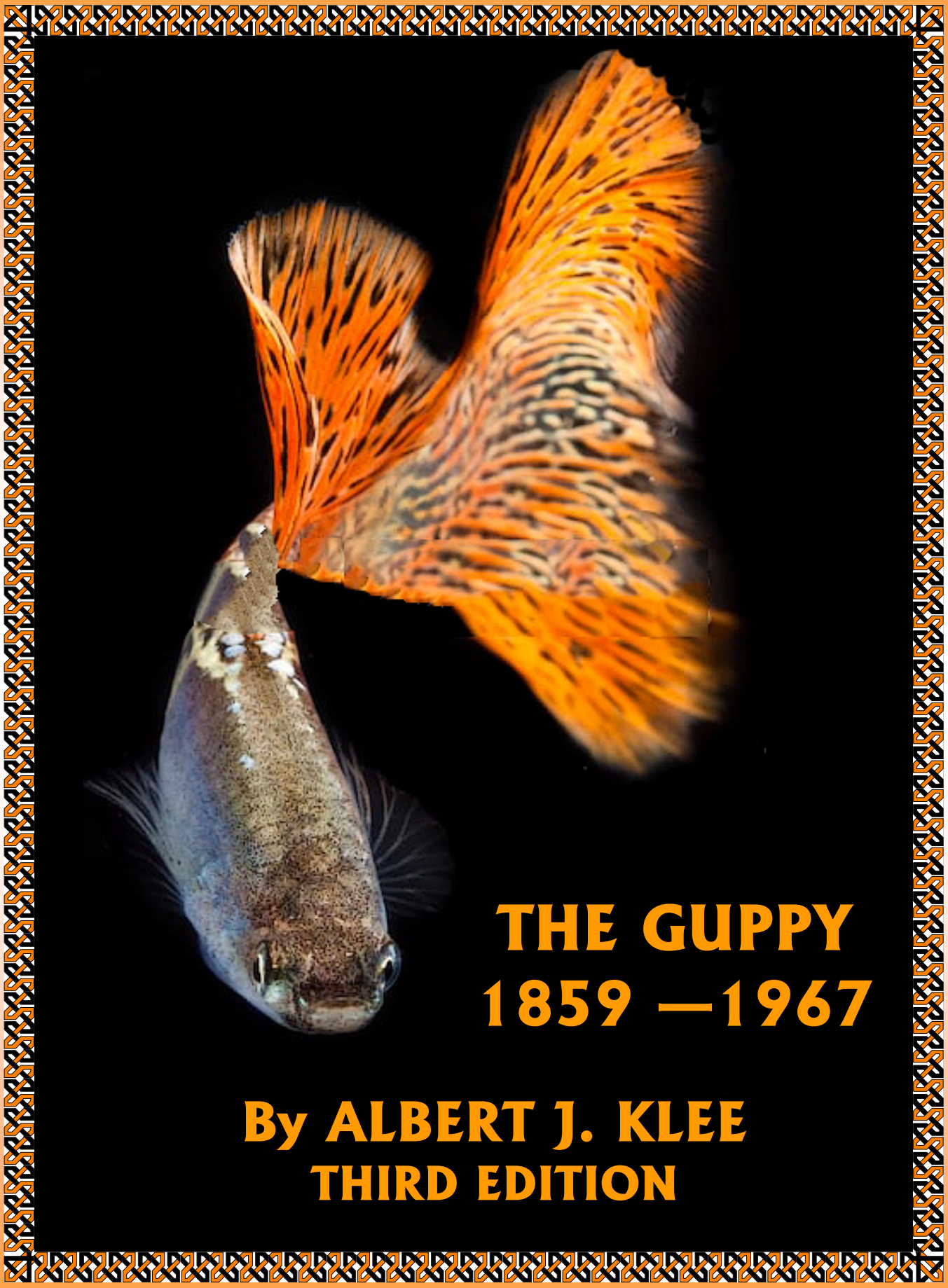

THE GUPPY
1859 —1967

By ALBERT J. KLEE
THIRD EDITION

Dedicated to
Henry Kissel Jr., Charles E. Visel, and William A. Sternke,
pioneers in the development of the fancy guppy
in the United States, and to
Dr. Stanley H. Weitzman, who never
hesitated to share his professional knowledge.

THIRD EDITION

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The Birth of a Species

In the monthly reports of the Royal Prussian Academy of Science for 1859 there appeared a paper entitled, "Concerning a new genus of *Leptocephalus* and several other new fishes of the Zoological Museum." At first glance this event would not seem to hold much significance for today's aquarium hobby, but we are examining the days far past. Indeed, to understand just how long ago it was, not just in the years but in the development of ichthyology itself, the original *Leptocephalus* was nothing more than a larval form of the eel. This was a fact not recognized by Science until two years later for at that time it was thought that leptocephalids were a species in their own right. In 1859 the author of the account, the German vertebrate zoologist, Wilhelm K. H. Peters, would doubtlessly have been greatly surprised had he known their real identity. I fancy that he would have been even more surprised to learn that one of the then-obscure fishes he relegated to a subordinate position in his paper would ultimately prove to be one of the most popular and best-known in the world. I speak, of course, of the guppy.

The original description of the guppy was short and to the point: "Greenish-yellow with a blackish network, the tiny meshes lying parallel on the edges of the scales; silvery on the belly. The scales lie in 7 longitudinal rows and 28 transverse ones; although a few of these are bored through, there is no significant lateral line. Total length 39, height 9, head length 7 millimeters. Dorsal 8, anal 10. Caracas; collected by Gollmer in the Guayre River." Peters named the fish *Poecilia reticulata* (*reticulata* = "net-like" or "reticulated") after the markings on its scales and because it was closely related to another fish, *Poecilia vivipara* (*Poecilia* was a word coined in 1838 by M. Bonaparte, the grandnephew of Napoleon; it means "little, variegated fish"). These black markings, a product of many tiny melanophores or black pigment cells, are typical of female wild type guppies even to this day. To aquarists, the description is disappointing as there is no mention of the beauty of the living fish. Herr Peters, you see, had only female specimens before him!

Wilhelm Karl Hartwig Peters (1815-1881)

Peters was a widely traveled scientist and his name is familiar to killifish fanciers, having described two *Nothobranchius* species. A dozen or more African fish species have been named after him, including an *Aphyosemion* and an Elephant Fish. Peters was about 100 years ahead of his time in terms of systematics. His descriptions easily could have been written in the 20th century.

The first three scientific descriptions of the guppy were based on specimens collected in three widely different areas.

1 - Caracas (collected by Julius Gollmer, 1857-58), 2 – Barbados (collected by Father Ermenegildo Arnaboldi di Tremezzo, 1861), and 3 - Trinidad (collected by Robert John Lechmere Guppy, 1859).

The Gollmer mentioned in Peters' paper, by the way, was Julius Gollmer, a German pharmacist living in Caracas, Venezuela. His passion was biology and today he is recognized as an important contributor to Latin American science and is cited in Hebe Vessuri's, "Science in Latin America, 1820-1870," and Texera's, "La exploración botánica en Venezuela, 1754-1950." He is, for example, the discoverer of a number of plants, including two species of *Anthurium* (*ellipticum* and *rugosum*) and a lichen (*Strigata nylanderiana*). Gollmer caught the first of these colorful little fishes in the Rio Guaire (spelled "Guayre" in those days), near Caracas, in 1856, and during 1857-58 he sent living animals and plants of all kinds to the Berlin Zoological Museum, the Berlin Zoo, and the Botanic Garden of Berlin. Unfortunately,

On a quest for guppies in Northern Venezuela
Guppies in this area prefer clear, cool (77° F) waters and shaded streams, rather than ponds.

The fish in this jar were the ones Gollmer sent to the Berlin Zoological Museum in 1857-58.

his shipment that included 61 of these little fishes was overlooked and sent off to the archives, not to be examined until Peters came upon them three years later.

It is a real puzzle why Peters described only female specimens since Gollmer had sent both sexes to Germany. In the Berlin Zoological Museum's collection, only Gollmer's females were listed as *Poecilia reticulata.* Two of Gollmer's jars that contained males in addition to females were recorded as *Girardinus guppyi*, something that could have happened only after 1906 when C. Tate Regan introduced this name. Although Gollmer was no ichthyologist, when catching the fish he certainly would have noticed the colorful males trying to mate with the females, a characteristic of guppies even in the worst of conditions. By placing both sexes in the same jar, it is not unreasonable to conclude that he considered both the males and the females as a single species.

Peters should have known in 1859 about the sexual dimorphism of poeciliids, as Heckel had described the two sexes of the green swordtail (*Xiphophorus helleri)* as early as 1848, although Heckel had not known that these fish were livebearers. The most likely explanation for the incorrect sorting of the two jars containing both sexes in the collection was simply a lack of communication between the Museum and Gollmer. When Gollmer sent the specimens to the Museum, the Director, Hinrich Liechtenstein, had just died and the institution was in a state of some disarray until a replacement, who turned out to be Peters, was named. Gollmer, who had been honored and praised for his shipments to the Berlin institutions and had even received a monetary reward, was not at all happy about this development and one result was that all communications between the Museum and himself ceased. In any event, the scientific name of the guppy is a consequence of the female, not the male. If there is such a thing as a piscine Women's Lib, how they must be laughing over this curious fact!

The Facts of Life: The First Record

It is a coincidence that in 1861, the very year that Science finally recognized that leptocephalids were nothing more than larval eels,

"They're called 'guppies.' Wait 'til you see what they're up to!"

Filippo de Filippi (1814-1867)

De Filippi (who was born in Milan) was Professor of Zoology and founder of the Royal Museum of Comparative Anatomy at the University of Turin, and was the champion of Darwinism in Italy. In 1862 he traveled as a naturalist on a diplomatic and scientific mission to Persia (he was first to compile a list of all the vertebrates known from that country), and between 1865 and 1867 took part in a scientific voyage of global circumnavigation. In 1861 he introduced the generic name "*Lebistes*" into the guppy literature.

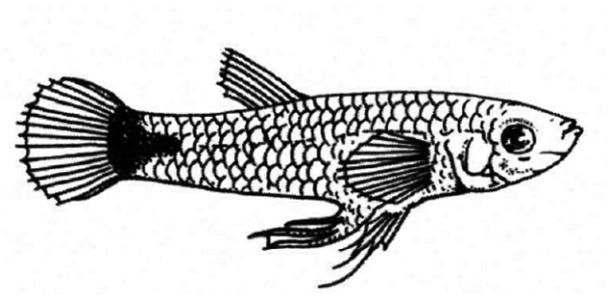
the second event in guppy history occurred. This time it was a paper written by an Italian zoologist (not, as stated by other aquarists, a Spaniard), Filippo de Filippi, entitled, "*Lebistes*, a new genus of fishes of the family of Cyprinodonts." One paragraph is of particular interest and I quote it, translated verbatim: "The Sacred Reverend Father Ermenegildo Arnaboldi di Tremezzo brought with him live from Jaimaca (sic) several smallish fish that were obtained from the islands of Barbados. These little fish are viviparous, and quite prolific even when kept in captivity, provided that the offspring are not born dead or do not succumb to the effects of climate (the latter not even delaying the death of the parents). From my dear and venerated Teacher Cav. Panizza, I received two males and one female conserved in alcohol, and a fourth individual likewise female."

The Second Description

To the student of aquarium history and of guppies in particular, de Filippi's account is significant. Father Arnaboldi collected his fish in Barbados, a member of the Windward Islands group located about 150 miles north and slightly east of the island of Trinidad. Since Barbados is situated roughly 550 miles from Caracas in Venezuela, it is understandable that de Filippi did not connect his fish with Peters' *Poecilia reticulata.* Moreover, we now know that mainland South American guppies are quite different in coloration and pattern from the island forms. Consequently, de Filippi considered his fish new and named it *Lebistes poecilioides* (*Lebistes* = "a small fish," derived from the Greek word for pot or

A Guppy Habitat in Barbados

The guppies are found in the shaded areas to the right. The temperature was 76° F, pH 7.2, and the hardness varied between DH 8-10.



De Filippi's "female" fish.

kettle, i.e., a "pot fish," probably stemming from the pot-bellied appearance of the pregnant female; "*poecilioides*" = "resembling *Poecilia*"). The counts on *Lebistes* were as follow: Dorsal 9, anal 7, ventral 6, longitudinal scales 34 to 38. If these data are compared with those of Peters' the two sets differ considerably. It is no wonder that de Filippi did not think to associate *Poecilia reticulata* with *Lebistes*. We shall return to the discrepancies between these two sets of data later.

De Filippi's description of *Lebistes* was as follows: "The color is grayish green dorsally, more whitish ventrally; faint, narrow blackish markings on the sides of the body, one of the more distinctive of them at the base of the tail. The female has a large blue blotch on her body."

Females With Gonopodia?

Readers should take de Filippi's description with the proverbial grain of salt for, as it turned out, de Filippi pulled a piscatorial boner in his description of *Lebistes*. According to de Filippi, *both* sexes had a gonopodium! The distinguished British ichthyologist, Albert Guenther, said of de Filippi's description: "If the characters assigned to his very doubtful genus are correct, it differs in a very extraordinary manner from the other fish of the family, in which sexual differences are observed. From an inspection of the (de Filippi's) figure, we should have considered the specimen to be a male; but Prof. de Filippi says distinctly that the peculiar anal fin is found in the female as well as the male." In point of fact, although de Filippi thought he had both male and female specimens, the truth of the matter was that all his specimens were males.

