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Small-Scale Guppy Breeding[1]

by Diana Walstad

(Revised February 2022

Guppy breeding appears to be a daunting business—a fish room full of tanks, automatic water changers, etc. It doesn't have to be that way.[2] Here, I describe a low-key approach with 9 tanks (10 and 20 gals) scattered throughout the house.

Modern Guppies

There was a time when the guppy (*Poecilia reticulata*) was the gateway fish for beginners and children. In the 1950s, guppies were valued for their hardiness. No large tanks, special foods, exacting water conditions... Unlike most fish (e.g., Neon Tetras), guppies produced offspring with riotous and unpredictable color patterns [**Fig 1**]. Breeding guppies was fun.

Fig 1 Homebred Guppies These guppies (all siblings from a single batch) are the result of crossing a male swordtail guppy (*See Fig 2*) with a fancy Blue Grass female. Because of the *color polymorphism* trait—unique to guppies—every male has his own color pattern.

However, in the past few decades, the common guppy has lost its reputation as an easy-keeper [1]. Many hobbyists—and not just beginners—have difficulty keeping purchased guppies alive. Guppies that die soon after purchase inevitably dampen hobbyist enthusiasm for keeping and breeding guppies. Premature deaths are often attributed to poor care, but I put 50% of the blame on the genetic weaknesses bred into modern, fancy guppies.

At one time, world-class breeders appreciated the guppy's unique trait of *color polymorphism* [2]. Now, strain uniformity is the "holy grail."

To maintain strain uniformity, persistent inbreeding is required to counteract the guppy's natural tendency towards color polymorphism. The result is fancy guppies that are highly inbred compared to wild guppies [3]. The emphasis on strain uniformity has put guppies into a genetic straight-jacket. And inbreeding without rigorous selection for fitness inevitably results in genetically weak guppies.

Aside from a few small heirloom and niche guppy breeders, fitness is not a big part of most breeding programs. After all, there are no awards or economic incentives for longevity and disease resistance.

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[1] *Acknowledgement:* Alan S. Bias, a long-time successful guppy breeder and authority on their genetics, provided valuable editorial assistance for this article.

[2] Breeders often cite inbreeding depression as justification for keeping large populations, but mating genetically related individuals does not automatically spell doom. *See later section 'Inbreeding'.*

Purchasing Guppies

Guppies are cheap and readily available from pet stores, on-line websites, and aquarium club auctions. That said, finding guppies that are satisfying pets and/or worth breeding is not that easy.

Store-bought guppies, mostly males imported from Southeast Asia, are usually what most beginners start with. They are attractive and inexpensive. Generally, farmers raise them in ponds under healthy conditions [1]. However, their underlying genetic weakness—combined with the stress of shipping and adjusting to a new home—often sinks them.

Fig 2 Swordtail Guppy [4]
This particular male was not from a fixed strain. Instead, he came loaded with exotic color and pattern genes that gave full expression in his offspring. (*See Fig 1*).

Although some of my store-bought males survived long enough to sire some nice progeny, I purchase most of my guppies from on-line sites (AquaBid.com, ebay.com, breeder websites). Most fish come directly from the breeder, which is always a plus. Aquarium club auctions and trade shows are also good places to find guppies. You can see the guppies beforehand and talk to the breeder. I use price to sort out the "wheat from the chaff." A conscientious breeder usually asks for and deserves a respectable price. You will not get quality fish in a $5 grab-bag.

As to female guppies, the few offered in stores are usually of very poor quality. In my experience, the only way to get high-quality females is to get them directly from the breeder.

For hobbyists fed up with guppy fragility, I would consider swordtail guppies [**Fig 2**]. They have greater longevity than most delta-tail strains. They are larger and not as skittish as Endlers, feral and feeder guppies. In my experience, crossing swordtail males with high-quality females from "delicate" delta strains produce very attractive progeny with greatly increased fitness. Genes for the swordtail phenotype are recessive, so it was easy for me to breed out the swordtail from my delta stock. [3]

Tank Setup with Plants

Assuredly, live plants are not necessary for breeding guppies. Tanks maintained according to established norms (barren tanks) work just fine. But I happen to like plants. And I believe that keeping guppies in a more natural system selects for fitness. I no longer use filters, aerators or pumps in any of the tanks. With a relatively light bio load (1-2 guppies per gal), the system (water purification by plants) works surprisingly well. [4]

Fig 3 Planted Tank with Guppies
This 20-gal tank holds about 30-40 adult guppies, plus snails and 30-40 small shrimp.

