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# Crossing Guppies with Endlers

by Diana Walstad (September 2026)

Since 2017, I have been breeding guppies in nine 10- and 20-gal tanks. From the beginning, I wanted fitter guppies than what was generally available in the hobby.

My strategy: Matings were planned. Kept records. Guppies had to be attractive, but I did not select—nor want—fixed color patterns. I only saved progeny from females that lived at least 8 months; progeny from those that died earlier were discarded. I avoided the severest forms of inbreeding (backcrosses and mating full-siblings). Every couple of years, I outcrossed my guppies to a different guppy strain.

Despite all these efforts, my guppies, which I call "Rainbow guppies," began to show fitness problems last year (2025). I noticed a few too many skin fluke outbreaks. The fish were also not living as long—8-10 months versus 12-15 months in the past. In August 2026, five sibling females that I had set aside for breeding were dead by 6 months of age. Discouraging. My strategy was clearly not working. The guppies had hardly gained the 1–2-year lifespan that the domestic guppy is capable of. I could not blame it on environmental factors, because my tank methods have not changed since 2017.

## 1. Outcross to Endlers

I suspected that the problem was inbreeding. One solution was more frequent outcrossing, preferably with less inbred individuals. An outcross in 2018 to swordtail guppies improved fitness markedly. (In contrast, outcrosses to delta-tail guppies were not as successful.)

**Fig 1 Santa Maria Endlers** represent a cross between guppies (*Poecilia reticulata*) and Endlers (*P. wingei*). Kenichiro Tamura created the strain and released it into the hobby around 2015. Males feature a black upper body and a bright red/orange lower body. Females are more robust and males court females less intensely than pure Endlers. Otherwise, they look like pure Endlers. {Photo: by Frank Schäfer, posted on Aquarium Glaser GmbH website.}

**Fig 2 Two of my Endler (EN) Females**
(I used the lack of pigment in their fins to determine the parentage of their progeny.)

**Two of my Endler (EN) Males**

I could have outcrossed my guppies to wild guppies from Trinidad or possibly feral guppies. However, in November of 2025 opportunity knocked when a nice group of Santa Maria Endlers [**Figs 1 and 2**] went up for bid at a club auction. I could not resist. Perhaps, they would bring new fitness genes into my Rainbow guppies?

I crossed my Rainbow guppies (RB) with the Endlers (EN) in both directions. Crossing RB males with EN females (RB X EN) consistently produced sizeable batches, suggesting greater fitness in EN females. This also provided an additional bonus—more F1 progeny to choose from.

The reverse outcross (EN X RB) was less successful. Male progeny were smaller and less attractive. Almost 10% of the females had spinal deformities. For genetic diversity in future breeding, I kept 3 attractive individuals. Otherwise, I focused on the F1s produced in the RB male X EN female outcross.

I put the 3 EN females with 4 young, vigorous RB males [**Fig 3**]. No doubt, the EN females carried stored Endler sperm. However, fresh sperm from novel males with new color patterns generally gets insemination priority [1].

**Fig 3 Rainbow (RB) Males** (at 2 mos. age) that sired the F1s

Indeed, the sperm "turn-over" came quickly after the initial outcross pairing on Nov 8. One female had 19 babies 3 weeks later on Nov 30. These babies were from eggs that had already been fertilized by stored EN sperm previous to pairing the females with the RB males. However, one Endler egg must have caught the tail end of the fertilization period, for **one** male in the batch was sired by Rainbow sperm [**Fig 4**]. (In guppies, egg fertilization takes place over a ~1 week period and the gestation interval is 20-45 days.)

**Fig 4 Mixed Batch** from an outcross (juveniles from the Nov 30, 2025 batch)

**Pure EN X EN Progeny**

**Single RB X EN** outlier shows his RB heritage compared to his half-siblings shown above.

Unsurprisingly, later batches (21 fry on 12/12/25 and 21 fry on 1/17/26) from the other 2 EN females were sired entirely by RB males. These were the desired hybrids (F1s).

A rapid sperm turnover like this is not unusual when outcrossing guppies. Female guppies control reproduction. When a novel male with a new phenotype suddenly appears, females not only give him fertilization priority but actually speed up egg fertilization, thereby shortening the gestation time [1].

F1 males showed a distinct mixture of RB and EN color patterns [**Fig 5**]. They had good size and had lots of orange on their bodies, but had no solid black bar on their bodies. {The black topping on Santa Maria males is due to genes on the male's Y chromosome [2].}

As to females, it was easy to recognize hybrids (F1s). Their caudal fins were pigmented [**Fig 5**], reflecting their inheritance of the *Cp* gene associated with the RB delta tail. {*Pigmentierte Caudalis* (*Cp*) is a dominant gene carried on both X and Y sex chromosomes that contributes to the delta tail in ornamental guppies [2].} Only the reverse cross (EN X RB) produced females with clear tails.

Since my goal was to use Endlers to increase the fitness of my guppies but keep Rainbow characteristics, I bred F1 females to pure Rainbow males. The resulting male F2s are very beautiful with full delta tails [**Fig 6**]. They show amazing color variation, thanks to all the color genes collected from previous outcrosses. I was surprised by how prepotent my Rainbow guppies were and how rapidly the Endler phenotype was lost.

