay in the hobby. Well, in closing all I can add is that breeding the discus has been the most challenging, frustrating and "yet" rewarding experience as a hobbyist. If you think you "KNOW IT ALL!" give these guys a try. I guarantee that they will "MAKE YOUR DAY-MONTH & EVEN YEARS!".

CALENDAR OF EVENTS

1998

September	11 - 13	TROPICAL FISH SOCIETY OF RHODE ISLAND AUCTION AND SHOW
September	20	DANBURY AQUARIUM SOCIETY AUCTION
October	3 - 5	NORWALK AQUARIUM SOCIETY AUCTION AND SHOW
October	23 – 25	NORTH JERSEY AQUARIUM SOCIETY WEEKEND EXTRAVAGANZA

N.A.S. BOARD OF DIRECTOR MEETINGS

THURSDAY, JULY 9 - THE DEMENTS HOME

TUESDAY, AUGUST 11 - NATURE CENTER

THURSDAY, SEPTEMBER 10 - SAFARI STANS PET SHOP (RT. 7 WILTON AT STAPLES PLAZA)

TUESDAY, OCTOBER 13 - NATURE CENTER

THURSDAY, NOVEMBER 12 - THE SILVESTRI HOME (203)972-0610

TUESDAY, DECEMBER 8 - NATURE CENTER

ALL ARE WELCOME TO ATTEND ANY BOARD MEETING. IN FACT THE BOARD WOULD LIKE TO INVITE YOU TO ATTEND, THE MEETINGS START AT 8:00 P.M.

Do It Your Self Substrate Heating Cables

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Introduction

I have been using DIY heating cables for some time now, and thought the net might be interested in the experience and the parts I have used. The cables are presently being used in a 75g heavily planted Discus tank with CO2 injection (DIY of course).

Parts of this article are a rehash of the fine DIY Heating Cable posting by Dan Resler and Uwe Behle on the USENET group rec.aquaria some time ago. For those interested, a hypertext review of that article is located on the World Wide Web (WWW), and can be seen with Mosaic, Cello, or Web Explorer if you have OS/2 3.0 (Warp), just point your browser to "http://marge.phys.washington.edu/fish".

With the high cost of commercial cable systems with prices upward of $250.00 and more, many people have been discouraged from trying heating cables. Others have wanted to build their own systems but have serious reservations about submerging any homemade electrical device into their aquariums

This article presents plans for building your own heating cable system that is both safe and inexpensive. The system is well within the capabilities of any plant tank enthusiasts. This is as good a place as any to place a word of warning. Electricity and water do not mix, therefore, be sure that you fully understand what you are doing before attempting any project of this nature. If you have any questions, ask a professional or post a question on fishnet

Heating cable systems can be grouped into two areas. The first method uses a high wattage (usually 0.5 watts per liter) heating cable that is intended as the primary heating source for the tank. This method requires some type of active control in order to limit the build up of heat within the substrate. Consequently, this type of system is the most expensive since it requires a temperature controller. Most commercial units are of this type.

The second system uses low wattage cables (typically 0.1-0.2 watts per liter). In this case, additional heating is required to maintain tropical water temperatures. This type of system is meant to be on continuously, with additional heating supplied by standard heaters. For the DIYer this is the system to choose. The low wattage doesn't require a temperature controller and therefore is much easier to build. Another advantage of this system is that tank heating is minimized, so we should get some flow through the substrate even during the hotter summer months.

Cables

The first step in building your system is to determine the wattage of the cable you need. Since we will be using a low wattage system, a good rule of thumb is to use 0.1-0.2 watts per liter of water. For example, my 75g is 47"x17"x20" which using the conversion 2.54 cm equals 1 inch, gives 119cm x 43cm x 51cm, which is 260967 when divided by 1000 gives us 261 liters. The power we are looking for then is around 261 * 0.2 or 52 watts.