Filippi's error in sexing was in part responsible for the fact that *Lebistes* was overlooked for many years by ichthyologists. In short, de Filippi's written account of his fish did not agree with later importations.

A Postscript on de Filippi

Readers by now no doubt suspect that de Fillipi's description of the fish he had in his possession was – to put it bluntly – a mess in more ways than one. In 2002, F.N. Poeser and I. J. H. Isbrücker, tidied up the mess very nicely with their article in the German aquarium, *DATZ*, titled, "Zum wissenschaftlichen Namen des Guppy" ("The scientific name of the Guppy") by declaring that *Legists poecilioides* was not a guppy! They based this conclusion on the following:

Dr. Robert John Lechmere Guppy (1836-1916)

Albert Charles Lewis Guenther (1830-1914)

Born in Germany as Albrecht Carl Ludwig Gotthilf Günther, he began his association with the British Museum in 1857 when he was charged with completing the museum's catalogues of amphibia, reptiles, and fish. He became the leading ichthyologist of his time and is famous for his *Catalogue of the Fishes of the British Museum* published between 1859 and 1870, which described over 6,800 species and mentioned another 1,700.

1. De Filippi's figured male was about three centimeters long, significantly longer than any guppy male ever previously investigated;
2. De Filippi did not record any of the bright colors that characterize male guppies;

3. Guppies have nine anal fin rays and about seven dorsal fin rays. De Filippi recorded exactly the opposite numbers, viz., nine dorsal fin rays and seven anal fin rays. This, and the fact that De Filippi refers to *Poecilia* [*vivipara*] in his species name, *poecilioides* (= looking like *Poecilia),* suggests that indeed he was looking at a molly rather than at a guppy;

4. No species of fish (in this case, no species of the subfamily Poeciliidae) is known to possess a gonopodium in both sexes, as maintained by De Filippi.

Poeser and Isbrücker suggest that de Filippi's fish either is a population of *Poecilia vivipara* or a population of *Poecilia vandepolli*, both of which are known to aquarists as species of mollies (*Molliensia* no longer being a valid genus for them). Unfortunately, the type material of *Lebistes poecilioides* got lost, and thus cannot be re-examined. In any case, *Lebistes poecilioides* cannot be a junior synonym of *Poecilia*

A guppy habitat in Trinidad

In the lowlands, many types of predators coexist with the guppies. Higher upstream, however, there are far fewer predators since waterfalls prevent their upstream migration. The natural guppy habitat shown here is in a pond below the falls. The pH was just a bit higher than neutral and the water temperature, at 74° F, was somewhat cooler than Venezuelan guppy waters.

reticulata based on merely this description. Rather it is a junior synonym of either *Poecilia vivipara* or *P. vandepolli.* The genus group name *Lebistes* consequently is a junior synonym *of Poecilia* Bloch & Schneider, 1801.

Poecilia reticulata is frequently ranked as belonging to a subgenus different from *Poecilia* sensu stricto. For a long time it was the only recognized species in *Lebistes,* which Poeser and Isbrücker demonstrated to be a mistake. Fortunately, Eigenmann (1907) established the genus *Acanthophacelus* with *Poecilia reticulata* Peters, 1859 as the type species. This taxon of the genus group is still available and perfectly valid as well. For those who rank *Poecilia reticulata* as subgenerically different from *Poecilia* sensu stricto, the full valid scientific name of the guppy is *Poecilia (Acanthophacelus) reticulata.* If this taxon is considered in the future as generically different from *Poecilia,* the valid name of the guppy then will again become *Acanthophacelus reticulatus*.

Finally, from the aquarist's viewpoint, in a sense a molly was our first recorded aquarium livebearer, for Father Arnaboldi certainly was an aquarist, especially in the context of the 1860's, and he bred his fish!

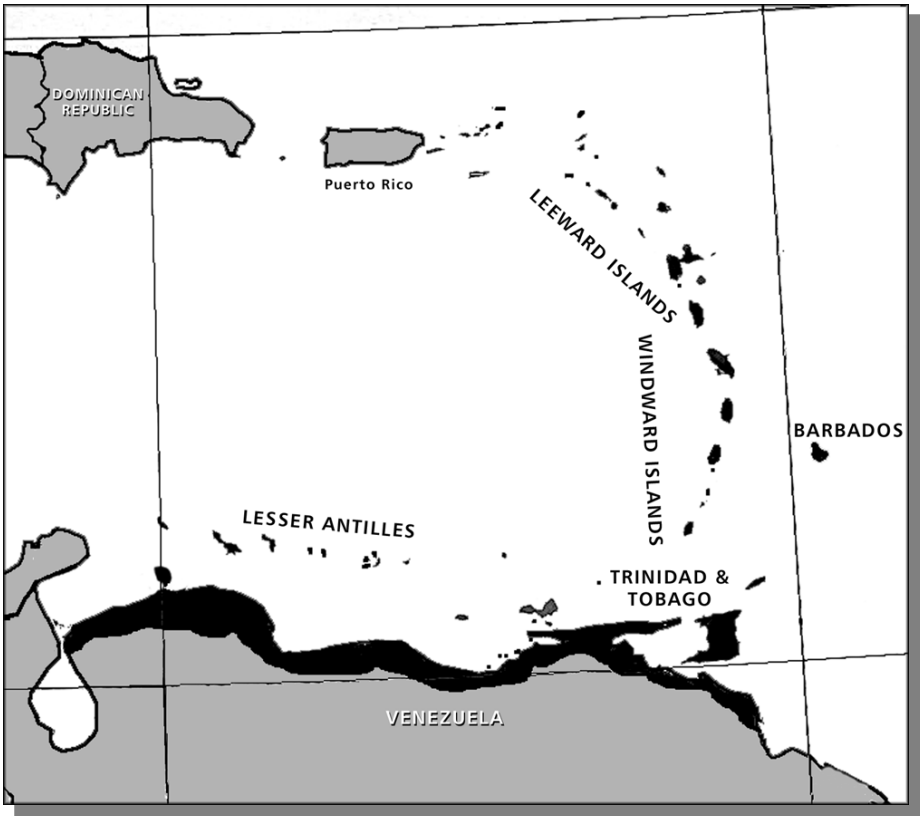
Doctor Guppy Makes His Appearance

The Guppy family arose in the counties of Dorset and Somerset in England, where the name, spelled variously, has been known since the 13th century. For example, in Bleak House, Dickens ninth novel (1852/1853) in which he satirizes the entire British legal system, one of the characters is Mr. Guppy, a legal clerk.

Originally farmers and yeomen (landowners), the Guppys began to spread throughout the world in the eighteenth and nineteenth centuries. The branch of the Guppys we are now interested in rose to prominence through the activities of Samuel Guppy of Bristol, who became a wealthy merchant and propelled his children into English society. His son, Robert, became a lawyer and moved to Trinidad to be the legal representative of a wealthy plantation owner. His son, Robert John Lechmere Guppy,

"The Father of American Ichthyology," David Starr Jordan (1851-1931)

Jordan is generally considered to be the greatest ichthyologist around the beginning of the 20th century. He wrote 650 articles and books on the subject, in addition to serving as president of Indiana University and Stanford University. He was also known for his work in education and philosophy, publishing many works on those subjects. He served as president of the World Peace Foundation from 1910 to 1914 and as president of the World Peace Conference in 1915. Although he campaigned vigorously against United States involvement in World War I, once war was declared he advocated aggressive measures to end the conflict quickly. Little known to aquarists is the fact that he served as an expert witness on the validity of the theory of evolution at the famous Scopes trial in Tennessee.



The original range of the guppy is shown on this map in black. It included the Netherlands Antilles and Venezuelan Islands, Trinidad, the Windward (Barbados) and Leeward (St. Thomas and Antigua) Islands, and on the South American continent from Yaracry Province in western Venezuela, in coastal rivers and streams, eastward to Guyana (formerly British Guiana).

was sent back to England to be raised by his grandfather and educated there.

At the age of 18, Lechmere Guppy, as Robert John Lechmere Guppy was known, ran away from his grandfather's home at Kinnersley Castle, Herefordshire, England because he did not want to own the castle! During his travels he was shipwrecked on the northern coast of New Zealand and spent two years amongst the Maoris. While in New Zealand he studied the local flora and fauna and explored the region, drawing maps of the area. By profession, however, he was a conchologist and geologist. After leaving New Zealand he went to Trinidad where his parents lived, and where he eventually became Superintendent of Schools. Guppy, by the way, pronounced his name to rhyme with "cup."

In 1859, the year of the first scientific description of the guppy, Lechmere Guppy, who was just 23 at the time, sent specimens of some small fishes he had found in the streams of Trinidad to the British Museum in London. In 1861, Guenther examined the guppy specimens available to him. Among them he had a female fish, collected in Brazil by Peter Clausen, a Danish exile who served in the Brazilian Army and sold his extensive natural history collections, which seemed to relate to Peters' *Poecilia reticulata.* Further, the Berlin Museum presented Guenther with several of the original specimens on which Peters based his description. The counts on these specimens

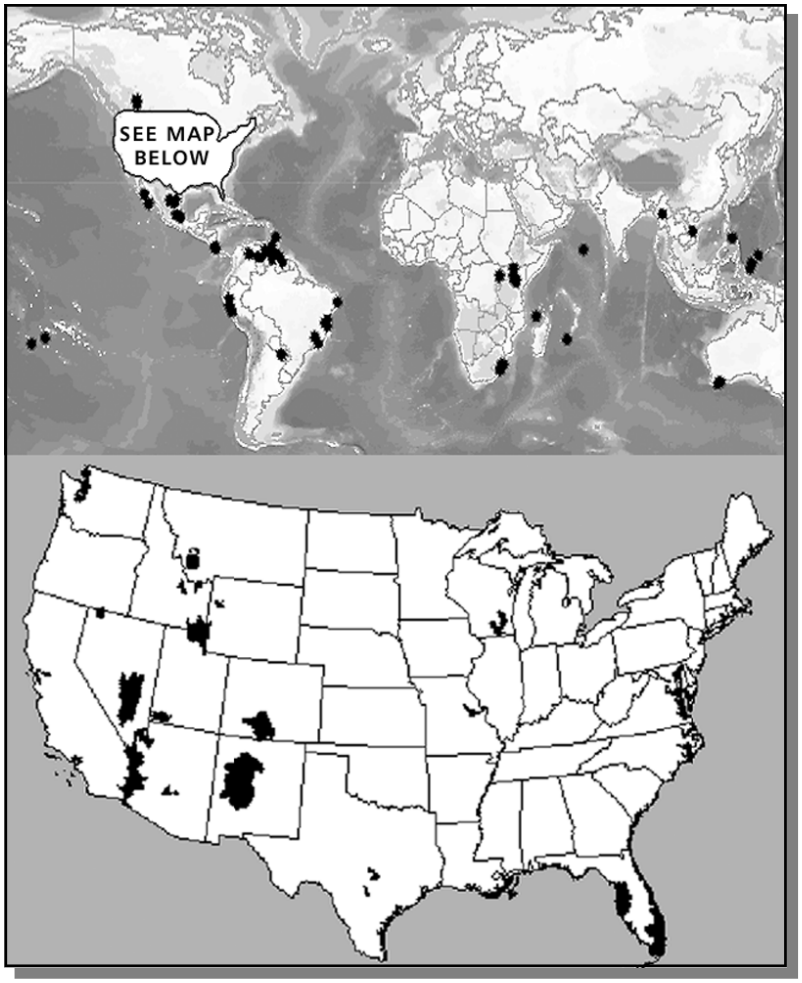
were rechecked and found to differ from those given by Peters, the new data being as follows: Dorsal 7, anal 8, ventral 6, longitudinal scales 27, transverse scales 9. Guenther moved the species to the genus *Girardinus*, renaming it "*Girardinus reticulatus*." *Girardinus*, by the way, was originally a genus of Cuban fish created in honor of Charles Girard, a noted American ichthyologist.

Guenther also had before him several males and females of a small fish collected in Venezuela by David Dyson, a British coleopterist described by Philip Henry Gosse in the 1861 edition of his *The Romance of Natural History* as "an experienced lepidopterist." Between 1844 and 1848, Dyson sold several hundred beetle specimens from Venezuela and other places to the Museum but he collected and sold other natural history specimens as well. Dyson's other claim to aquarium fame is that in 1854 an Apple snail (*Ampullaria dysoni* – now *Pomacea flagellata dysoni*) was named after him.