I kept the original purchased EN females to determine their longevity under my tank conditions. Possibly, the inbreeding required to fix the Santa Maria phenotype may have compromised their fitness. Time will tell. Thus, I will monitor their fitness. Assuming that they were about ~3 mos. old when I purchased them in early Nov 2025, they are now about 11 mos. old. So far, they are doing very well.

**Fig 5 F1s (RB X EN) at 3 mos age**

**RB X EN females** have pigmented fins.

**RB X EN males** have good size and lots of color. Copious red body spots are probably from Endler genes. Some males do not have full delta tails.

## 2. Endlers

The Santa Maria strain is a K-Class of Endlers, meaning that they are hybrids between Endlers (*Poecilia wingei*) and guppies (*P. reticulata*). [N-Class Endlers are pure Endlers.]

Previous hybridization suited me fine, as the more genetic diversity, the better. I am less interested in strain purity and rubber-stamping color patterns than in having pretty guppies that are also fit. Plus, the emphasis on purity with N-Class Endlers—unless they are recently derived from wild strains and/or maintained to prevent inbreeding—may eventually become inbred themselves. Finally, with K-Class Endlers, the earlier hybridization may have cleared out much of the genetic disruption caused by crossing different species (i.e., *outbreeding depression*). That said, most fixed strains of ornamental guppies are so severely inbred, that an outcross to any Endler would probably improve fitness.

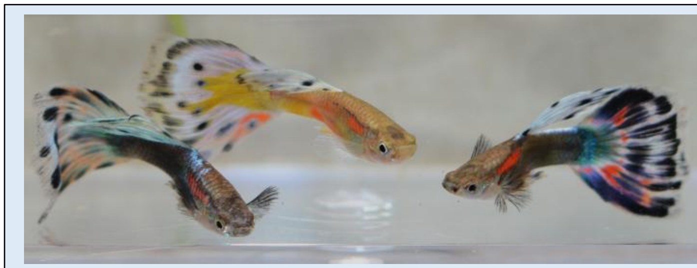

**Fig 6 Select F2 males [RB X (RB x EN)]** at 5 mos

## 3. Discussion

I found that maintaining the fitness of breeding stock is not easy. You first have to establish a base-line for fitness metrics (normal longevity, disease resistance, and fertility). With an established base-line, should things go wrong, you can better decide whether the problem is genetic or environmental. I had a base-line for my Rainbow guppies and when they started going downhill last year, I suspected—because their environment had not changed—that the loss of fitness was probably due to inbreeding.

Ironically, my choosing only a very few of the longest-living—and most beautiful—guppies probably brought on inbreeding problems. I scrupulously avoided mating siblings and doing backcrosses, but I routinely mated cousins and half-siblings. DNA homozygosity had apparently accumulated over multiple generations—enough to start causing problems. Inbreeding's negative effects (i.e., *inbreeding depression*) may have outweighed my selection for fitness.

In my own defense, even scientists and biologists involved in conservation management wrangle over the best way to increase fitness. Kardos (2021) [3] makes a strong case for simply maintaining overall genetic diversity, rather than selecting for specific fitness traits. The investigators argue that basing strategies exclusively on genetic variation at select genetic loci risks the loss of genetic variation elsewhere in the DNA. They also cite problems with using inbreeding as a tool to "genetically cleanse" (i.e., *purge*) a population of bad alleles. Yes, purging will remove bad alleles from a population, but the inbreeding involved can also "fix" bad alleles and permanently compromise fitness in that population.

Fraser (2008) [4] describes methods for increasing genetic diversity in captive-bred salmon. One important one is "Equalizing Family Size" whereby each individual fish contributes progeny to the next generation—as opposed to random mating where often the fittest, most vigorous male dominates the gene pool. Ironically, a population's fitness derived from matings between only superior individuals may be temporary—negated in the long-term by inbreeding to those individuals. Equalizing Family Size widens the gene pool, potentially increasing and/or maintaining population fitness.

There are many other ways to prevent inbreeding or lessen its impact. The first steps, though, are simply acknowledging inbreeding as a potential problem, setting base-line standards for fitness, and then monitoring a fish colony over multiple generations. Not an easy task…

In the future, I plan to relax my standards for attractiveness and longevity in exchange for greater genetic diversity. Also, I will outcross more frequently to guppies that I believe are less inbred—Endlers, swordtail guppies, feral guppies, wild guppies, and ornamental guppies from breeders that have not neglected fitness in their breeding program.

Because inbreeding specifically targets DNA, it affects all sexually reproducing organisms—fish, shrimp, plants, fruitflies and humans alike. Most hobbyists associate inbreeding depression with morphological deformities (e.g., bent spines), but fitness traits (disease resistance, reproduction, survival, and longevity) are even more vulnerable. Inbreeding's negative effects are random and unpredictable. Importantly, they dramatically increase with stress. Thus, aquarium fish may show no symptoms of inbreeding depression until they are stressed.

(*In the future, I will provide more in-depth articles on inbreeding. I believe the loss of fish fitness due to inbreeding depression is an important—but sorely neglected aspect—of the aquarium hobby.*)

## References


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Diana Walstad is the author of *Ecology of the Planted Aquarium*. For more information and other articles, check out: **http://dianawalstad.com/aquariums**