Using Ordinary Wire for Cables

In order to keep our costs down below $50.00 for this project, it is necessary to build are own heating cables. In order to do that, it is necessary to understand some basic electrical properties. The power rating of a cable (in watts) is directly related to the voltage applied to the cable and current (amperage) that flows through it. One watt is said to be equivalent to one amp moving through a circuit with theelectromotive force of one volt. With this, power is:

Power (watts) = I (amperage) * V (voltage) equation (1) using Ohm's Law V(volts) = I (amperage) * R (Ohms) and rearranging we get I = V/R equation (2) taking equation (2) and substitute into equation (1) and you get. Power (watts) = V*V / R equation (3)

Equation (3) tells us that for any given voltage, the amount of heat generated by a wire depends indirectly on the resistance of the wire. If the voltage remains the same, increasing the resistance will decrease the power rating of the cable, The resistance of the wire is determined by its thickness and

length, with resistance increasing as a wire gets thinner and/or longer. With a few other additions we can come up with an equation to directly calculated the length of cable.

Now the resistance in equation (3) is really expressed in the following form
R = rL/A equation (4)
Where r is the resistively, L length in meters, and A is the area in meters squared.
Substituting equation (4) into equation (3) for the resistance and we get
P = V*V*A/rL equation (5)
One final thing to accomplish, the area for a wire is simply the following.
A = pi(r*r) = pi(d*d)/4 equation (6)
Substituting equation (6) into equation (5) yields.
P = V*V*d*d*pi / 4*r*L equation (7)
Rearranging equation (7) for L the length gives.
L = V*V*d*d*pi / 4*r*P equation (8)

Where V is volts, d is the diameter of the gauge wire you want to use (in meters), P is the power you want to dissipate (in watts), and r is the resistively which for copper has the value 0.000000017.

Now we have an equation that can be used to directly calculate the length of wire that we need for the power that we wish to dissipate. But you say we don't know the voltage to use or the diameter of the wire to use yet. That is correct, but we can get those values from other sources, which is what we will do now.

The commonly available voltages for A.C. step down transformers are 6,9,12,15,18, and 24 volts. The reason I have only stated these voltages is that with anything that goes in water it is best to stay under 40 volts. That is for a safety reason. If say something happens to your cables and the insulation breaks on them, as long as the voltage is under 40 or so volts, there will be no problems. That is us humans and most importantly the fish won't be affected.

I would suggest using a 12 or 24 volt transformer depending upon the amount of power you wish to dissipate, since they are the most common and therefore the cheapest. The most common ratings for the transformers are 12 volt at 2 amps and 24 volts at 4 amps. The way to choose which one to use is simple. Go back to equation (1) where the power is related to voltage times the current. This equation give the MAXIMUM power that each transformer is capable of producing. In the case of the 12 volt transformer, the MAXIMUM power is 12 volts times 2 amps for a grand total of 24 watts, whereas the 24 volt transformer is 24 volts times 4 amps for a grand total of 96 watts. Since you want the transformer to have a safety factor of say 20%, you need to pick a transformer that will handle the required power plus an additional 20%. This keeps the transformer from getting to hot and burning itself out. So in our example where we want to dissipate 52 watts we would need to get the transformer that is 24 volts and 4 amps. Since these transformers are cheap (around $25.00), its probably best to get one of these unless your heating requirement is very small.

So we have decided on using 24 volts, now we must decide on the wire gauge to use, which in turn sets the diameter. Now since resistance increases with cable length and with decreasing diameter it would seem like you would want to use the smallest diameter cable possible. While this would work it would usually give us a cable gauge 36 or higher. At this gauge, the cable is extremely thin and fragile, in addition these gauges are not readily available and more expensive then larger gauge cables. Since we want to keep this project as cheap as possible, we will go with a larger gauge. Some diameters of common gauges are listed below:

AWG	Diameter (Meters)
26	0.000405
27	0.000361
28	0.000321
29	0.000286
30	0.000255
31	0.000227
32	0.000202

In my setup I used 30 gauge wire as I already had several hundred feet of Teflon coated wire around. However, any standard pvc or silicon coated wire will do. The only recommendation is to make sure that the wire is rated for greater than 80 Celsius. Most wires easily meet this requirement.

Now go back to equation (8) and plug in the values for the voltage, diameter of the wire (in meters), power you wish to dissipate, and the resistively value. For my setup using 30 gauge wire, a power of 52 watts, and a voltage of 24. I get a length of approximately 33 meters. or converting to feet by multiplying by 3.28, 108 feet. By varying the size of the wire, you can increase or decrease the total length of wire you will need. Just remember that gauges smaller than 30 are extremely small, hard to find and much more expensive than larger gauges.