Breeding guppies requires considerable fish catching. Catching them in a typical planted tank would be well-nigh impossible. Thus, all plants in my guppy tanks are portable (**Fig 3**). I can easily pull the plants out before catching the fish.

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[3] I relate my experiences with guppy genetics in a separate article 'Breeding Guppies: Genetic Pitfalls and Successes'. Article is available on my website: http://dianawalstad.com.

[4] My website article 'Potted Plants for Fish Breeding Tanks' describes the method.

Maintenance and Selection

I do major tank maintenance every month—changing 30-50% of the water, siphoning out bottom mulm, culling guppies and shrimp, trimming and repotting plants.... Minor tinkering in between major cleanups involves removing excess fry, matt algae, and floating plants.

I keep my tanks lightly stocked. My comfort zone for a 10-gal tank is 40-80 babies, 20-25 juveniles, or 5-10 adults.

I keep a female's entire batch of 30-80 fry in their own tank so that I can identify inferior and superior individuals from her batch. At about 6-8 weeks, I begin removing guppies that show small size and problems. I keep males that mature early with good size and color, traits that usually translate into large, superior adults. At 4-5 months, I begin selecting potential breeder guppies, those with good size, good form (e.g., short strong backs), big dorsal fins, vibrant color, energy and robust health.

Guppies raised in Southeast Asia are exported for sale at 10-17 weeks [1]. I use this grow-out time to roughly monitor the growth rate of my guppies and the efficacy of my fish-rearing system.

Euthanasia

Breeding guppies is probably not suited for young children and the sentimental. To successfully breed guppies, one must routinely cull and euthanize fish. Large, older, well-fed females produce 50-80 babies every 4 weeks. One cannot possibly raise, sell, or even give them all away. Nor should one keep sickly and deformed guppies in a breeding colony. Rigorous culling is essential for maintaining fish health and quality.

Disposing of unwanted guppies should be quick and painless--both for the fish AND the hobbyist. I would argue against putting unwanted fish in the freezer or down the toilet to a lingering death. Using an anesthetic (e.g., MS-222, clove oil, CO_2) is more humane. Clove oil is inexpensive and widely available. I put fish into a dark container with about 2 cups of tank water. Then, I sprinkle the surface with 2 drops of 100% clove oil and cover the container. No mixing. The clove oil puts guppies gently into a permanent sleep in about 5-10 minutes. Afterwards, I scatter the container's contents over my property as tree fertilizer.

To make an unpleasant but necessary task more palatable, I equate the removal of excess fry with the removal of excess plants and snails from the tank. Because fry gather at the surface, they are easy to catch. Breeding guppies provides a valuable lesson in the biological reality of over-population.

Stress Reduction

Guppies are social fish. Juveniles, in particular, like to be in groups. They also have their own likes, preferences and personality. Some males can be overly zealous and pick on one particular female. In turn, some older females will bully a younger female. If I see bullying that lasts more than a few hours, I separate the two. Continuous bullying can lead to poor growth, disease, and death.

For reducing stress in scared, newly purchased fish, the presence of some juvenile guppies in the new tank can make them less fearful. Feeding live baby brine shrimp is another calming tactic.

I am careful when netting older guppies. Males with big delta tails can get bent backs by rough handling. I use soft mesh nets so as not to scrape their skins. Sometimes I gently coax a net-trapped individual into my cupped hand. Tank transfers do not need to be traumatic.

Fortunately, modern guppies are thoroughly domesticated and accustomed to being handled. I move mine directly and frequently from one tank to the other.

Diseases

In 2017 when I started buying guppies from breeders and pet shops, I knew that disease would be a major hurdle. Most of the new fish were healthy, but it only takes a couple afflicted individuals to wreak havoc. Unsurprisingly, it was not long before some fish became diseased. The parasites Camallanus worms and skin flukes caused the most problems. [5]

After a few years, I gradually eliminated these problems—by treatment and by culling disease-susceptible individuals from the population. Some Metalheads that I worked with developed notably more disease than my other guppies [**Fig 4**]. When the tank had a fluke outbreak, the Metalheads were the first ones to get sick. Other strains did not get sick or fared much better with disease treatment. Eventually, I got rid of the Metalheads. My guppies rarely get sick now.