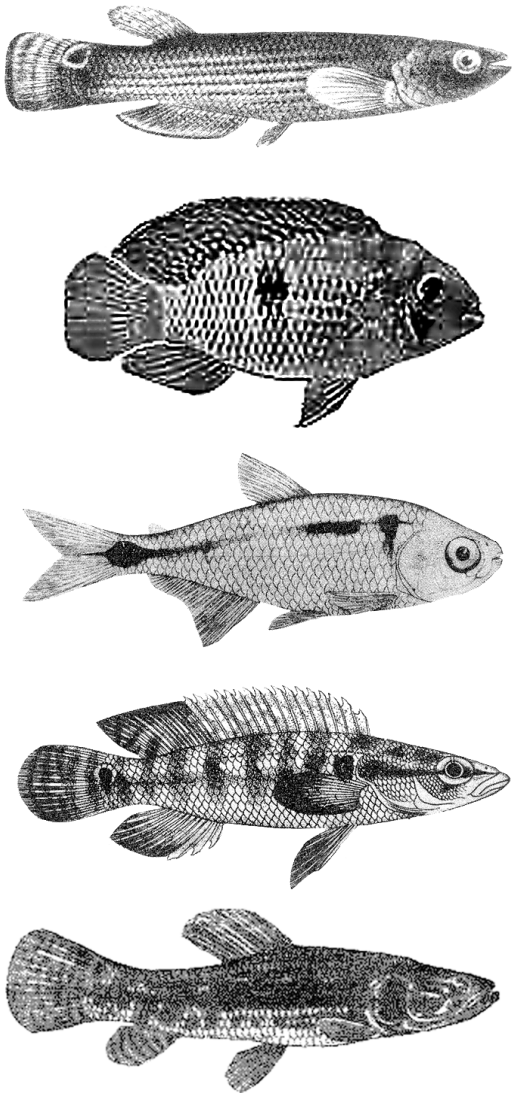
Guenther considered Lechmere Guppy's specimens to be a new species and, basing his description on these fish plus those collected by Dyson in Venezuela, described it as "*Girardinus guppii*." The counts for *guppii* were: Dorsal 7- 8, anal 8-9, ventral 5, longitudinal scales 26-28, transverse scales 8. Guenther's description of the male was as follows:

"The male is conspicuously marked; two brown streaks run along the trunk, and are sometimes confluent into a band; one brown streak runs along the middle of the side of the tail, a round black spot behind the shoulder, another at the commencement of the caudal streak, a third at the root of the caudal. One or two of these spots may be absent. The male from Venezuela differs somewhat in coloration from those from Trinidad. The spaces between the brown streaks are occupied by very large silvery patches, and there is a large ovate spot in the middle of the side of the tail."

Guenther's contributions may be summarized as follows: He described the Trinidad form of the guppy; he recognized differences in coloration between the Venezuelan and Trinidad guppies; and he corrected Peters' counts for



Man-made Introductions of the Guppy (shown in black). Top Right: Worldwide. Bottom Right: United States.



Predators of the Guppy
From top to bottom:
***Rivulus hartii*, *Aequidens latifrons*, *Astyanax bimaculatus*, *Crenicichla saxatilis*, and *Hoplias malabaricus*. The first four are the main predators, *Crenicichla saxatilis* specializing in eating them. *Rivulus hartii, on the other hand,* preys mostly on immature guppies.**

Poecilia reticulata. Regarding his extension of the range of the guppy to Brazil, it appears that Guenther was in error. Most likely the fish collected by Clausen in Brazil was a female *Poecilia branneri* or some other closely related species. (As late as 1954, other fishes have been mistakenly identified by scientists as the guppy; e.g., see Fowler's "Freshwater Fishes of Brazil," 1954.) It was too early for the guppy to have been artificially introduced into Brazil for eradicating malaria. That was to come later.

The Moving Finger Writes and Misidentifies

Things were relatively quiet from 1866 to 1906 regarding the guppy and its scientific name. There were, however, several minor errors introduced in the scientific literature. In 1883, for example, Jordan and Gilbert in their "Synopsis of the Fishes of North America" referenced the guppy as "*Poeciloides reticulata,*" thereby misspelling the generic name. In 1887, in his "A Preliminary List of the Fishes of the West Indies," Jordan placed Guenther's *guppii* in the genus *Heterandria*, falling far off the mark on that one. In his outstanding work, "The Cyprinodonts," published in 1895, Samuel Garman (1846-1927) recognized that Guenther's "*Girardinus guppii*" was a synonym for *Poecilia reticulata.* He failed, however, to recognize that de Filippi's "*Lebistes poecilioides*" was also a synonym. Unfortunately, Garman included two other species in his list of synonyms for *Poecilia reticulata*, viz., *Poecilia branneri,* and "*Poecilia vandepolli*." The former is a perfectly valid species, found near Para, Brazil, and may have been the Brazilian fish that Guenther included in his description of "*Girardinus reticulatus*;" the latter is a synonym for one of the mollies, viz., *Poecilia sphenops*.

In his description of de Filippi's fish under the name "*Poecilia poeciloides*," Garman unfortunately also included a fish named by Girard in 1859 as "*Limia poeciloides*." This, however, is a synonym for still another molly, *Poecilia latipinna*. It is a happy thought that the aquar-

Dr. Plantagenet (Jim) Lechmere Guppy (1871-1934) and wife, Margaret.

ium hobby was not plagued with this confusion, there being no aquarium hobby at that time as we know it today! Despite these errors Garman did simplify the guppy nomenclatural picture greatly. He reduced the list of names to two: *Poecilia reticulata* and "*Poecilia poeciloides*."

Enter The Mosquito

Around the end of the Nineteenth Century the discovery was made that mosquitoes carry malaria. Between 1890 and 1899 the colorful and controversial Englishman, Sir Ronald Ross, investigated the use of fish in combating malaria in India, and after 1900 this effort was intensified. Another Englishman, C. Kendrick Gibbons, had observed that in Barbados the malaria rate was low and that the island teemed with "millions of guppies," hence the origin of one popular name for the guppy, "millions fish." Gibbons suggested that the presence of the guppy might be the cause for this low malaria rate, and others started to use the fish in malaria eradication programs. William Crawford Gorgas, for example, used the guppy in Havana in 1902 to eradicate fever, and when the Panama Canal was being built he set up hatcheries to breed the fish in quantity. Considerable publicity was given to all these efforts and others began to distribute the guppy for the same purpose. Oswaldo Cruz, for example, brought them to Rio de Janeiro about 1905.

Extending The Guppy's Range

Thus, by these man-made introductions the range of the guppy was extended considerably. As far as is known, its original range included the Netherlands Antilles and Venezuelan Islands, Trinidad, the Windward Islands (including Barbados), and the Leeward Islands. On the South American continent they ranged from Yaracry Province in western Venezuela, in coastal rivers and streams, eastward

Charles Tate Regan (1878-1943)

Regan joined the British Museum in 1901 where he became a student of G. A. Boulenger, who had succeeded Albert Guenther. Regan reviewed the Museum's collection of fishes from the standpoint of modern systematics, resulting in the establishment of a comprehensive classification of fishes. In 1912 in his pioneering revision of the livebearer subfamily, Poeciliinae, Regan clarified the status of guppy names.

Carl H. Eigenmann (1863-1927)

Called the "Father of Characid Studies," Eigenmann is famous for his contributions on South American fishes. Jordan had trained Eigenmann and inspired his very active ichthyological career, characterizing him as "one of the most eminent workers in the field of systematic zoology and one of the ablest of natural history teachers, withal the most tireless of explorers." Upon Eigenmann's death his successor praised Eigenmann's researches, placing him "in the first rank of ichthyologists of all time."

to Guyana (formerly British Guiana). It is possible that some or all the island forms were introductions by man, but if they were they certainly were of long-standing and had nothing to do with malaria. Definite later man-made introductions, however, include such diverse places as Brazil, Costa Rica, India, Italy, Madagascar, Marshall Islands, Mexico, and West Africa.

Natural Predators of the Guppy: Lessons for Linebreeders

Along with collections, information was slowly being accumulated regarding the guppy's natural habitats. As with most fish, the guppy is subject to attack by predators in the wild. There are five major predators of interest: a killifish, *Rivulus hartii*, widely and abundantly distributed throughout guppy habitats; the "blue acara" cichlid, *Aequidens latifrons*; the characin, *Astyanax bimaculatus*; the pike cichlid, *Crenicichla saxatilis*; and the large and voracious characin, *Hoplias malabaricus*. The first four are especially serious guppy predators. The relatively small *Rivulus hartii* preys more on immature guppies than adults but, unfortunately for the guppy, the carnivorous *Crenicichla* appears to specialize in eating them.

Knowledge of predation and its effects have some bearing on the selective breeding of guppies in the aquarium. Experiments have been conducted in which equal numbers of male and female guppies were offered to these predators. The experimental evidence showed that the male guppy, being more colorful than the female, suffered more heavily in that a greater percentage of them were eaten. That this was not just a matter of size, since the females admittedly are larger, was demonstrated when different strains of males were employed. The more colorful males suffered the greater losses.

This has led to the following theory of guppy populations in the wild. In the center of a pool containing predatory fishes, we find mainly mature females along with a very few large males. On the edges of such a pool, however, there is a mixture of immature males and females, just reaching sexual maturity. Since these young males are not fully colored, the competition is not simply a matter of brightly colored versus dull-colored individuals, but rather whether there is any color at all. In such a set of circumstances, the pressure is for development of patterns that show themselves early in life. Such patterns are likely to be those that attain a high level of pigmentation in the adult male, however. Further, since these

patterns are essential to the males for reproduction, they will tend to be of the "father-to-son" type of inheritance, rather than "father-to-daughter" type. The males simply cannot afford to "miss" a generation if they are to continue the strain. Of course, as the young males mature, they color up and fall victim to the predators. This then, is a population serviced by young males.

In a pool free of predators, however, the picture is quite different, for young and old individuals of both sexes are found in all parts of the pool. Here, old, highly colored males hold the advantage and the population is serviced by older males. Since the males survive for a longer time, there is less harm in "missing a generation" and consequently, father-to-daughter inheritance is more prevalent. This, therefore, is an example of how the genetic characteristics of a population of fishes can be controlled by its environment. The aquarist, of course, can control the environment, hence the highly developed guppies of today.

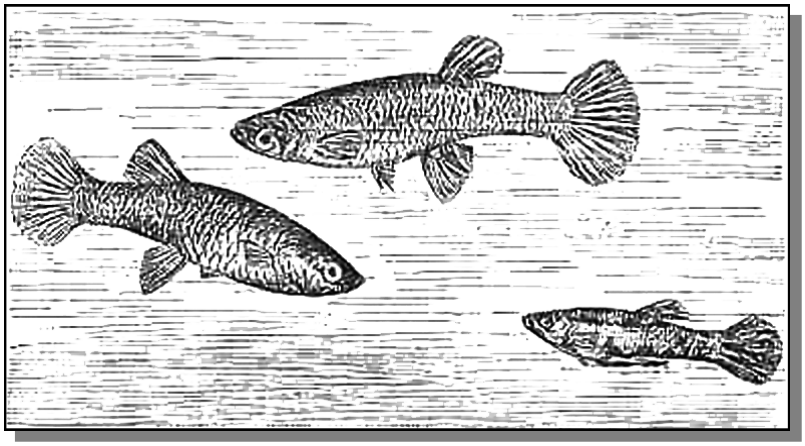
Another Year and Another Guppy

The year 1906 was a significant one for the guppy. Early that year C. Tate Regan published a paper entitled, "On the Freshwater fishes of the Island of Trinidad based on the collection, notes, and sketches made by Mr. Lechmere Guppy, Jr." The Guppy referred to here, however, was Dr. Plantagenet Lechmere Guppy (known to his friends simply as "Jim"), one of the nine children of Dr. Robert John Lechmere Guppy and his wife, Alice. He was in the service at the time to the government of Great Britain, and the idea of collecting specimens of Trinidad fishes and of making extensive field notes and sketches was that of Edward G. Boulenger, the curator of reptiles and the aquaria at the London Zoo.

Under the heading of "*Girardinus guppyi*" (note the revision in the spelling of the trivial name), Regan quoted the following from Lechmere Guppy, Jr.'s interesting account: "This fish receives its name ("Bellyfish") from the fact that the females usually have the abdomen distended with young. It is very plentiful, especially in such places as the 'Dry River' at Belmont, a suburb of Port-of-Spain, where they swarm in the filthy, soapy water that drains from the yards of the dwellings along the river. They save a great deal of trouble by consuming the mosquito worms."

Lechmere Guppy, Jr. was a founding member of the Trinidad and Tobago Field Naturalist Club and in his paper Regan named two fishes after him: *Pseudauchenipterus guppyi*, and *Tetragonopterus guppyi*. The former, however, was a synonym for the catfish, *Pseudauchenipterus nodosus* (named by Bloch in 1794 - ichthyology, even on Trinidad, had been around for a long, long time!) and the second, a chara-

The seaman bringing the first guppies to Germany had a tough time. He had to fill jars with hot water and float them in the guppy containers to maintain the temperature. This had to be done both during the day and the night, often in very rough weather.