Cable Layout and Anchoring

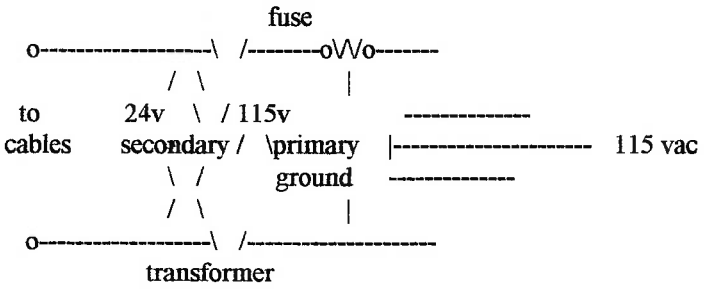
With the cables done we need to arrange them within the tank to produce the most beneficial effects. Any arrangement that provides good bottom coverage (i.e. the cable traverses the entire length and width of the tank) would be acceptable. However, in any arrangement, try to make the spacing between the parallel lengths between 5-10 cm. A quick look at any standard tank shows us that 6 or 7 transverses along the length of the tank provides just about the optimum coverage. You will need to adjust this to fit your tank, as long as the spacing between runs does not exceed 10 cm you will be fine. If your cable is too long, simply fold the entire length of cable in half and in half again if needed. The example that we are using here came out to be 108 feet. Looking at the 75g with its approximately 4 feet inside length, and using 6 transverses gives us a length of approximately 24 feet for coverage of the tank. In order to get the cable to fit within this length we simply fold the cable in half twice. This then gives us an effective cable length of 27 feet, something we can easily get to fit within the tank.

Anchoring the Cables

In order to keep the cables from coming out of the substrate when pulling up plants, we need to anchor the cables somehow. There are many things you can do here to accomplish the objective, so use your imagination. However, you should try to keep the distance between supports to no more than 30 cm. In my case, I had some scrap Plexiglas laying around. So I simply cut some strips an inch or less in width and the length a little less than the width of the tank. In order to anchor the cables to these strips, I simply used some aquarium silicone sealant I had laying around. I put a "gob" of silicone on the strip, pressed the cable into the "gob" and finally put on a little more silicone on top. Then let the entire mess setup over night. The silicone holds the cables nicely to the supports and allows the entire apparatus to be done outside the tank and then gently lifted into place. To give the best possible convection within the tank, he cables should be about 1/4 inch above the bottom of the tank.

The Power Supply and Connections

The figure below shows the schematic for a simple power supply. The selection of your transformer is of primary importance when building such a device; there are a few things to consider before making your purchase.



First, make sure the transformer will be able to handle the needed power. You should buy a transformer that is rated to handle a 20 - 30 percent higher wattage than you need. Finally, make sure that the current rating (amperage) of the secondary winding meets or exceeds the current required. This will be the case as long as the power of the transformer is higher than the power you wish to dissipate.

To connect the output from the transformer to the cables, you will need to run feeder cable. A rule of thumb here is to use the same gauge that is coming out of the transformer. The heating cables should be soldered to the feeder cables and covered with heat shrink tubing, or covered with aquarium silicone. I used aquarium silicone as it had the added benefit of helping to support the rather fragile 30 gauge wire at this point.

Connect the primary side of the transformer up to any standard 3 prong extension cable. The ground line in the extension cable should be attached to the metal case of the transformer. The secondary side on most transformers have three wires coming out. Two will be the same color the third will be different. This third wire is commonly called the center tap, and will not be used. It allows you to run two components off the transformer, but at half the voltage of the transformer (i.e. a 24 volt transformer would allow me to run TWO 12 volt appliances using the center tap).

Don't forget to put a slow-blow fuse into the primary side when you wire everything up. A fuse is your last line of defense should the transformer fail. The value of the fuse can be calculated using AMPERAGE = POWER/120 , (e.g. in our example 52 watts / 120 volts = 0.43 amps = 430 milliamps). Use a fuse rated at 1.2 to 1.5 times this calculated value. Also be sure to connect the ground wire from the 115 volt source to the metal case of your transformer.

If you attempt to test the cables before putting them in the tank, be extremely careful. Heating cables can get hot very quickly when powered up. You should only test your cables while they are submerged in water, otherwise they may get too hot and damage the insulation on the wire.

If any questions, please feel free to email me with any questions.