Some fancy strains cannot adapt well to a new environment. They have lost genes for disease resistance [5]. The fish might do very well for the original breeder but fall apart when challenged with the tank environment of a new owner.

Fig 4 These Metalheads were gorgeous, but too fragile for my tanks.

One does not have to become a disease expert to keep guppies healthy. Most diseases are caused by organisms (flukes, Costia, Ich, Tetrahymena, mycobacteria) that are opportunistic pathogens living peacefully in tanks, ponds, and nature. Ordinarily, these bacteria and parasites are not a problem, because the fish's immune system provides enough protection to prevent disease.

Sometimes, though, a situation develops that allows potential pathogens to multiply exponentially and cause problems. For example, a vulnerable fish in a healthy tank could develop mycobacteriosis ("Fish TB") perhaps due to old age, stress, new purchase, genetic weakness, etc. That fish becomes an infection focus, allowing the causative mycobacteria to multiply. Eventually, the diseased fish starts releasing mycobacteria into the water, thereby transmitting disease to otherwise healthy tankmates.

Diseased individuals should be removed from the tank as soon as possible. A diseased fish is a huge reservoir of activated, "pumped-up" pathogens. Allowing a sick fish to die in the tank is a very bad idea. As it decomposes, it releases astronomical numbers of the pathogen into the water, sometimes overwhelming the immune system of otherwise healthy fish.

Incoming guppies are very vulnerable during their first 2-3 weeks in a new home. They are not only stressed but exposed to new strains and new species of opportunistic pathogens. A UV sterilizing filter used during this critical adjustment period kills microorganisms in the water, thereby reducing the *number* of potential pathogens. It gives the fish a precious 2 weeks to produce protective antibodies. [6]

Ordinary table salt—used in a bath or a hospital tank—is an under-rated, all-purpose chemical that works well for killing *external* parasites. Moreover, guppies can tolerate high concentrations of salt.

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[5] My website articles 'Treating Fish for Camallanus...' and 'Flukes and Sick Guppies' describe treatments.

[6] My website article 'Mycobacteriosis in Aquarium Fish' describes how I stopped a Fish TB outbreak with UV sterilizing filters.

Whenever possible, I let tanks rest a few days without any fish. [The larva of many parasites (Ich, skin flukes, etc.) will die if they cannot latch onto a fish within a few days of hatching from their cysts.]

I don't mind coddling fish that have been weakened by shipping, bullying, accidents, etc. However, there came a time when I was unwilling to rescue every single sick guppy, especially those that I had raised myself and that were well-established. I decided that heroic measures were counter-productive. Diseased individuals threaten their tankmates, and if used for breeding, perpetuate genetic fragility.

Indeed, instead of treating guppies during an outbreak, one guppy breeders used Costia outbreaks to weed out susceptible individuals and increase his population's resistance to Costia. I used a similar strategy to successfully eliminate chronic fluke problems in my guppies.

Foods

Guppies are omnivores, so I include vegetable matter in their diet. Pellets are generally better than flake food. Vitamins degrade, so I freeze bulk food stocks and portion out enough for 2-4 weeks of feeding. Treats include freeze-dried bloodworms, hard-boiled egg yolk, and a homemade food paste containing flake food, sardines, and pureed spinach.[7] Fish get fed 2-3 times a day, starting with flake food in the morning.

One can raise and breed guppies without hatching brine shrimp eggs, but I feed baby guppies live baby brine shrimp (nauplii) twice daily for the first 2-3 weeks.[8] Guppy fry will hunt down nauplii until their bellies are properly swollen. It is a wonderful food for them. I also feed nauplii to adults as a treat or as "comfort food" if they have been stressed.

Reproduction

Males court continuously, but all that frenzied activity often does not translate into a successful copulation. Female consent is generally required for copulation and a male's paternity success [6].[9]

Virgins, which contain eggs waiting to be fertilized, mate indiscriminately with any male. Upon encountering their first male, they generally mate within an hour. Afterwards, she stores the sperm and can produce batches for 8 months without any additional mating [7].