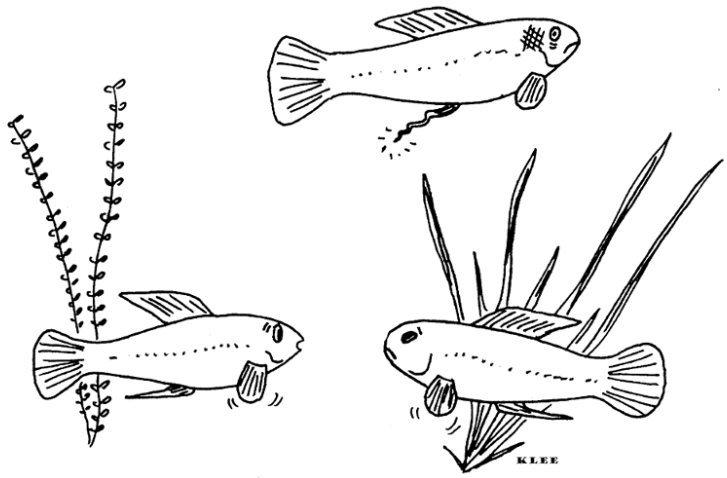
Ernst Bade's sketch of "*Girardinus januarius* var. *reticulatus*" (from his "Süsswasser Aquarium," 1909).

cin, was later transferred to a different genus, viz., *Hemibrycon guppyi*.

The First Aquarium Importation: To Great Britain?

Years later, Lechmere Guppy, Jr. found himself in the animal exporting business with one of his offices in Guyana. In August 30, 1934, he was interviewed for the *New York Sun*, and during the interview made the following statement: "As a matter of fact, I took a can of live guppies to a friend of mine in England in 1906 and I think I was the first to introduce live specimens over there." The ultimate disposition of these live specimens is not known. Perhaps they were given to Guppy's friend, Edward G. Boulenger. Whether they survived to form part of the future breeding stock of English guppies or merely died off within a short time is also not known. In any event, this importation predates by two years what has formerly been regarded as the first date of an aquarium importation, i.e., an importation into Germany to be discussed shortly. However, this was still quite a few years after Father Arnaboldi brought live guppies to Italy.

In 1907 another scientific name became associated with the guppy when the distinguished American ichthyologist, Carl H. Eigenmann, referred several older guppy names to a new genus, "*Acanthophacelus*." Eigenmann called Peters' fish, "*Acanthophacelus reticulatus*," de Filippi's fish, "*Acanthophacelus reticulatus* var. *poeciloides*," and Guenther's fish, "*Acanthophacelus reticulatus* var. *guppii*." Except for the new generic name this was an improvement, since Eigenmann considered all three fish to belong to the same species, relegating the last two to the status of subspecies or varieties.



"Charlie was chasing his girlfriend and didn't see the side of the tank coming!"

The Guppy Finally Definitely Enters The Hobby

The following year, 1908, definitely brought the guppy into recorded hobby history. The first living guppies to arrive in Germany were imported by the firm of Carl Siggelkow in Hamburg. The shipment consisted of 25 fish from La Guayre, a port-town

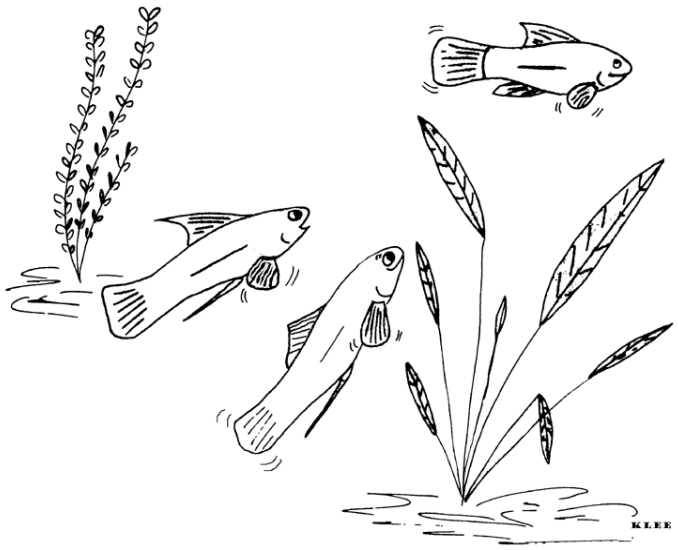
near Caracas, Venezuela (the collector was not Gollmer as he had died in 1861), but only three of the fish were males. The latter were a little less than one inch, and their main color was greenish-yellow. There were some black spots and stripes on the body, and some red and blue in the rear of the body near the tail fin. A few days before Christmas the first guppies were born in Germany, all twelve of them!

In 1909, the celebrated German aquarist, Johann Paul Arnold (also of Hamburg), wrote the first article on the introduction. The fish was also mentioned in the third edition of Ernst Bade's "Süsswasser Aquarium," published in the same year, but in it he confused *Poecilia reticulata* with a fish he described as "*Girardinus januarius* var. *reticulatus*."

Some of the difficulties encountered in tropical fish transportation at the turn of the Century were described in an account of this very first shipment to Germany. Starting in Caracas, the water temperature in the 4-gallon cans the guppies were kept in was in the seventies, but as the ship neared Europe it threatened to drop below 60 degrees Fahrenheit. To save the guppies from succumbing to the low temperature, the seaman bringing the fish to Germany emptied the jars of very expensive Venezuelan honey he was also bringing back, filled them with hot water, and immersed them in the guppy containers to maintain the temperature. This had to be done both during the day and the night, often in very rough weather when the boat was pitching and yawing in the high seas. On top of this, some of the guppies were killed after the ship docked when it was fumigated with the cyanide gas, the standard procedure at the time designed to kill the rats that brought in various diseases.

The following year Arnold received live specimens from the Englishman, Captain J.A.M. Vipan, an avid aquarist who ultimately introduced guppy populations from Barbados, Venezuela, and Trinidad to German aquarists. The widely traveled Vipan also shed some light on the nomenclatural problem. After finding *Poecilia poeciloides* on Barbados (in enormous quantities), *Girardinus guppyi* on Trinidad, and *Poecilia reticulata* on the Venezuelan mainland, he wrote: "I held these three types some years in the aquarium and found that they cross easily among one another. I am certain that all are the same fishes under different names." After retirement Vipan maintained an extensive private aquarium at his estate at Stibbington Hall, the collection including in 1925 several sturgeons over forty years old!

For a variety of reasons the name in Germany that predominated was "*Girardinus guppyi*." Although Siggelkow was an influential importer, his Venezuelan specimens were drab in comparison with those from Trinidad. Arnold himself wrote: " . . .while the various colors of the spectrum are only faintly apparent in southerly specimens, they appear gaily and without duplications in the island dwellers." Although the Barbados form was as colorful as that from Trinidad, the latter were imported by Arnold, an aquarist of considerable stature in



"All systems are go!"

Donn E. Rosen (1929-1986)

Rosen was Curator of Ichthyology at the American Museum of Natural History from 1961 to 1986. Along with his colleague, R. M. Bailey, Rosen published the revision of the Poeciliidae where the scientific name of the guppy was readopted as *Poecilia reticulata*, in which form it remains today. Rosen's 1978 and 1979 data on *Xiphophorus* and *Heterandria* have often been used to illustrate cladistic biogeographic methods.

Germany, the counterpart of William T. Innes in the United States. It was, therefore, the Trinidad importation that caught the fancy of the hobby in that country. Consequently the "*guppyi*" name held sway and, through the influence of German exporters and hobbyists, this term spread to the United States as well. Although the name "*guppyi*" was the most popular among aquarists (it was later shortened to "guppy" for day-to-day use), confusion reigned for three additional years over its scientific name. In 1910, for example, Eigenmann had second thoughts and decided that Guenther's "*Girardinus guppii*" was a distinct species and upgraded it to full species within his new genus, i.e., "*Acanthophacelus guppii*."

In the spring of 1911, Ernst Bade, a renowned German aquarist who had immigrated to the U.S. some years previously, imported the guppy into the United States. These specimens presumably were part of the shipment of Jamaican guppies that reached Germany in 1910, although it is not known if Bade imported these fishes directly, subsequently sending some to Germany and distributing the remainder on a very limited basis in the United States. In any event, several them fell into the hands of Richard Dorn, one of the pioneer aquarists in America, and the species slowly became distributed in the United States.

Visitors from Curaçao and Jamaica

In 1909, another misidentification occurred when Meek identified specimens of the guppy taken from the island of Curaçao as "*Girardinus vandepolli*." In 1910, another shipment reached Germany, this time under the name, "*Poecilia poeciloides*." Although it is not known who made this importation, we do know that the fish turned up in the hands of the well-known fish breeder, Paul Matte of Lankwitz (near Berlin), and that they came from Jamaica. These guppies were, of course, introductions to that island, perhaps made in the interests of mosquito eradication. As we shall mention later, it was from this 1910 Jamaican importation that the United States received its first guppies the following year. In summary, these different importations, from different lands and under different names, understandably caused considerable confusion.

The Guppy and the Mosquito Revisited

At the February 1, 1910 meeting of the Zoological Society of London, the Secretary read the following letter from Vipan who was then a Fellow of the Society:

"During the last eighteen months a great deal has been said regarding the absence of fever in

Barbados and the cause of this immunity, which has rightly been put down to the presence in great numbers of a little fish, *Girardinus poeciloides*, locally known by the name of Millions, which feeds on water crustaceans and insects including the larvae of the mosquito, and from being in such vast numbers, very effectively keeps down this insect and consequently malaria. Now the reason of this little fish being found in such vast quantities all over the island of Barbados is not difficult to state, for it happens to be the only freshwater fish on the island and consequently has no enemies in the fish line to reduce its numbers.

"In the island of Trinidad, where there is a certain amount of fever, there is another little fish, *Girardinus guppii*, but in restricted numbers as there are plenty of other and larger fishes in the fresh waters that keep it from multiplying to any great extent. On the mainland in Venezuela where fever is rife, there is also a little Cyprinodont, *Poecilia reticulata* Peters, but there are also great quantities of other fishes. The three little Cyprinodonts - *Girardinus poeciloides*, *Girardinus guppii*, and *Poecilia reticulata* - I have kept for some years in an aquarium, and I have found that they all interbreed freely and am quite sure they are all the same species under different names.

"That being so and the fact that in Venezuela and Trinidad, where these fishes are indigenous, there is an abundance of fever, what can be the use of expending large sums of money in importing some of these fishes to other fever- stricken countries such as Nigeria, for even supposing they survive the attacks of other fish, how could an importation of a few hundreds or thousands be of any use in the great watershed of the Niger; whilst, moreover, there are a good many specimens of an allied genus (*Haplocheilus*) distributed all over the West Coast of Africa, and all of which feed freely on the larvae of the mosquito."

The "*Haplocheilus*" referred to were the present-day *Aphyosemion* and *Epiplatys*. Vipan had an excellent point, but after this letter was read the Secretary commented that although he agreed with Capt. Vipan's remarks concerning guppy importations for the purpose of eradicating mosquitoes, he would favor further experimentation along those lines. The Secretary also stated that although many thousands of Barbados guppies were introduced elsewhere, no "practical" results were obtained. It seems, therefore, that the Barbados form was the one distributed all over the world during the period 1905-1910, not the Trinidad or Venezuelan forms.

Rosen and Bailey Wrap It Up

In 1912, Edward G. Boulenger (we have met him before) transferred de Filippi's fish to the genus *Girardinus*, i.e., "*Girardinus poeciloides*." The following year, W. F. Langer, a German ichthyologist, described "*Poecilia poeciloides*," thus legitimizing the trade name used for the Jamaican guppies imported into Germany in 1910. In any event, 1913 was the year that the nomenclatural situation of the guppy was greatly clarified by the distinguished British ichthyologist, C. Tate Regan. In his pioneering revision of the livebearer subfamily, Poeciliinae, Regan lumped *Lebistes poecilioides, Girardinus reticulatus, Girardinus guppyi, Poecilia reticulata, Acanthophace-*

(Continued on page 20)

***Corydoras bondi*, a fish named after Dr. Franklyn F. Bond, Director of Fisheries at Cape Town and who discovered Endler's Livebearer in 1937 in Northern Venezuela.**

Table 1: A Summary of Guppy Names and Changes

1859

Peters describes *Poecilia reticulata* from Venezuela.

Robert John Lechmere Guppy sends specimens of the guppy from Trinidad to Guenther at the British Museum.

1861

de Filippi describes "*Lebistes poecilioides*" from Barbados.

Guenther lists de Filippi's fish but uses a slightly incorrect spelling, i.e., "*Lebistes poeciloides*."

Guenther examines Peters' specimens and corrects the counts. He renames *Poecilia reticulata* as "*Girardinus reticulatus*" and extends its range (mistakenly) by including a fish collected by Clausen in Brazil (probably *Poecilia branneri*).

Guenther describes "*Girardinus guppii*" from specimens collected by Dyson in Venezuela and Guppy in Trinidad.

1883

Jordan and Gilbert rename Peters' fish as "*Poeciloides reticulata*," disagreeing with Guenther's placement of it in the genus *Girardinus*.

1887

Jordan renames Guenther's "*Girardinus guppii*" as "*Heterandria guppii*."

1895

Garman recognizes Guenther's "*Girardinus guppii*" to be a synonym for Peters' *Poecilia reticulata*, but unfortunately includes two other species, *Poecilia branneri* and "*Poecilia vandepolli*" (= *Poecilia sphenops*) as well.

Garman mistakenly includes "*Limia poeciloides*" (= *Poecilia latipinna*), described by Girard in 1859, with de Filippi's fish, calling it "*Poecilia poeciloides*."