CompuServe 71563,2013
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Suggested Source for Components

Heating Cables (Commercial)
DALECO
3340F Land Drive
Fort Wayne, IN
219-747-7376

Transformers
Signal Electronics Local Electronics Stores
500 Bayview Avenue
Inwood, NY 11696-1792
516-239-5777

Wire, Silicone, etc: Your local hardware and Radio Shack

Components Used

24v 4A transformer	24.99 local electronics store
3"x3"x5" case	5.99 local Radio Shack
fuse holder	.29 Radio Shack
0.5 amp slow blow fuse	.69 local electronics store
extension cord	had $1.00 at local Hechinger
30 gauge wire	had check around for best price
18 gauge wire	had check around for best price
silicon sealer	had $3.99 for 10 oz tube from Hechinger
Plexiglas (strips)	had $4.99 for 30"x28" sheet from Hechinger

BREEDING TROPHEUS DUBOISI

Kevin Cyr
Norwalk Aquarium Society 1993

Overview

Like many hobbyists, I became interested in Duboisi's due to the contrasting black with white polka dot color pattern of the juveniles. As Duboisi's mature the dots give way to either a white band, a yellow band ("Maswa's") or no band at all. Additionally, most of the Duboisi's I have seen have royal blue faces as adults. I must admit, it was somewhat disappointing, yet intriguing to find out that these neat looking Duboisi's lost their white dots as they progressed into adulthood. However, the adult colors are also quite attractive. The following sections, will describe my experiences with Tropheus Duboisi "Maswa". The adult "Maswa" have a broad yellow band, a blue face and a narrow blue streak along the base of the dorsal fin.

Feeding & Water Conditions

My water supply comes from a well that is chlorine and chloramine free. The pH is 7.0 and the hardness is 6.7DH. To this I add 1 tbls./5 gal. of Instant Ocean, 1 tsp/10 gal. of Aquacichlid (an Aquatronics product) and 1 tsp./20 gal. of baking soda. This brings the water to a pH of 8.4 and a hardness of 18DH. All of the tanks are on a central system and most of the tanks have reverse undergravel filters with 1/2" to 1" of dolomite covering the filter. Twenty percent of the water is changed weekly.

For many years, the Duboisi's were fed Tetra Conditioning Flakes exclusively. I have since purchased other types of Tropheus and they are being fed a mixture of 50% Aquarian Marine flakes and 50% Spirulina flakes. The Tropheus mixture is now being fed to the Duboisi's. In the past I have lost many Tropheus and I believe it was due to the diet. This new mixture has worked well and I have had very few losses since changing over to this new mixture. In addition to the flake food, good lighting is provided for the Duboisi tank in order to grow a good quantity of algae. The fish continually pick the algae off the rocks and sometimes off the sides of the glass. One person that purchased some of the Duboisi's, put nine of them in an algae coated tank and within a couple of days the tank was scraped completely clean by the Duboisi's.

The baby Duboisi's are fed brine shrimp in the morning and the flake food mixture in the evening. After four weeks, the brine shrimp is discontinued and the babies are fed the flake food mixture only.

Breeding Duboisi's

In reading about Tropheus setups and talking to other hobbyists, I discovered there were a multitude of options for setting up a Tropheus tank. Some of the options included a bare tank with gravel, a tank filled with rock work, the use of PVC, a single large rock, etc. The owner of a local pet shop knew someone that was breeding Duboisi's in a 45 gallon breeder tank filled with large round-shaped rocks. Since this was the only person I talked to that actually knew of someone breeding Duboisi's, I decided to go with this approach.

In order to have plenty of length for all of the rocks and leave ample space for open water, a 55 gallon tank was used. In the bottom of the tank was a reverse undergravel filter which was covered with 1/2 inch of dolomite. Next came the rock work, the closest thing to large round rocks I could acquire was lava rock, so I purchased two 25lb. boxes. The lava rock was stacked in the left two-thirds of the tank with six inches of open water over the top of the rocks. In stacking the rock, the bottom row was layed out to create plenty of caves and connecting channels. Large pieces of rock were then stacked on top of the open spaces, being sure to leave ample room for the fish to swim in and out. The stacking continued until the rock work was within six inches of the top. Since there was not quite enough lava rock to complete the excavation, it was supplemented with slate. Lastly, a tall flat piece of driftwood (approx., 10"W x 18"H x 2"W) was placed catty corner in the back right corner of the tank. For lighting, a 4-foot fluorescent strip light was placed on a piece of glass on top of the tank. In order to get the optimum amount of light and algae growth, a full- spectrum vitalite was used.