However, should the female encounter a new male, the new male's fresh sperm usually takes precedence over older stored sperm. In an experimental study [8] with double-mated females, virgins were mated to their first male. One day after the resulting parturition, they were remated to a second male. Paternity in the female's next batch was skewed 83% towards the second male.

A non-virgin female may produce mixed batches—fry sired by multiple males. A paternity analysis of 101 batches from ten wild guppy populations reported an average of 3.5 sires per batch [9]. This polyandry trait (i.e., female polygamy) is believed to contribute to genetic heterozygosity and the guppy's phenomenal success as a species.

The whimseys of non-virgin female guppies in "choosing" males has been well-documented in the scientific literature. Once virgins have mated, they become very choosey. They generally reject males outside of their estrus period (0 to 6 days after parturition). And they may not accept males—for whatever reason—that do not appeal to them.

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[7] My website article 'Treating Fish for Camallanus Worms...' describes the food paste. (The fish liked it so much that I now prepare it without the Fenbendazole dewormer and feed it routinely.)

[8] My website article 'Hatching and Growing Brine Shrimp' describes several ways to hatch eggs.

[9] Wild males gain some paternity via non-consensual sex [6], but successful copulation via hasty, "gonopodial thrusts" requires maneuverability and acrobatic skills that domesticated males with their large tails may not have.

Fig 5 Female 'B' apparently liked and accepted the new Blue Delta male.

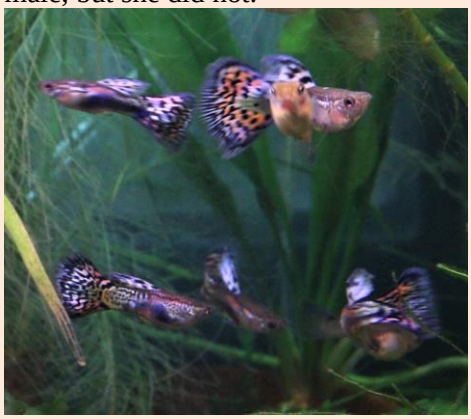
Progeny born to Female B were all sired—as predicted--by the new Blue Delta male. The progeny's lively coloring was entirely different from my other guppies, so I knew he was the sire. Because the Blue Delta strain has a uniformly blue tail, the progeny's color blotching must have come from the dam.

I ran up against the vicissitudes of guppy mating and female whimsy upon outcrossing two full sisters ('A' and 'B') to a purebred male from a Blue Delta strain [10] On the day of purchase, I placed him alone with 'B' for two days. Because she had produced babies the day before, she was in her early estrus phase, and therefore, primed to be receptive. After 2 days with 'B', I placed him alone for 4 days with her sister 'Female A'. She had also just had babies the day before, so she was equally primed. Afterwards, I kept both females with the male for another month.

I predicted that the sisters, both ideally mated early in their estrus phase, would produce progeny sired by the Blue Delta male.

Indeed, Female B's batch, produced a month later, were all sired by him [**Fig 5**]. In contrast and much to my surprise, Female A's next batch were all sired by earlier males, that is, stored sperm from previous matings [**Fig 6**].

Fig 6 Female 'A' should have produced progeny by the Blue Delta male, but she did not.



Progeny born to Female A show the CM pattern of the CM males that she had previously been kept with. Unlike her sister, she did not accept the Blue Delta male.

Scientific studies have shown that while the most recent male generally gains paternity, individual females sometimes, somehow give paternity to earlier males.[10]

Once I have identified a superior female, I try to get as many batches from her as possible. Her survival and normal reproduction at an older age signals a good genetic makeup for female fitness.[11] Her daughters get priority for future breeding.

When I have identified a premier female, I often switch males in between batches, so that I can obtain batches sired by different males. Thus, I can later inter-breed her half-sibling progeny. This will concentrate her good genes yet avoid the mating of full siblings.

[10] Investigators [11] showed that virgin females that were mated naturally with two males had a much different paternity result than females that were artificially inseminated with a 1:1 sperm mix of the same two males. How individual female guppies skew paternity ('cryptic female choice') is still unknown.

[11] My website article 'Guppy Longevity, Inbreeding and Outcrossing' contains scientific studies and my own experience with increasing guppy longevity.

