

***The Fabled Homozygous (HH) Hifin Variatus***  
by Glenn Y. Takeshita

The Hifin story began in 1960 when Mrs. Thelma Simpson released a strain of Hifin swordtails which she had developed from a single mutation with an extra large dorsal fin. Then in 1963, Bill Hearin released his fabulous Delta Topsail Variatus strain which he developed by crossing the variatus to the Hifin Simpson swordtail. The Hifin hybrids were then crossed back to the variatus for several generations to perfect his Delta Topsail Variatus strain. When Bill Hearin released his Topsail Variatus in 1963, he did so with three color varieties - the Blue Topsail, the Yellow Topsail and the Red Topsail. The blues had the best developed Hifins.. The Hifins were high and very wide - this is why Hearin called his hifins - Topsails. The yellow and red topsails had dorsals that were much smaller in size when compared to his blue strain.

The Hifin character was also transferred to the moons via hybridization with either the Hifin swordtail or the Hifin variatus. In Hawaii the Hifins Moons were already a reality in 1964. I introduced the Hifin Moons to the hobby through several articles written in Sept. 1965 (Aquarium Journal) and April 1967 (TFH).

Dr. Joanne Norton discussed the genetics involved in the inheritance of the Hifin character in TFH (Jan. 1967). She believed that the Hifin character was caused by a single dominant gene(H). The Hifin was expressed as long as this dominant gene was present. Since Hifin X Hifin only produced 66% Hifins(Hh) and 33% lowfins(hh), Dr. Norton believed that the homozygous Hifin combination was a lethal one and all individuals with two Hifin genes(HH) all died before they were born. Therefore, according to Dr. J. Norton all Hifins are heterozygous for the Hifin character with the genotype(Hh). Therefore, following Dr. Nortons' theory a fixed strain would be one that has 50% Hifins - others would say 66% since they would not count the homozygous young that were not born.

Dr. Norton's theory of Hifin inheritance:  
Two possible crosses are shown below.

1.
 

		h	h	
H	Hh	Hh	hh	1:1 ratio of hifins to lowfins
h	hh	hh	hh	
  
2.
 

		h	h	
H	Hh	Hh	hh	2:1 ratio of hifins to lowfins
h	hh	hh	hh	

lethal genotype

Since 1960 everyone working with the Hifins whether it be swords, variatus or moons, all hoped for a Hifin pair that would produce 100% Hifin young. The forty years that the Hifins have been in the tropical fish hobby, I have heard of Hifin pairs that produced a wide range of percentages( 1% to 80%) of Hifins. This wide range of percentages makes one wonder if the

genetics involved regarding the Hifins are more complex than the theory suggested. Looking at Hifins for 40 years, everyone will agree, there are many different shaped Hifins. You see extremely large and beautiful Hifins, you see Hifins that are very high without any width, you can have Hifins that go backwards instead of up and you see very small Hifins especially in Moons. All shape and sizes of Hifins can be seen. This variability of Hifins indicates that there are many modifying genes being expressed in conjunction with this Hifin character. Therefore, I believe that Hifin genetics is very, very complex and not simple and straight forward as most of us hobbyists believed.

Now that we agree that Hifin genetics is complex and not simple, let us discuss the homozygous(HH) Hifin variatus that I believe I have.

It all started in Oct. 1998 when I had 17 young from a female Hifin Marigold Variatus which I purchased from a pet shop (Modern Pet Center) in Honolulu. Since it was such a very small batch of young I really did not take very good care of them. I had them in a 5 gallon tank for about 1 month. I fed them live brine shrimp nauplii and flakes, and they were not growing like I believe they should be growing. One day I decided to check to see what I had. I was shocked when I found that they were all Hifins - a batch of 17 young which was 100% Hifins. I then realized how valuable the original female variatus was. But since I really didn't take very good care of her, she was in pretty bad shape. I tried my best to recondition her so that I could have more young from her. But it was too late she never gave me another batch of young and she died 2 months later. Now that I knew how important the young were they were transferred to a 10 gallon tank and given the royal treatment. They are young adults now - 3 males and 14 females. I lost 1 male and 1 female, resulting in 15 young adult Hifin variatus. If this F1 young consistently give me all 100% Hifin young I will be on my way in fixing a strain of true breeding Hifin marigold variatus. How could this happen after 40 years working with Hifins? Since I was just baffled, I decided to call my friends - top breeders here in Hawaii. I called Ah Kwai Tom, Fred Morita, Franklin Lau, Ed Kunimoto, and George Yukitomo - all of them were shocked because they all never had a 100% Hifin batch of young from a Hifin X Hifin crossing. This question had to be answered for it was driving me crazy. After awhile I built up enough courage to call a new friend - Dr. Clyde Tamaru who has a PhD in Aquaculture at the University of Hawaii and I asked him the same question I asked my other friends. Is it possible to get a homozygous Hifin fish when the theory all these years said that the homozygous Hifin combination was lethal? The answer I got from Dr. Clyde was, it was possible that a homozygous hifin fish or fishes lived for some unknown reason and these fishes are giving 100% Hifin batches of young. This against the grain result is not very common but not very unusual. According to Dr. Tamaru when it comes to genetics anything can and will happen. His and my past experiences confirm this. But he cautioned and told me that everything that happens has a scientific explanation but at times the reason cannot be found right away.