1902

Gorgas uses the guppy to eradicate mosquitoes in Cuba.

1906

Regan publishes Plantagenet Lechmere Guppy's Trinidad observations of the guppy, using the name, "*Girardinus guppyi*."

Plantagenet Lechmere Guppy introduces live specimens into Great Britain.

1907

Eigenmann refers Peters', de Filippi's, and Guenther's species to a new genus, *Acanthophacelus*, and considers the last two to be subspecies of varieties of the Peters' fish.

1908

Siggelkow imports guppies from Venezuela into Germany.

1909

Arnold in Germany receives live Trinidad guppies from Capt. Vipan under the name "*Girardinus guppy*."

Bade lists the guppy in the 3rd edition of his "Süsswasser Aquarium" as "*Girardinus januarius* var. *reticulatus*."

Meek misidentifies guppies from Curaçao as "*Girardinus vandepolli*."

1910

Jamaican guppies reach Germany under the name "*Poecilia poeciloides*."

Eigenmann rethinks *guppii* and now considers it a distinct species, i.e., "*Acanthophacelus guppii*."

1911

Jamaican guppies, probably bred from those imported into Germany the previous year, are brought into the U.S. by Ernst Bade.

First U.S. article on the guppy appears under the name "*Poecilia guppyi*."

1912

E. G. Boulenger transfers de Filippi's fish to "*Girardinus poeciloides*."

1913

Langer describes the Jamaican importation of 1910 into Germany as "*Poecilia poeciloides*."

Regan finally clarifies the guppy scientific name mess and lumps *Lebistes poecilioides, Girardinus reticulatus, Girardinus guppyi, Poecilia reticulata, Acanthophacelus reticulatus,* and *Acanthophacelus melanzonus* under the name, "*Lebistes reticulatus*," erring only by including *melanzonus,* which is a mixture of two non-guppy species.

1920

Milewski places the guppy in the genus *Glaridichthys*, considering *Girardinus* to be a subgenus, i.e. "*Glaridichthys (Girardinus) reticulatus*."

1963

Rosen and Bailey consider *Lebistes* to be a subgenus of *Poecilia*; the current full scientific name of the guppy now is *Poecilia (Lebistes) reticulata.*

Table 2: Scientific Names of the Guppy (including misspellings)

Acanrthophacelus guppii
Acanthocephalus guppii
Acanthocephalus reticulatus
Acanthophacelus guppii
Acanthophacelus reticulatus
Acanthophacelus reticulatus guppii
Acanthophacelus reticulatus poeciloides
Girardinus guppii
Girardinus petersi
Girardinus poecilioides
Girardinus poeciloides
Girardinus reticulatus
Glaridichthys reticulatus
Haridichthys reticulatus
Heterandria guppii,
Heterandria guppyi
Lebistes poecilioides
Lebistes reticulatus
Poecilia poeciloides
Poecilia reticulata
Poecilia reticulatus
Poecilioides reticulatus
Poeciloides reticulatus

(Continued from page 17)

lus reticulatus, and *Acanthophacelus melanzonus* under the name, "*Lebistes reticulatus*." Thus, Regan recognized that all these fishes represented the same species. He was mistaken only in including Eigenmann's "*Acanthophacelus melanzonus*" which is, in reality, a mixture of two species: *Poecilia picta* and *Poecilia parae*. Since Regan believed *Lebistes* to be distinct from *Poecilia*, he kept the guppy in the former genus, altering the ending of the specific name to agree in gender.

For many years afterwards the scientific name of the guppy was recognized widely as "*Lebistes reticulatus*," although in 1920 Milewski considered *Girardinus* to be a subgenus of *Glaridichthys* and renamed the guppy "*Glaridichthys (Girardinus) reticulatus*." Also, several invalid trade names such as "*Poecilia Petersi*" or *Poecilia* "Peters" were used at times. It was only in 1963, when the American ichthyologists, Donn E. Rosen and Reeve M. Bailey, published their notable revision of the Poeciliidae that the scientific name of the guppy was readopted as *Poecilia reticulata*, in which form it remains today. Since Rosen and Bailey considered *Lebistes* to be a subgenus of *Poecilia*, the full scientific name is *Poecilia (Lebistes) reticulata*, although it is not necessary to use the subgeneric term in either general scientific or popular writing, or in conversation.

Prof. John A. Endler

Department of Zoology & Tropical Ecology, James Cook University, Queensland, Australia, and Department of Ecology, Evolution & Marine Biology, University of California - Santa Barbara.

My apologies to readers for subjecting them to this nomenclatural razzle-dazzle in the history of the guppy, but we have certainly met a number of interesting people along the way! If readers have taken the opportunity to nap until now (paraphrasing George Bernard Shaw, "a nap, dear friends, is a brief period of sleep which overtakes superannuated persons when they endeavour to listen to scientific lectures"), the picture will be brighter as we explore the role of the guppy in the aquarium hobby worlds of Germany, the United States, and Great Britain. Table 1 should also help in summarizing what we have learned to date in this sequence about the guppy. Finally, over the course of its first 105-year history, the guppy has had 23 different scientific names and these are listed in Table 2, including its various misspellings.

Just how Many Guppy Species Are There?

In 1937, the Director of Fisheries at Cape Town, Dr. Franklyn F. Bond (*Corydoras bondi* is named in his honor), discovered a fish in Northern Venezuela that resembled the guppy. The specimens he collected were archived in the Museum of Zoology of the University of Michigan and nothing more was done with them at the time. In 1937 the fish, of a bright color and pattern never seen before in a guppy (one characteristic is their metallic green spots, variable in size, shape, and position), was rediscovered in the Laguna de Patos, near Cumana, northeastern Venezuela by Dr. John A. Endler, Professor of Biology at the University

Endler's Livebearer

of California at Santa Barbara. The fish has since been known in the hobby as "Endler's Guppy," "Endler's Livebearer," and "Endler's *Poecilia*." Endler gave some specimens to Dr. Donn E. Rosen, Curator of Ichthyology at the American Museum of Natural History from 1961 to 1986, so that it could be named. Unfortunately Rosen died before this could be done.

According to Dr. Stanley H. Weitzman, Curator and Research Scientist, Division of Fishes, Smithsonian Institution, Rosen was convinced that there were many guppy species and that he wanted to do a cladistic revision of them, including their biogeography in the style of the later papers he wrote about platyfishes. Dr. Weitzman sent him the collections that he (Weitzman) had made from northern Venezuela as well as some of the other collections of these fishes in the Smithsonian. Rosen did not live to do the project and, after Rosen died, when Weitzman wrote to recover the specimens he was told they were not to be found.

Endler tried to cross his guppy (i.e., the Endler's) with wild guppies located a few kilometers away in Venezuela where he found the fish, as well as with other wild stocks of guppies. He reported that although occasionally he would get F1 hybrids, it went no further, and he concluded they were clearly a distinct species. However, they can crossbreed and the offspring can also reproduce and crossbreed.

Rosen's proposed guppy project would have shed much light on the guppy speciation question if it had been done before the various guppies were distributed around the world. As was mentioned previously, not only were guppies introduced in tropical or subtropical areas worldwide, mainly to help against malaria by controlling mosquito larvae, but in recent times even fancy guppies were often introduced in natural habitats. These introductions only serve to make the task more difficult and it is not certain that it can ever be done.

Distribution of Endler's Guppy. The white circle is where Endler's guppy was found (Cumana). The black areas (near Caracas and in Trinidad) are original locations of the guppy.

Endler's Guppy is Named

In 2005 "Endler's guppy" was declared by biologists F.N. Poeser, M. Kempkes, and I.J.H. Isbrücker to be a new species, named *Poecilia wingei* (pronounced **VIN**-YEH-EYE) after Dr. Ojvind Winge, and placed in the *Poecilia* subgenus *Acanthophacelus*. Their "new" species only differed from the common guppy in coloration and behavior, since the meristic data of Endler's guppy (i.e., the physical attributes of body parts such as scale counts, number of fin rays, gonopodial structure, etc.) are identical to that of the common guppy. Although Endler had difficulties in inter-breeding his specimens with common guppies, aquarists have had no problem since that time in interbreeding the two.

However, Dr. Felix Breden, who is listed in the bibliography of the Poeser/Kempkes/Isbrücker paper, took issue that Endler's guppy was a distinct species. Color and pattern are not valid criteria for speciation, and behavior is only when comparisons between groups are made over many generations. Also, what DNA analysis there was at the time showed that they were not very different from other guppy populations. There was, therefore, no compelling reason to accept the establishment of a separate species for this guppy.

"Darling, I accidentally mixed the virgin females with the young male guppies today... I hope you're not angry..."

In 2009, however, Schories, Meyer and Schartl (Schories, et. al., 2009) described a new guppy species from western Trinidad and included additional information on *Poecilia wingei*. The authors did a mitochondrial DNA-sequence based molecular phylogenetic analysis and found that the new species, *Poecilia obscura*, is most closely related to the common guppy and to P. wingei. In it the authors state: "Therefore, *P. obscura* forms a cryptic species complex with the two other species. *P. wingei* is now unequivocally defined by the molecular phylogeny as a valid species." Cryptic species, by the way, are animals that appear identical but are genetically quite distinct. The authors also stated that Poeser and his co-authors "…did not validate their taxonomic classification in the light of the 'genetic differentiation without speciation' hypothesis." In other words, coloration and behavior just don't hack it with these fish. In any event, the bottom line is that Poecilia wingei is a valid species.

The Guppy in Germany

Early in 1909, a fish-breeder from Breslau (an old German town that became part of Poland after World War II) reported that he had bred a young guppy male that showed the beginnings of a lower sword. In 1910, a Herr Seidel from Hamburg described the first upper-sword guppies in an article published by his club, "Ludwigia." Later in the year, on November 22, 1910, one of the most important dates in German guppy history occurred. On this day the "Nymphea" aquarium club in Leipzig held the very first guppy show in Germany, its primary aim being to introduce the different guppy importations and their variations to aquarists. Ever since, "Nymphea" has been one of the most important clubs supporting the guppy hobby in Germany. In 1920, for example, members of the

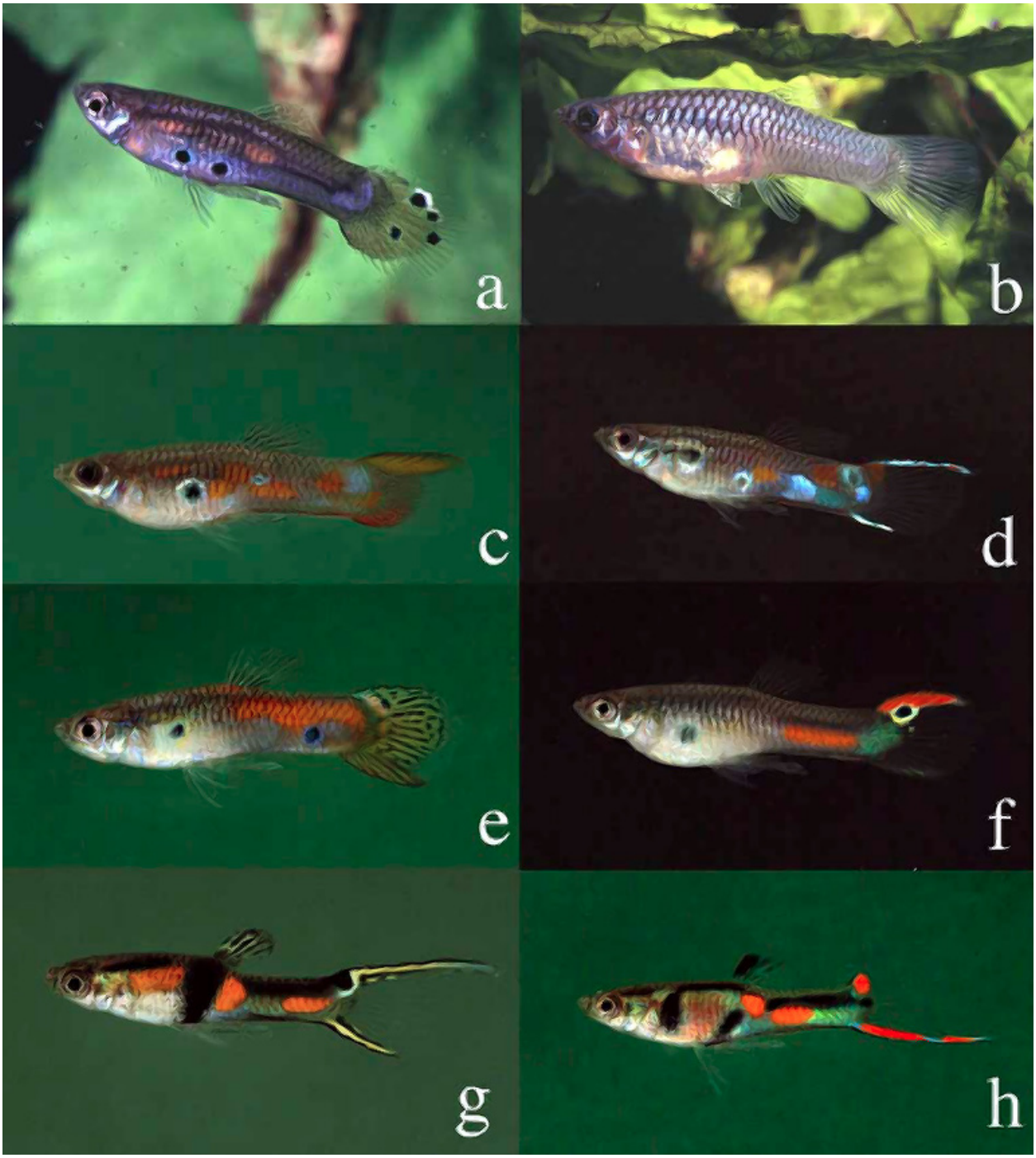


FIGURE 2 from SCHORIES 2009.