Sexing Guppies

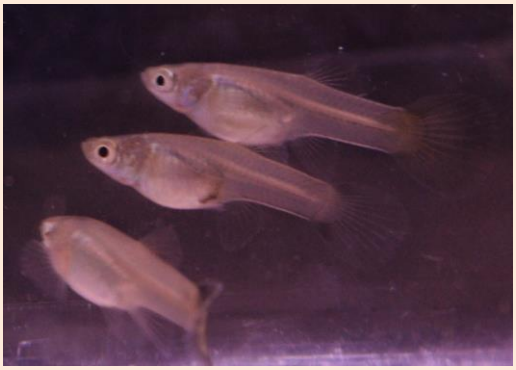


Fig 7 Sexing Guppies The juvenile in the middle has a gravid spot that identifies her as a female. The other two are males.

For years, I resisted sexing progeny and raising the sexes separately. First, it requires two tanks instead of one. Second, males that grow up without females sometimes develop homosexual behavior. Third, mating and reproduction selects guppies for their survival under natural conditions. In the past, I had witnessed too many young females die after giving birth. I want females that can withstand the known stresses of mating and reproduction.

Thus, I just allowed the entire batch of both sexes to grow up together and mate indiscriminately. Because I was selecting for longevity, I had plentiful time to counteract these unplanned matings between full-siblings. When the guppies reached 4-5 months, I would begin selecting superior males and females as potential breeders and put them with less-related guppies from other batches. Because a female had to survive past 8 months before I would keep her progeny, she would have gone through 2-3 estrus periods of planned matings. (The more estrus time with a new male, the better his chances of siring her progeny.)

Ideally, I add the new male as soon as possible after the female gives birth, within 1-6 days. But if the female is in mid-cycle (> 6 days following parturition), I wait for her second batch. This informal "wait a month" policy works reasonably well, but as discussed earlier, it is not full-proof.

Over time, I began to realize that sexing guppies and keeping a ready supply of virgin females was—in some situations—essential. While trying to increase longevity in male guppies, I discovered that some longer-living males were not reproducing (*See page 11*). For monitoring reproductive longevity, it was easy to track whether an older female was still reproducing, but older males were a black box. After pairing older males with my non-virgin females, were subsequent batches sired by his sperm or were they sired by stored sperm from previous males?

The only way I could tell whether older males were actually reproducing was to pair them with virgin females and see if the female(s) produced fry. Moreover, virgin females are much more willing to copulate than non-virgins, thereby smoothing the mating pathway for males. Finally, keeping females as virgins would reduce the production of unwanted fry.

To sex guppies, I look for the appearance of a "gravid spot" in females. Females develop a dark, melanin-pigmented area in the anal region at 3-4 weeks. This is at least a week before males reach sexual maturity.[12] **Fig 7** depicts 25-day-old juveniles with the female showing her gravid spot.

I put females into a "virgin tank." During the next couple weeks, I routinely check the virgin tank to make sure that I didn't include any males. One single male could upend the apple cart. I look for any juveniles showing male sexual development—thickening of the anal fin, male body coloration, and the absence of a gravid spot.

As to preventing homosexuality in males, experienced breeders often keep their juvenile males with "chase females" (miscellaneous females). Young males need interaction with females during their development to learn normal sexual behavior [12]. Female guppies do not require this training, but males do. Thus, after transferring some virgins to a separate tank, I make sure that the males have some young chase females to interact with.

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[12] Males develop their colors and a fully functioning gonopodium (modified anal fin) at 5-6 weeks. Only after the gonopodial hood has extended beyond the gonopodium tip are males capable of inseminating females [6].

Inbreeding

Small-scale guppy breeding such as mine with only 9 tanks and a small overall population size will lead to some genetic homozygosity. But that does not mean the guppies will automatically degenerate (i.e., lose fitness and fertility due to inbreeding depression). In native habitats, isolated pools harbor small populations (~100 breeding guppies) that live and mate among themselves for many generations before an immigrant male might bring in new genetic material [13].

Most certainly, one should avoid the "willy-nilly" mating of full siblings for multiple generations. However, I believe that one can breed healthy guppies within a small population like mine. Inbreeding's effect varies tremendously depending on the founding individuals, selection factors, and the number of fish actually reproducing (N_e).[13] One 10-year-study [15] showed that moderate inbreeding actually "purged" bad genes responsible for reduced survival from their guppy populations.