Before I proceed with my story, I would like to mention that what I am reporting about does not in anyway refute, Dr. Joanne Norton's theory on Hifin inheritance. As far as I am concerned, Dr. J. Norton is the teacher and I am just a student when it comes to genetics since her doctorate is in genetics and I respect that.

Now to continue my story. To compound what I mentioned above about a batch of 17 Hifins(100% Hifins). I also attained 3 more batches Hifin variatus which were all Hifins from 3 other females which I got from my friend - George Yukitomo. These young adults were sisters from a batch of young that George got from a female Hifin marigold variatus he also bought

from Modern Pet Center. Why I got these females from him is because he mentioned that this batch of young were throwing 80% Hifins which gave him only 2% males and 98% females. Now the story is more interesting or should I say more confusing. Four female Hifin marigold variatus that gave batches of young that were all Hifins. I looked for the common element to explain this confusing problem and I think I have a logical explanation.

I believe the key to the above puzzle is the male Hifin marigold variatus I bred all 4 females to. As far as I am concerned the key is the male Hifin variatus - he has to be the homozygous individual for Hifin. To prove this I have placed with him virgin Hifin females from another strain. If these females give me 100% Hifin young, I can safely say he is the key to my puzzle. My only concern is that he is an older fish and he is not very active sexually. In my books he is definitely not a driver who chases the females constantly - he seems to be a gentleman, who I see chases the females only occasionally when I was watching him. Also, since the batches are small, his spermatozoa are not very strong and active and this concerns me. The male is also not very strong and active but has a good Hifin and body conformation and color. Is this because he is an individual that should have died before being born? I am at present kind of babying him since he is the key to a homozygous line of Hifin variatus.

So far the following are the statistics for the 100% Hifin batches.

1. Female #1 - 17 young( 3 males + 14 females); lost 1 male and 1 female. Remaining 15 (2 males + 13 females). Born - Oct. 1998.
2. Female #2 - 36 young. Too young to sex yet. Born - 6/99.
3. Female #3 - 20 young. Too young to sex yet. Born - 7/99. Lost 8 young. Remaining 12 young.
4. Female #4 - 12 young. Too young to sex yet. Born - 7/99.

At present I have a total of 75 young from the homozygous Hifin variatus male. I lost 2 females, therefore I have just 2 females left. The 2 females at present appear to be ready to drop another batch of young.

All 4 females discussed above may also be homozygous for Hifin but my gut feeling is that the male is the key to this puzzle.

Evidently the Hifin marigold variatus that is being sold at Modern Pet Center are probably all coming from one breeder in the orient. For some unknown reason this line of Hifin marigolds are producing some homozygous Hifin individuals that I was just lucky to buy. The F2 generation will give more concrete answers which I will pass on to you in another article in the future.

Possible matings that are probably occurring to give 100% Hifins:

1.	Female	H	H
	Male H		HH
	H	HH	HH

2.	Female	H	h
	Male H	HH	Hh
	H	HH	Hh

The above both matings will give 100% Hifin batches. Naturally #1 is preferred over #2 especially for a tropical fish farm operation. #1 will give you Hifins for all future generations. #2 possibility would have to be handled a different way - if 21 h are bred together you will have some lowfins which you would have to culled.

Potential of the homozygous Hifin:

It is quite evident what the potential of the homozygous Hifin variatus will be to the tropical fish farmer and the hobbyist. First and foremost would be the possibility of developing Hifin Swords, Variatus and Moons that will throw 100% Hifin batches of young. To the fish farmer this will mean a lot of time, hard work and money saved because you would not have to segregate the hifins from the lowfins.

Some bad characteristics or problems in the homozygous Hifin Variatus young:

1. Sex ratio: In the first batch of 100% Hifin marigold variatus, the sex ratio was more females than males. There were 14 females and only 3 males.

2. The quality of the hifins on the males was poor. They did not have the desired topsail-type dorsal instead they had a very narrow and small dorsal. The females dorsals were okay.

The above two problems can be easily corrected by breeding the females to a strain that has males with topsail-like dorsals and a 1:1 sex ratio.

Summary:

Before I end this article, I know that many of you would say that the information is very premature. I agree totally with you, but I felt that this was the first time in 40 years working with Hifins, that this has occurred that I just wanted the whole tropical fish hobby to hear about it. I am so excited that I had to do this article. Several months ago I wrote a few short paragraphs for the Honolulu Aquarium Society of which I am an honorary member but decided to do this article to spread the good news.

Please look for my update article in the future on this subject. -- "ALOHA".

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