Now came the fish (yes I put water in first). I purchased six juvenile Tropheus Duboisi "Maswa" and

these were the first occupants of the tank. These fish are intriguing to watch because they are perpetually in motion. They constantly swim in and out of the rocks and continually chase each other around the tank. After a month or so, I purchased four juvenile Tropheus Moori "Moliro" and added these to the tank, they got along well with the Duboisi's. Eventually, the Duboisi's started to develop a faint vertical band and the dots started to fade, my enthusiasm was building as it appeared I was getting close to possibly spawning these wonderful fish. As the dots faded and the fish attained maturity, the activity in the tank heightened and there was much chasing, picking and hiding. It became very apparent that one of the males was the "king of the tank". I was not sure of the ratio of males to females but the fish seemed to coexist quite well and none of them were "pounded" or pinned in a corner.

Then came that joyous day!!! There were several little white dotted fish swimming around in the tank, I was ecstatic, it was great !! But .... How was I to get these little fish out of this rock filled tank without disrupting the whole environment ? After much contemplation, I decided that it would be next to impossible to remove the babies, so I left them in the tank. Much to my amazement, they survived just fine and eventually grew up to a size where they could be coaxed to go behind the piece of driftwood, where they became trapped and were easily netted. After that first spawning I became much more observant and closely examined the fish every day. In particular, I would look at the lower jaw (buccal cavity) of each fish. When a female was holding eggs, the lower jaw would become extended and would bulge a little more than normal. Sometimes the bulge would be very obvious and usually meant a larger batch of 6-9 eggs, but sometimes the bulge was very slight, indicating a smaller batch of 2-4 eggs. When observing fish for the extended jaw, be sure to observe them before they are fed. The reason for this is that the females will sometimes stuff food into their buccal cavity when they are feeding and it will look like they are holding eggs, when in fact they are not. The females will continue to eat during the time they are holding eggs.

When a female was holding eggs, I would mark down the date on the calendar. Three weeks after that date I would pull the female and strip the eggs. To catch the female, she was coaxed into the corner behind the piece of driftwood and then netted out. Sometimes this "operation" would necessitate the removal of over half of the rocks in order to find her and force her into the corner. This process would take 15 minutes or so but was well worth the effort given the reward of several baby Duboisi's. Removing and replacing half of the rocks did not seem to seriously disrupt the fish and once the rocks were replaced (even if rearranged a little bit) all was back to "normal" in an hour or so.

To strip the eggs from the female, hold the lower jaw open with your finger then dunk the head of the fish in and out of the water, forcing water through the gills and expelling the baby Duboisi's. If you have large fingers, you can use a piece of airline tubing to hold the jaw open. While holding the jaw open, look inside to be sure all of the babies are removed. Once the female is stripped, return her to the tank.

Duboisi's take approximately 30 days to completely absorb the egg sac. Stripping the female after 21 days, leaves one week for error and assures that the female will not expel the babies before then. After 21 days, the babies will still have a small egg sac but can freely swim around and they even start eating. I usually put the babies in a separate 5 1/2 gallon tank but when space is short, I will put them in with other Lamprologus babies and all get along fine. If by chance, you get over anxious and pull the eggs too early and the egg sac is still quite large but the fish can move around, you can put the babies in a breeder net until they start swimming freely. If you pull the eggs real early, then you will have to put the eggs in a small stainless steel strainer and run air under the strainer to keep the eggs in motion until they are large enough where the fish are somewhat mobile.

With all the rocks in the tank it was difficult to determine the ratio of males to females but there were at least two females that would consistently spawn. One day I decided to move my Duboisi's to another tank because I wanted to try a setup that would make it easier to pull the females. The new tank was a 45 gal. breeder. It had a reverse undergravel filter and dolomite and for caves, I stacked pieces of 1-1/2" PVC over the top of a 4" PVC pipe. Next, were the fish, I put in two adult Tropheus Moori "Moliro" and eight baby "Moliro" (using them as dither fish). I vented the Duboisi's and it appeared that there were three males and three females. I put two males and three females in the new tank. Well, as they say, one learns by experience, and I learned that this was a "deadly" mistake. The dominant male Duboisi immediately "pounded" the other male and pinned him in the corner. This pounded male never recovered(hence a deadly mistake). The male Duboisi proceeded to beat on the male Moliro, so I immediately removed the male and female Moliro's from the tank. The male Duboisi chased the other females around the tank but did not appear to hurt them, I decided to leave them and hope for the best. Sev-