I routinely breed half-siblings and cousins. I avoid severe inbreeding [mating full siblings or parents to progeny (backcrossing)] except on those rare occasions when I want to concentrate the genes of a truly spectacular individual or not lose a cherished phenotype.

Should I detect deterioration in my stock, I will outcross to a new strain. In general, I have brought in new genetic material by outcrossing my females to an outside male about every year. Since I really like my homebred females, I only use males for outcrosses.

Record Keeping

When you have only 9 tanks, avoiding problems like inbreeding requires record keeping. Records also adds purpose, feedback, and interest to what otherwise could be slapdash guppy breeding.

At this time, I keep a journal of every pairing, birth date, death, etc. Every month I inventory each tank and the status of its inhabitants (**Table 1**). I also track how each litter has progressed over time (**Table 2** *on the next page*). Each "breeder" female is identified by her birth date and a letter afterwards. I bestow an 'A' on females I like best.

Finally, I keep a detailed analysis (*See page 11*) of each mating that include pictures. It documents why I chose a particular pairing and whether the litter met up to my expectations. Using these records, I can make some sense of the genetics, learn from my mistakes, and make adjustments.

Tank #	What's Inside?	Birth/Pair Date (s)	Breeding	Comments
4	1 m + 2 f	p. 11/20	M: Delta Blue F1 (7/13/21) F: (9/21/20A) and (1/26/21B)	Waiting for 1/26/21B to drop; older f. not reproducing

Table 1. Tank Inventory shows the monthly status of each tank and—as an example—the Dec 2021 entry for Tank #4.

[13] One group of investigators [14] calculated that the N_e ('effective population size') of their 'S' guppy strain decreased—due to fish removal for their experiments—from 623 to 18 over a 16-year period. This precipitous decrease occurred despite the fact that the investigators always kept more than 300 individuals.

Birth Date	SIRE	DAM	Current Disposition
1/26/21	YG/BG/CM	AT/BG (6/27/20A)	Last remaining fish ('Female 1/26/21B') from this batch doing well and reproducing normally

Table 2. Litter Records show the status of each batch of guppies that I raised to adulthood and—as an example—the Jan 2022 entry for the batch born on 1/26/21.

Discussion

Hobbyists can keep male guppies in a tank and enjoy their beauty just like any other tropical fish [**Fig 8**]. Breeding guppies is far more work. Many hobbyists understandably object to culling. But removing inferior and diseased individuals is essential for breeding healthy, quality guppies.

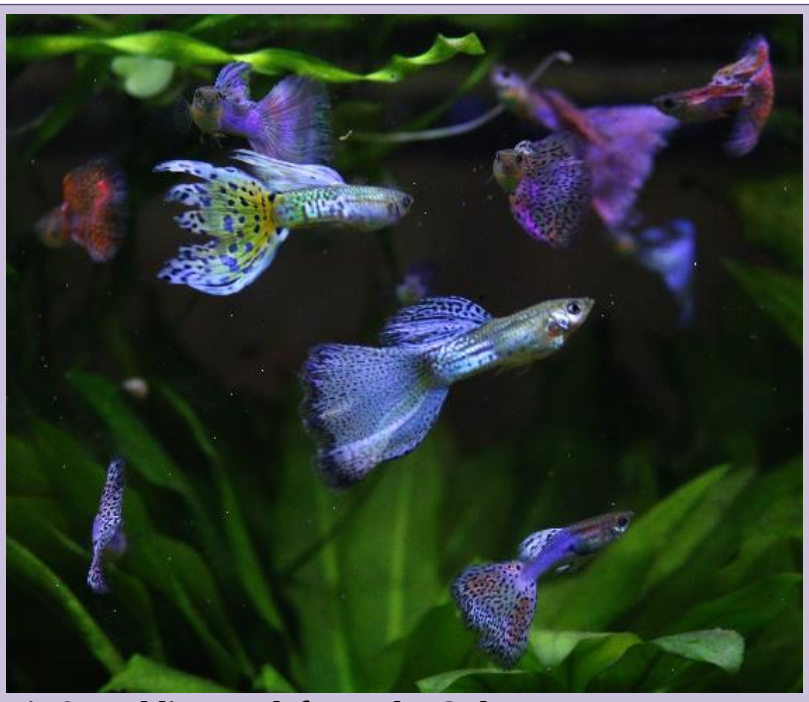

Fig 8 Holding Tank for Males Only
I keep about 20-30 adult males in a 20-gal single-sex tank. Occasionally, I might pull one out to breed with a female.