P. obscura **male (a) and female (b) from the Oropuche River. (c)** ***P. obscura*****, population from the Rio Seco; (d)** ***P. reticulata*****, population from the Caroni Swamp; (e)** ***P. reticulata*****, population from the Rio Yaguaracual; (f)** ***P. cf "wingei"*** **from the El Cordon waterfall; (g)** ***P. wingei*** **from population Campoma; (h)** ***P. wingei*****, population from the Laguna de los Patos. Note: The fish in (f) labeled** ***P.*** **cf "*wingei*" is suspected by the authors to be a hybrid.**

club developed the first point system in the world for judging guppies, based on a rudimentary system of 50 points, and many local clubs all over Germany used this system until the early thirties.

The first guppy show held after World War I took place in Bytom, Poland (then known as "Beuthen") and was organized by the local club known as "Najas" (European aquarium societies frequently took the names of plants or animals). Other notable events between the two World Wars included the appearance of the first true doublesword guppy in 1928, and the gold guppy in the early thirties. There is some controversy about the identity of the first breeder of the gold guppy; the only thing certain is that it appeared in Germany sometime between 1925 and 1932. In the United States, however, it is generally believed that the gold guppy was introduced in 1933 by a Swedish aquarist named Otto Fredlin who also sent some to Germany.

During World War II, some aquarists tried to keep the hobby alive by organizing an exhibition in Berlin (the "Reichguppyschau") and a new judging system was created, based on a more extensive but still primitive discipline of 100 points. Because of the hostilities, however, it was not held. After the war ended, the first albino guppies arrived in Germany (the date was 1950). J. Rueckert, who received the fish from Dr. Frederick Proewig in New York City, described them as "…like a gold guppy with red eyes, and white dorsal and caudal."

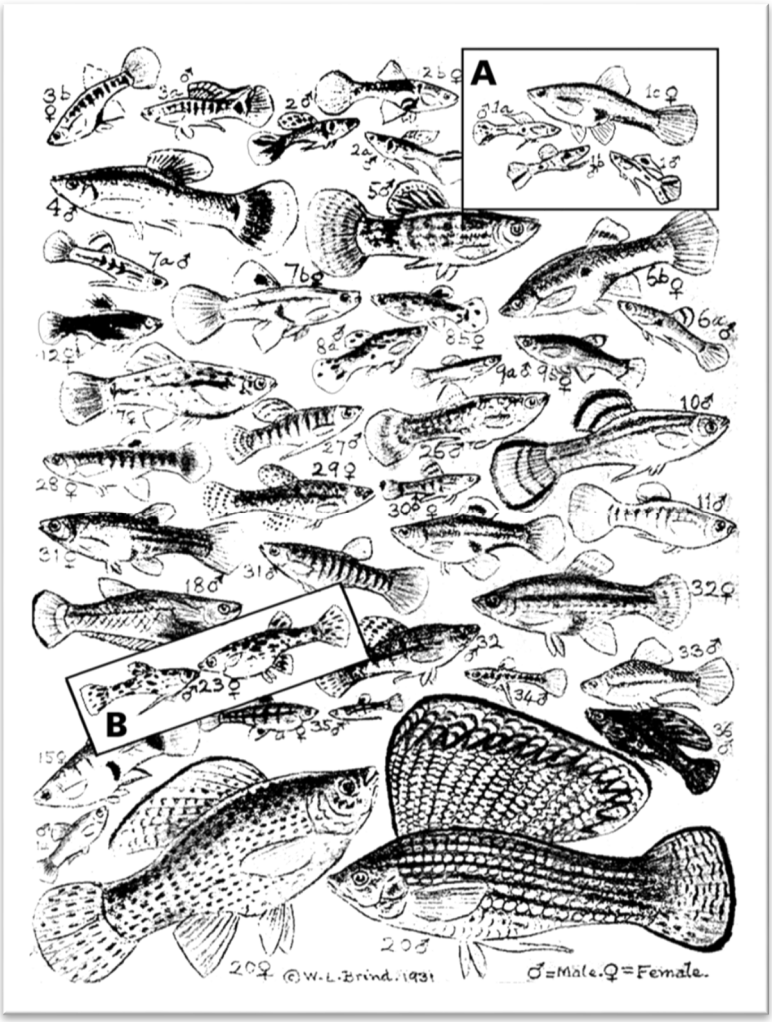
An important event occurred at the first international guppy show held in Germany (Hanover, 1954). This was the year and place where Paul Hähnel, a Bronx cabinet maker (Hähnel was born in Dresden, Germany), redirected German guppy breeding by exhibiting the first true veiltail ("Fächerschwanze" = "Fantail") guppies that anyone there had seen before. For this he received the title, "Guppy King of the Old and New World." The show was a big success for the German aquarium hobby. Breeders from five countries showed their guppies and, over a period of four and a half days, it attracted 3,000 visitors. There were long articles with photos in the local newspapers and there was even a 10-minute special report about the show on TV.

German Guppy Organizations

The organizers had planned to form a guppy study group after the show but it was so successful that they founded an association devoted to guppies. On February 15, 1955, the Deutsche Guppy Gesellschaft (German Guppy Association or DGG) was founded. A year later, on January 2, 1956, a similar study group was founded in the German Democratic Republic (GDR). The DGG prospered and in 1961, at its Eighth International Guppy Show, the first long finned guppies appeared. These were bred in Berlin by Heinz Krueger, and were known as Berlin ("Berliner") guppies.

Paul Hähnel (1902-1969)

At the first international guppy show held in Germany (Hanover, 1954) he received the title, "Guppy King of the Old and New World" (Guppy König der alten und neuen Welt).



Brind's drawings of various livebearers in his 1931 monograph on guppies and platies. The guppies shown (upper right-hand rectangle, A), all had rounded tails. Another drawing in this diagram (lower left-hand rectangle, B) was labeled "*Girardinus reticulatus*," but the fish shown was actually *Phalloceros caudimaculatus*.

Guppy enthusiasts in the German Democratic Republic (GDR) formed a study group in 1963 within the larger Kulturbund ("Culture Association") of the GDR. In 1964 an agreement was reached in Berlin between the Kulturbund and the DGG to work together to exchange fish and information between the two different political Germanys. In the following years a small group of DGG members left the club and, in Berlin, founded a new one called the Gemeinschaft zur Förderung der Guppyzucht (Association for the Advancement of Guppy breeding or GFG). The DGG and the GFG decided to merge in 1975, and a new association was created, the Deutsche Guppy Föderation (German Guppy Federation or DGF).

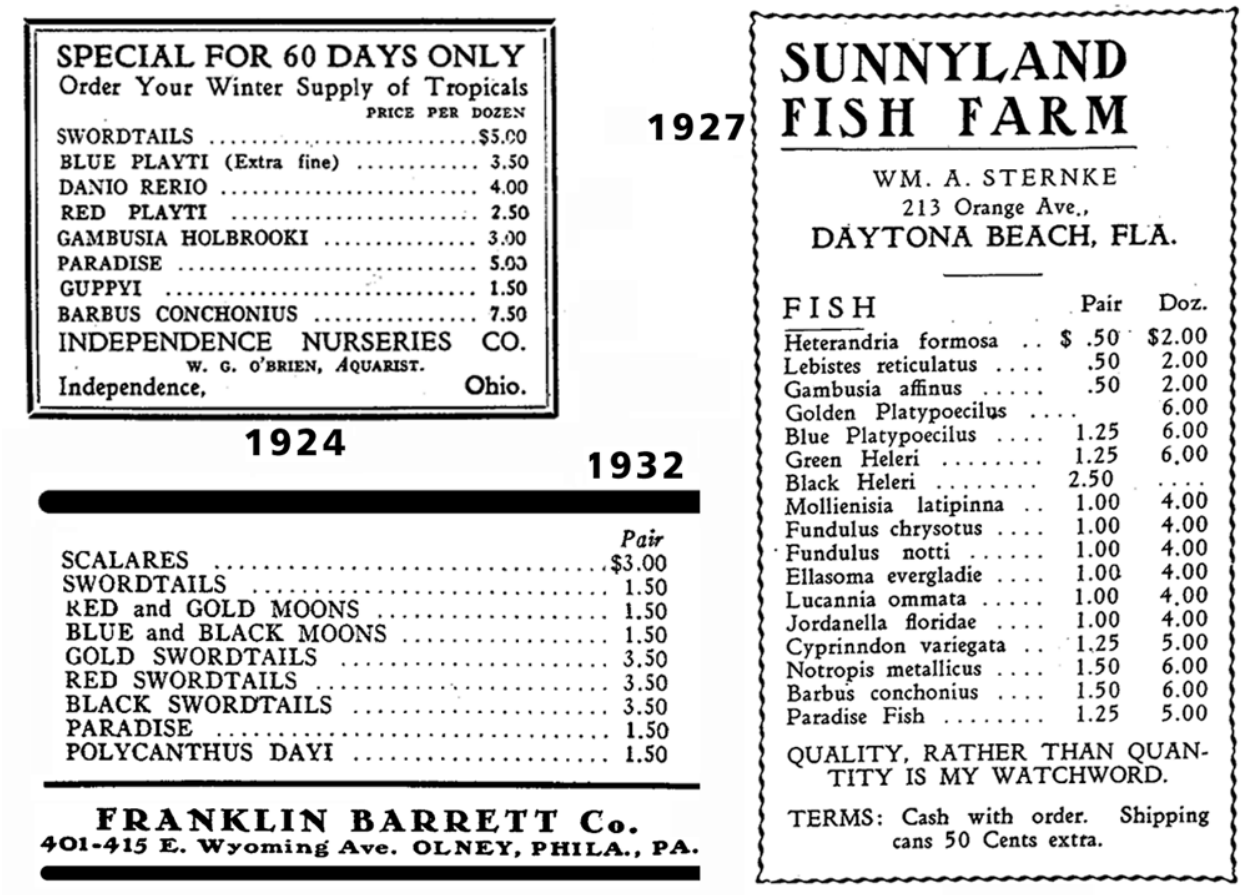
The Guppy in the United States

Although guppies were widely distributed throughout the hobby in the United States after its introduction in 1911, there was considerable competition from the larger and more dramatic livebearers, such as the swordtail, platy, and molly. Ads between 1924 and 1932 list guppies under just a single name, that is if they appeared in the ads at all, while numerous color variations of platies and swordtails were offered. Platies, early on listed as "platyi" and later as "moons," were available in black, blue, gold, and red; swordtails were offered in black, gold, green, and red. Guppies, however, were just guppies!

That the situation was unchanged in 1931 is reflected in Walter L. Brind's monograph on guppies and platies published in that year. Brind's description of the guppy was as follows: "This little fish - the male is barely 3/4 inch long - is indeed a living rainbow for colors (as far as the male is concerned) though the much larger female - 1-1/2 inches long - is as inconspicuous as her mate is brilliant. No two males are colored or marked alike. Every conceivable combination of saffron yellow, carmine red, violet, peacock green, white, turquoise blue and black is lavished profusely on the 'costume' of this sparkling, animated living jewel of the Aquarium. The female is light greyish olive green on the back, bluish or greenish metallic on the sides and whitish underneath."

Note that Brind made no mention of guppy varieties, although blue, red, gold, and black platies were described. Regarding the swordtail, he had even previously published a separate monograph on that fish and its many color variations. According to Brind, the popularity of the guppy, aside from the ease with which it could be kept and bred in the aquarium by beginners, lay "…undoubtedly in the fact that the young ones are born alive at intervals of a month or so in 'litters' varying in number from four or five to sixty or even more in the case of large adult females." The opportunity to develop new strains was never mentioned.

The 1920's, therefore, were slow years in the development of both the hobby in general and



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1924

1927

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FISH	Pair	Doz.
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Lebistes reticulatus	.50	2.00
Gambusia affinus	.50	2.00
Golden Platypoecilus		6.00
Blue Platypoecilus	1.25	6.00
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Mollienisia latipinna	1.00	4.00
Fundulus chrysotus	1.00	4.00
Fundulus notti	1.00	4.00
Ellasoma evergladie	1.00	4.00
Lucannia ommata	1.00	4.00
Jordanella floridae	1.00	4.00
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QUALITY, RATHER THAN QUANTITY IS MY WATCHWORD.

TERMS: Cash with order. Shipping cans 50 Cents extra.