eral hours later I came back and two of the females were beat up and pinned in a corner. I removed the beat up females and put them in a "hospital" tank. Taking no more chances, I decided to revert back to what worked. I first removed all of the baby "Moliro's" and all of the PVC from the tank and proceeded to fill the left two-thirds with lava rock. Once this was completed, the male would continually chase and pick at the remaining female but there were enough places for her to hide and she survived fine and eventually spawned once again. As for the other two females, I tried to re-introduce them into the tank several times but the male always pinned them in a corner.

Today I have one male Duboisi that consistently spawns with one female and I have a spare female that I periodically try to re-introduce but have yet to be successful. I am also growing up 10 more babies in the breeding tank to try and get more females. The male does not bother the babies at all. The babies are now about 2-2 1/2" and are starting to lose their dots and all is still peaceful.

The spawning female spawns regularly every 4-5 weeks. One month the female will have three eggs and the next she will have nine eggs, then three then nine and this sequence is repeated consistently. My experience does not prove that the PVC or bare tank methods will not work. The lesson to be learned from my experience is that moving Duboisi's from a rock filled environment to which they have become accustomed, to one where there is very little cover is not in one's best interest. I hope that my experience will save someone from having the same devastating experience.

As for the PVC or bare tank method, this does work. I have been fortunate enough to visit several breeders that have used this method and I have witnessed first hand that they are successfully raising Duboisi's and other Tropheus in virtually bare tanks. The only items in the tank are either a couple of flower pots or a few pieces of PVC to provide a little bit of shelter. I believe the reason these breeders are successful is threefold. First, the fish are raised up together in this environment and as the fish mature, the dominant male remains in the tank and most of the sub-dominant males that emerge, are removed. Secondly, the ratio of males to females is approximately two males to 9-14 females. Lastly, the size of the tank used is 70 gallons or greater. I believe that the main reason the "bare tank" method works is because of the large ratio of males to females, where it is very difficult for the male(s) to pick on any particular fish very easily.

If you decide to give Duboisi's a try, I hope this article will provide some insight and will help you avoid some of the pitfalls I have encountered. Good Luck !!!

Low-Tech Reef Setup

by B. Wilfong

copied from the world wide web

Reef tanks I must admit are beauty, challenging, and expensive I have read so much about reef tanks and setups in the past couple of years that I am just about crazy over the cost. The one thing that I believe gets so many people down is the skyrocketing price of a setups, namely the setups that are quoted by the experts of this field with the dosing this and that, MH and VHO and this and that. I am not saying that they are wrong, but that there is a cheaper way to do things to get great reef results. I am not an expert in the field of microbiology nor reef technology but I have set up my share of reef systems in the past couple of years. What I hope to give you is a low cost, low-tech setup with a limited failure rate. The setup I have in mine the one of my favorite setups that I have done for myself and at the shop that I work at. It only cost around $500.00 complete. This is mainly a soft-coral setup but you can have a few hardy hard coral as well.

I started with a basic 50 gallon tank, preferably a tub tank. This way it is longer from front to back for more room to move around and coral growth. The next thing I added was the tank stand. It really doesn't matter if its walnut or oak or what as long as there is room for a sump in it.

The next thing I did was to add 5 pounds of "live sand" and mix it with 5 pounds of Aragonite (SeaFlour - .0020). This will give you about a 1 to 1 1/2 inch layer at the bottom of the tank. If you feel inclined to, you can do the Jaulbert thing, it works great but I decided on just a 1 - 1 1/2 layer for DeNitrification.

Next was the addition of "Live Rock". This part is kind of tricky. They say that you need anywhere from 1 to 2 pounds of live rock per gallon of water, I think that is find but what I find best to do is visualize 1/3 of my tank filled with live rock. This usually equates to about 20 to 25 pounds of live rock in a 50 gallon tub. (Try to find flat pieces they are easier to stack.)