Experienced guppy breeders use a variety of methods [16]. Mine is constrained, because it only involves 9 tanks. I wish I could save batches from every superior male and female to see how their progeny turn out, but I can't.

Rather than adopting a single method, I would argue for flexibility, perhaps switching strategies as needed. For example, after selecting for longevity, I found that the resulting guppies were, yes, living longer—a marked improvement from when I started. But some of these older guppies were infertile. (A guppy that doesn't reproduce is, in my opinion, functionally dead.) As a consequence, I have begun selecting for fertility as well as longevity. This requires that I start sexing guppies and keeping virgin females to test for male fertility.

Breeding guppies became doable for me only after I established a healthy colony. I had to eliminate sickly strains and weak individuals from my breeding stock. I outcrossed my initial fancy strain (Blue Grass) to hardier swordtail guppies to bolster fitness and longevity.

I believe that concerns about inbreeding have been exaggerated. Yes, elephants and humans with their long generation times and precious few progenies can suffer severely from inbreeding. But guppies are so prolific that there is plenty of wiggle room to rectify any inbreeding problems. I would rather line-breed superior individuals and accept some genetic homozygosity than breed less related, less-desirable individuals just to maintain genetic heterozygosity. Allowing guppies to express their

natural color polymorphism might be just as effective in maintaining genetic heterozygosity as keeping hundreds of guppies bred according to strict strain standards.

Let the big commercial breeders select for strain standards and uniformity. Small-scale breeding of outbred guppies is more fun. Anticipation abounds in waiting for the first juvenile male to "turn" and show off a brand new color pattern. My colony of outbred guppies seems to produce one beautiful phenotype after another. Sometimes I lose one lovely phenotype only to discover a different but equally beautiful one down the road. Outbred guppies are packed with genes just waiting to be expressed in an infinite variety of ways.

I was captivated by guppies as a child. Despite long sojourns with other fish (Rainbowfish, cichlids, etc.), I reverted back to the "lowly" guppy. Someday, I hope that this marvelous little fish will regain the popularity it deserves.

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Record Keeping Example for Batch Born on 01/26/2021

Purpose: My YG (Yellow Grass) and BG (Blue Grass) males are over a year old, and I have no more of these phenotypes. Goal is to get progeny from these two beautiful old males.

Dam History:

She was paired with CM (Christmas) males (b. 3/8/20) on 10/04/20. On 11/19, they were removed and she was paired with 1-2 BG males. Then, on 11/29, I added the YG male, so she was with the BG and YG males for over a month and during one entire estrus cycle (she had babies on 12/30/20).

Progeny Results:

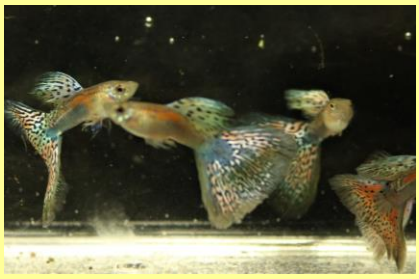
About 50 very large babies born on 1/26/21. On 3/8/21, most juvenile males look like they are sired by previous CM males. Only 2 males are YG and none are BG.

The 22 females are nice. Discarded 5 during a fluke outbreak on 5/13. Sold some. On 6/14, I had 12 left. Most females have developed HTD (high thumb dorsal) within last two weeks. Kept two females (A and B) as breeders.

I discarded 'A' on 11/03/21 because of bacterial skin infection. As of 02/01/22, 'B' was alive and reproducing normally. She is a premier breeder female.

Conclusion: The old BG and YG males were not that successful as sires and may have had fertility problems OR the dam did not accept the BG male. I should have used a virgin female for mating, because it is a quicker, more reliable test for male fertility and a virgin would have been less choosy.

1/26/21 Progeny at 2 months age. Very healthy and colorful.
Photo: 3/26/21



Primary Sires: CM (3/8/20)

Secondary Sire: YG (1/5/20)

Non-Sire: BG (11/08/19)

DAM: 6_27_20A