1932

	Pair
SCALARES	$3.00
SWORDTAILS	1.50
RED and GOLD MOONS	1.50
BLUE and BLACK MOONS	1.50
GOLD SWORDTAILS	3.50
RED SWORDTAILS	3.50
BLACK SWORDTAILS	3.50
PARADISE	1.50
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Ads in the aquarium literature between 1924 and 1932 featured many color varieties of platies, swordtails, and mollies. However, no varieties of the guppy, color or otherwise, were available. The Barrett ad of 1932 didn't even list guppies!

the guppy in particular. Paradoxically, it was during the early depression years of the 1930's that the hobby experienced an awakening that added many new hobbyists to the fold. Aquarium development of the guppy progressed rapidly during this period, so that by the mid 1930's a number of recognizable guppy strains were available.

The First American Guppy Article

In the November 1911 issue of the BROOKLYN AQUARIUM SOCIETY BULLETIN, the first article in an American aquarium magazine on the guppy appeared, written by one of the outstanding early aquarium writers in America, Christian Heede.

"Poecilia guppyi"

"This is another livebearing fish which, with *Girardinus reticulata* (our next article) and *Poecilia poeciloides*, belongs to the species *Acanthophacelus*.

"*Poecilia guppyi* are found in Venezuela, Trinidad, and Barbados, in the latter place they are called the "millionfish" on account of their great abundance. They are also found in the Dutch colony of Surinam and in its capital Paramaribo. The fishes are raised, and then liberated in ponds to catch and eat the larvae of the mosquitoes, thereby stamping out malaria. In several English colonies the local governments have distributed this species of fish amongst ponds and other still waters with the intention to extinguish the larvae of the malaria-giving mosquitoes. These fishes were first imported to Europe in 1908 and on account of their beauty have won many friends among fish fanciers. Others were imported to New York last spring, but are only held by a few collectors.

"These fishes breed every four to six weeks, bearing at first 7 to 15 young and later, as with all livebearing fishes, a greater number of young. The parent fishes are not very cannibalistic toward their young; still the aquarium must be well stocked with plants, both below and on the surface as a protection for the brood, *Myriophyllum* and floating plants being especially adapted to this purpose. The safest way would be to remove the newly born to another aquarium; a teaspoon is a handy article for this purpose.

"The coloring of the male fish is very beautiful, red, yellow and dark spots are found on each side of the fish, one near the gill cover and one near the tail, the latter resembling an eye somewhat similar to that seen on the peacock- eyed fish.

"The coloring varies according to the temperature and condition of the fish. Hardly two males are alike and they change their marking and coloring continuously, even while watching the fish for a short time one can easily observe the rapid changes. Poecilias are about one inch long and are one of the smallest aquarium fishes in existence. The females are plain; of a yellowish pearly color, and larger than the males."

In his article Heede somewhat confused the scientific names of the guppy. The fish that he called "*Girardinus reticulata*" was in effect quite a different fish, viz., *Phalloceros caudimaculatus*. Some authors have erroneously reported the initial importation of the guppy into Germany as the year 1905 because of Koehler's misidentification of *Phalloceros caudimaculatus* as "*Poecilia reticulata*." Although *Phalloceros caudimaculatus* had been introduced to the hobby as early as 1898 (in Germany, and incorrectly as "*Girardinus decemmaculatus*"), a black-spotted variety was collected in a mountain stream back of Santos, Brazil, and became known as "*reticulatus*." For the record, as far as the organized hobby is concerned and realistically speaking, *Phalloceros caudimaculatus*, *Gambusia affinis holbrooki*, and *Cnesterodon decemmaculatus* were the earliest aquarium livebearers.

Henry Kissel (1873-1963)

Henry Kissel started as a breeder of goldfish shortly after the end of World War I. He is shown here in his fish hatchery in 1930.

Lace Guppies

The most important strains to be developed in the United States during this period were the lacetail (also called the peacock tail), chainside, and bird's-eye dorsal. Henry Kissel Jr., of Cliffside, New Jersey, developed the lacetail. Kissel started breeding and selling fishes in 1914 and by 1930 his main show room had twenty-six 50-gallon glass tanks, eight 25-gallon glass tanks, seven 15-gallon glass tanks, and six 150-gallon wooden tanks, as well as two 2,000-gallon pools extending from the building under a lean-to of glass, the last being used for the propagation of daphnia.

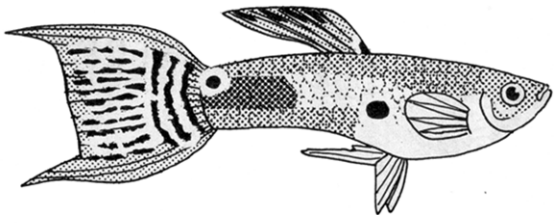
This strain was characterized by lace-like black markings on a white or light yellow background. In some males the tail was lyre-shaped. By 1933 Kissel had placed a good quantity of this strain on the market, selling them from his store in Cliffside. It proved to be one of the most popular in the hobby. Ironically, these lacetail guppies were imported by the British who subsequently improved them and sent them back to the United States where they were known as English guppies!

Chainside and Bird's-eye Guppies

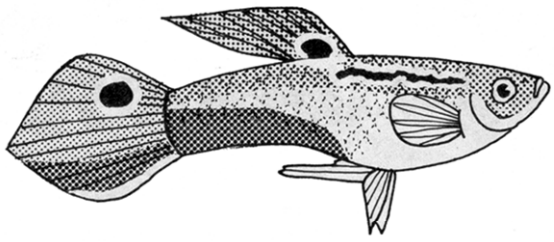
The chainside (or just chain) guppy sports an irregular dark line from the top of its head at eye level back to about the middle of the dorsal fin. The bird's-eye dorsal had a black spot and many of them had very long, pointed dorsals. Both of these strains were on the American market in 1933. These three varieties were not, by today's standards, impressive, but they served to make the guppy one of the most popular aquarium fish of the times.

Gold Re-Discovered in America

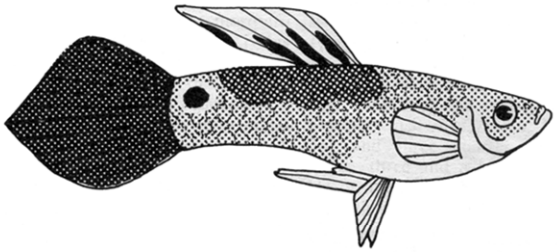
The gold guppy was introduced in 1933 by a Swedish aquarist named Otto Fredlin who sent some to Germany. They caused a considerable sensation there and four males were sent to Frederick L. Stoye, a prominent aquarist and author in the United States. Although it was introduced as "*Lebistes reticulatus* variety Fredlini," by 1944 it was better known as the "gold guppy." Fredlin, who started work on this strain about 1930, produced a fish with true, fairly dark, gold body coloration, and the characteristic has been transmitted to several strains popular today.



The Lace Guppy, developed by Henry Kissel Jr.



Chainside or Chain Guppy



Black Guppy

The Swords

In 1933, William A. Sternke, a pioneer fish breeder and operator of the Sunnyland Fish Farm in Florida, produced strains with a single upper spike on the tail of the male (topsword), strains with a single lower spike (bottomsword), and strains with a spike on both top and bottom (doublesword and lyretail). Orange and red colors predominated and chainside markings were also characteristic. Fish with elongated dorsals and various sword variations were common in the inbred strains of the time, but the Sternke strains were the first commercial offerings in the United States of such varieties.

Blacks & Black Veiltails

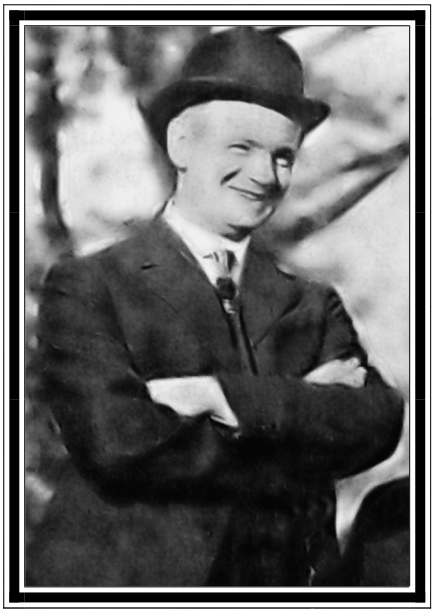
Another of the strains produced during the early 30's in the United States was the black guppy. The male fish was somewhat dark in general, but sported an all-black tail fin. This fish resembled the British cofertail in that the central rays of the fin were somewhat elongated. Some of these black strains tended to have tails that were both broader and longer than usual. In February of 1934, O. M. Black, proprietor of the Park Slope Aquarium Store in Brooklyn, marketed the first black veiltail guppies. The males had long veiltails of smoky yellow that turned jet-black when the males were courting. The females of the pure strain had a black crescent in the tail.

A Notable Exhibit

The next major accomplishment in the American guppy hobby has been frequently mentioned in passing in the aquarium literature but it has not received the attention it deserves. In late October of 1934, the Bay Ridge Aquarium Society of Brooklyn held an exhibit of aquarium fish that featured a spectacular assemblage of guppies. The society offered gold, silver, and bronze medals for two sanctioned classes: "Lyretails" and "Any Other Variety." As might be expected, the leading guppy breeders of the day entered the competition. Some of the guppies exhibited later sold for as high as $5.00 per pair, a high price to pay in the middle of the depression. To put this amount in

William A. Sternke (1892-1978)

Sternke was a pioneer fish breeder and operator of the Sunnyland Fish Farm in Florida. The Sternke strains of topswords, doubleswords, bottomswords, and lyretails were the first commercial offerings in the United States of such varieties.



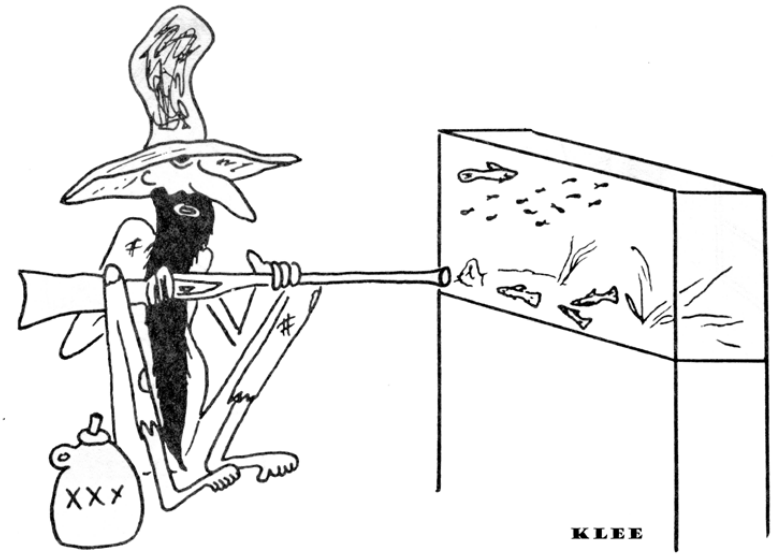
Charles E. Visel (1882-1962)
"Father of the Fancy Guppy in America."

context, in 1934 the average monthly apartment rental was $20, the tuition to Harvard was $410 a year, a gallon of gas cost 10 cents, a stamp 3 cents, and a loaf of bread 8 cents!

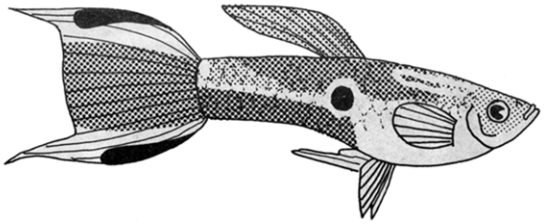
The gold award in the AOV category for guppies went to Charles E. Visel of Brooklyn, one of the oldest of the old-timers and a gentleman of considerable stature among aquarists. (He also had some standing with pigeon fanciers. In January 1931 at the forty-second annual Madison Square Garden Poultry, Pigeon and Rabbit Show, for example, Visel entered Dun and Black Laced Satinettes, Blondinettes, Bluettes and Silverettes, all varieties of fancy pigeons). Before World War I he had been active in helping the aquarium hobby get organized and, after many years of breeding fancy goldfish and accumulating many awards, he turned his talents to the breeding of' guppies. At the time of the competition, Visel maintained a fish hatchery in Brooklyn.

Visel 's gold medal winner was a male veiltail, all of two inches long, the length of the tail being equal to the length of the body. The tail was coal-black and the color extended halfway along the body toward the head. The dorsal was extremely long and also black. In short, this was a very long step toward what we know today as the half-black veiltail guppy. It is important to recognize also that, like the O. M. Black veiltail, the Visel veiltail bred true to type. Although he received the medal for one particular fish, he had developed a legitimate strain. Visel, along with Henry Kissel and Bill Sternke, should rightly be inducted into an American Guppy Breeder Hall of Fame.

It should be noted that Henry Kissel and Charles E. Visel were old-timers in the aquarium hobby who got their start in the hobby before World War I and shared the spotlight with such famous aquarium personalities of the era such as A. A. Phillips, Jr., W. H. Heimbach, Fred G. Schaefer, Herman Rabenau, Franklin



"One of yew boys got tuh marry her!"