For stacking the rock there are a couple of different approached that you can take. I prefer to use PVC and make a sort of stairway. I use 1/2 pvc, make a square with a center row, then use "T" pieces to fit different sized pipe that incline. They incline 'up' higher from front to back. One thing to make sure of is NOT to create to old wall - that is where all the rocks are stacked back against the tank and when fish goes down it's next to impossible to remove it. I prefer to place my reef in the dead center of the tank. I want to make sure that I can get my hand completely around the reef in all directions. However you stack the rock just make sure that there is ample "holes" between the rock so there can be adequate flow through the rock mass.

Next comes the filtration. I use a wet/dry. If you don't like wet/dry's then just use a 10 gallon sump with a surface skimmer overflow box. I just use a plan old SeaReef model 60 wet/dry and for me it works well. (If you are going to use a 10 gallon tank for a sump just make sure there is a mechanical filter - I have use the long sponge that is made by Aqua Clear - I think its from the model 300.)

The skimmer - I use a SeaReef 19" skimmer. Of course there is better out there, but it has worked fine for me. It come with a RIO 2100 pump. Just pop that into the wet/dry of sump and it works great.

That is basically the tank setup so far the price is:

50 gallon tub - $60	Stand - $90
Wet/Dry - $129.00	Skimmer - $120.00
Live Rock - $150.00	Live sand - $15.00
SeaFlour - $8.00	

Total so far - $352.00

Next comes the lighting. There is a lot out there on VHO and MH. They also work great but I tend to keep most soft coral and some hard corals and believe it or not I have used no more than 60 watts of light for the past 1 1/2 years. I bought a canopy for the 50 gallon and used 2 x 4's to lower the lights to about inches off of the water surface. Then I used 1 36" 30 watt Triton or other full spectrum bulb. And 1 36" 30 watt Super Actinice by URI bulb. Both of these bulbs has a built in reflector so I didn't use a reflector in my hood. I used end-caps and clips to secure the bulbs to the 2x4 that were mounted in the hood. As a ballast Ice-caps are nice but I just use a ballast that supported two 30 watt bulbs. If you can't find these ballast then by all means use two 30 watt ballasts. Hooking up the wiring is pretty easy, just make sure that the ballast is remote (far away form the water). And that was it. End caps are about $12.00 a pair or you can use PVC and make end-caps (see Moe – Beginner to Breeder for more on end -caps). The clips were $2.00 a pair, the bulbs were about $20.00 each and the ballast was $11.00. That makes it a grand total of $431.00, You can't get better than that.

Again, I must say that this is mainly a soft-coral tank with a few hard coral. In my tank I have kept plenty of mushrooms, a leather, lots of star polyps, tongue coral, bubble coral, an elegance, a couple anemones, an open brain, No clams, hammer Coral, I tried Acropora but I think I moved it around to much and it died, Favia or brain coral button coral, Trumpet, Closed brain, I didn't like the plate coral, it moved around to much, finger coral Orange cup coral, Pogada and some others.

Also, make sure that you do regular monthly water changes to keep Nitrite down and add supplements. I use Liquid Gold or Coral Vite, Coralife Strontium, a drop or two every three days of Iodine. I do my supplements daily – 1/8 ts. Of each a day. Calcium is another of of those important things: for a long time I used the Coralife Caclium supplement then went to dosing KW (I hear that pickling lime is also used but I am not sure of what the long-term result are as of yet.) For dosing I just use a 2 liter bottle with a gang valve attached so I can regulate the drops, about one drop every 7 seconds works for me. I now mix my KW at – teaspoon per gallon.

If you have any questions or comments they are welcome, e-mail me. Dalla5@aol.com

I hope this helps a few of you out there that are overwhelmed by the price of reef tanks.

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Featured on National Japanese & Local T.V., in People Magazine, the N.Y. Times & other Publications.

SEE OUR OFFER IN COUPON PAGES

610 West Ave.
Norwalk
06850

853-7477

MEETING NOTICE

SEPTEMBER 17, 1998

8:00 PM

FEATURING

MARK BROADMEYER

ON

REEF KEEPING

FREE ADMISSION — PUBLIC WELCOME
REFRESHMENTS, DOOR PRIZES, RAFFLE, AUCTION
MEETINGS ARE HELD AT:
THE NATURE CENTER FOR ENVIRONMENTAL ACTIVITIES
10 WOODSIDE LANE, WESTPORT CT

THE WET PET GAZETTE
NORWALK AQUARIUM SOCIETY
P.O. BOX 84
NORWALK, CT 06856

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