Bragg Guppy

Barrett, J. J. Halterbeck, William Tricker, Ernst Bade, William T. Innes, and E. J. Wilcox. Starting in 1912, the Brooklyn Aquarium Society held an annual show and in 1915, at their Fourth Annual Exhibit, Visel was awarded the diploma for the largest and best display. Fourteen thousand people viewed the display and it embraced the largest collection of aquarium fishes ever shown together. There were 333 separate exhibits and the entries included both tropical species and goldfish. Innes judged the goldfish and Bade judged the native and tropical species.

Cream Guppies

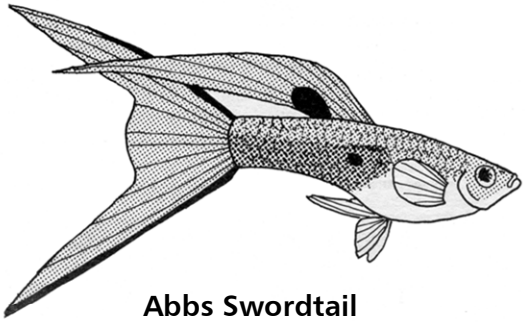
By 1934 the following guppy tail shapes were available: round, square or rectangular, lyretail, uppersword, lowersword, doublesword, and veiltail. From 1934 to 1937 additional varieties were developed including the speartail (a moderate extension of the middle rays of the tail) and "Bohemian gold." The latter was born in the tanks of a Czechoslovakian breeder and is the fish we know today as cream (double recessive, blond x gold). It is light yellow, almost translucent, but not albino. It arrived in the U.S. about 1937, and for a while was known as the "white guppy," although a true white is a blond x blue double recessive.

Bragg Guppies

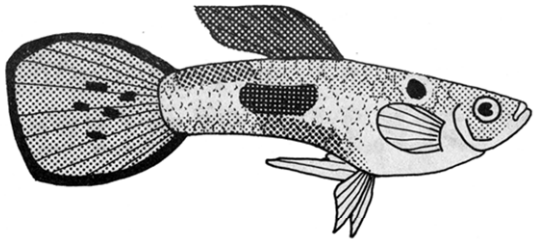
The Bragg guppy, developed by a Midwest breeder, was another popular strain in the mid-1930's. Sporting a lyretail, it had a reddish brown marking on the back that came down to about the middle of the sides. Around and through it were wavy, broken lines of iridescent white. Despite its ray extensions, the black markings on the tail often gave it a squarish appearance.

Abbs Swords

Also during the 1930's, a New Jersey physician and member of the prestigious New York Aquarium Society, Alfred W. Abbs, started development of a strain of guppies based mainly on the lyretail and swordtail forms common at the time. By 1939 he had produced a magnificent strain of large-bodied fish with long dorsal fins and extreme sword-like extensions on the upper and lower caudal lobes. The swords were often longer than the body of the fish, prompting some to refer to it as a "superstrain." The males were also extremely colorful, which greatly increased their desirability. Abbs guarded the strain closely, but he did give several to Dr. Myron Gordon, the renowned fish geneticist of the New York Zoology Society. From these, Dr. Gordon obtained several albinos in the early 1940's, and this



Abbs Swordtail



Trinidad Guppy

most likely was the source of the albino guppy Dr. Frederick Proewig of New York City sent to Germany in 1950.

The Progenitor of Guppies To Come

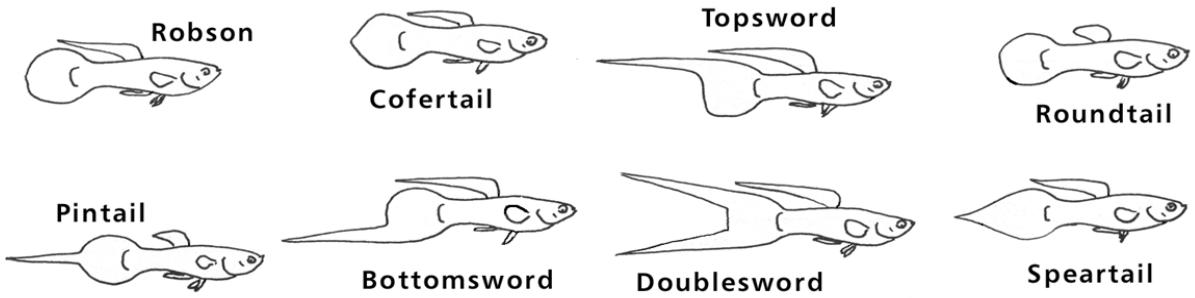
The so-called "Trinidad guppy" was a popular strain during the early 1940's. There is no evidence that the strain originated in Trinidad, but it was exceptionally colorful. The fish were fairly large and were marked with black, mostly in the form of spots. The tails of the males tended to be bright yellow edged with brown or black. Most importantly, however, was that the females often showed color, particularly in the tail fin. This was of great genetic significance because the strain subsequently formed a partial basis for the broadtailed guppies as we know them today.

A Dead End

The O. M. Black and the Visel veiltail strains, although not equal to the veiltails of today, certainly could have formed the basis for their development but they apparently died out before World War II. Perhaps black guppies were at a disadvantage compared to the more showy black mollies, or perhaps fanciers just preferred colored guppies, but a likelier reason is that the United States experienced another depression in 1937. The hobby lost many of its followers, and many hatcheries and fish stores went out of business. Unlike the depression of 1929, when the hobby actually experienced a rebirth, this depression had disastrous results, and the hobby did not revive until after World War II. There was more money to be had in breeding other animals, such as dogs of the toy variety. Chihuahuas, for example, sold at extremely high prices. Piling ignominy upon ignominies, in 1937 Henry Kissel turned his fish conservatory into a mouse house, converted his aquaria to mouse cages, and bred mice instead of fish. As the Second World War approached, however, British aquarists had much more to worry about than the price of mice or Chihuahuas. We now need to backtrack a bit in time and turn our attention to several important events in England.

The Guppy in Great Britain

In 1937, the Fish Culturist's Circle, a famous British aquarium society, formulated the first guppy standards in history. They provided for some variation in fin shape, but gave preference to blond-bodied fish with tails shaped like a Grecian lyre. Also in this year several enthusiasts announced that a meeting would be held at the Coach and Horses Hotel in London to see if sufficient members could be found to



The British standards for the roundtail, speartail, topsword, doublesword, and bottomsword were published in 1938. The Robson guppy was developed in 1937 and standards for it were published in 1947, along with standards for the cofertail. The pintail was developed in 1940 and its standards were published In 1949.

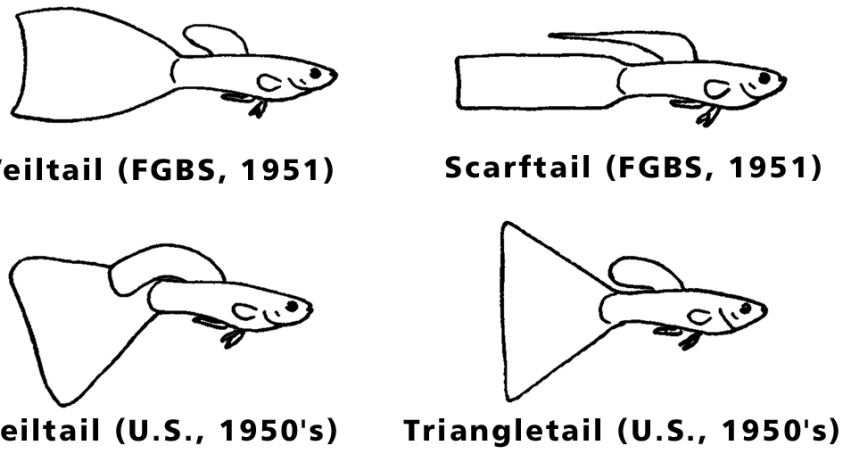
form a guppy specialist's group. About thirty people attended and the Guppy Breeder's Society (GBS) was formed the following year with its headquarters in London. The GBS published its first yearbook in 1938 but, needing some rules to guide the judging of their fish, the Society devised and published standard outlines and point allocations in their 1938-39 yearbook. Five tail shapes were included: speartail, lowersword, uppersword, doublesword, and roundtail. No females were shown, and three basic body colors were recognized: gray, blond, and gold.

Thus, 1937 saw the birth of the first guppy specialist organization, and 1938 witnessed the first significant guppy standards. Whether or not we give the nod to the United States in the race to develop new strains of guppies, Great Britain is a clear winner in the matter of formal organization and standards.

The Robson Guppy

A. E. Robson of High Gate, London, one of Britain's early successful guppy exhibitors, developed what came to be known as the Robson guppy. For several years guppy breeders had attempted to introduce color into the comparatively colorless female but with little success. Because Winge's pioneering scientific work on the genetics of the guppy emphasized the importance of the male to the virtual exclusion of the female, it was thought impossible to introduce color into the female. In 1934 Frederick Stoye wrote: "According to Winge, males transmit their color to their sons regardless of the females they are mated with, for the fathers alone are responsible for the colors of their sons and the mothers have no influence on them." In all fairness, however, this was a misreading of Winge by Stoye but, unfortunately, this notion persisted in the hobby for many years.

Robson, however, produced a strain in which the females sported a large round jet-black tail and a black dorsal. In addition, they had a delicate blue-green sheen on their bodies and their ventral and anal fins were edged in blue. The males lacked the black spots characteristic of the common guppy of the time, but they did have their tails and dorsal fins edged in black. Although it was originally reported that Robson obtained his strain from a cross between a black-tailed male and a cream female, the truth of the matter was that he started with imported females that exhibited much black in their fins. In 1947 Robson received the Fellowship



The first British broadtailed guppy standards (top) compared to American guppies (bottom) of the 1950's.

Award for his guppy strain, but by the middle of the 1950's, the strain had all but disappeared.

The First Annual Guppy Show

The first Annual Guppy Show (and the first to be held in Europe) took place in 1938. Mr. Shiller, Manager of Selfridges Public Aquarium and Keeper of the King's Aquaria, was asked to judge. However, the Guppy Breeder's Society soon fell on hard times when Great Britain went to war in 1939. Its members were Called to the Colors and attendance at meetings dropped to a mere handful. Most of the founding officers were now in the armed forces and the Dean of British guppy breeders (the cofertail guppy was first developed by Phillips), W. G. Phillips, took over as Secretary and Acting Chairman.

The Pintail Guppy

In 1940, a fish sired by roundtails appeared that had a long extension from the center of its round caudal fin. Mr. Phillips, the breeder, entered it in the only class possible (AOV - any other variety than the standard outlines) under the name "spiketail." One member suggested that it had a shape similar to the pintail duck, and the name "pintail" stuck. In 1949 an official standard for this variety was adopted by the GBS.

The War Takes Its Toll in Britain

Because of the war, most aquarium societies in Great Britain were now suffering greatly and, to help with its finances, the GBS merged with the North London Aquarium Society. After the Crown Hotel where they still met was bombed, the club moved to a small cafe owned by one member. It proved excellent for their monthly gatherings and shows. For a short time membership picked up until once again the bombs rained down on London and the cafe was demolished. Meetings were moved to a large church hall devoid of everything except a long table flanked by benches, since all the interior furnishings had been removed to a safe place to avoid bomb damage. Here the enthusiasts gathered on Sunday mornings. It says something for their interest when both air raid sirens and the church organist running through his repertoire preparing for the evening service constantly interrupted meetings!

Members of the armed forces on leave swelled the gathering and the subsequent demand for guppies became quite acute. The price of good breeding-fish jumped to about three dollars. In the closing days of the war their old headquarters at the Crown Hotel again became available and the society moved once more. Finally, because of the proliferation of local guppy groups associated with the GBS, it was decided in 1949 to change its structure to that of a federation. Thus was born the Federation of Guppy Breeder's Societies (FGBS). The GBS was no more.

"I decided to stay for the guppy auction!"

Enter The American Broadtails

By providing a favorable diet, controlled water conditions, and appropriate housing, Abbs had developed very large guppies in the 1930's. At first they were considered to be a new, super-sized variety, but when these fish were raised under less optimal, more normal conditions, their descendents were of normal size. That environmental conditions affect the sort of guppies one obtains in aquaria should come as no surprise, however. When researchers relocated guppies from a waterfall pool in Trinidad teeming with predators to previously guppy-free pools above the falls where there was only one known possible predator (of small guppies only, therefore large guppies would be safe), the descendants of the transplanted guppies adjusted to their new circumstances by growing bigger, maturing later, and having fewer and bigger offspring. The speed of these changes bewildered evolutionists, by the way, because their standard "millions-of-years view" is that the guppies would require long periods of time to adapt. One evolutionist remarked at the time, "The guppies adapted to their new environment in a mere four years–a rate of change some 10,000 to 10 million times faster than the average rates determined from the fossil record."

These observations bring us to one breeder destined to occupy forever a niche in the Guppy Hall of Fame, i.e., Paul Hähnel. Hähnel emulated Abbs in providing an optimal environment but in addition, he also established selection criteria for breeding his fish. In time, the veiltails for which he was to become famous started to appear in his tanks. After over a decade of inactivity on the breeding front, the Fancy guppy had been reborn.

Although others were also developing broadtailed guppies more or less simultaneously, the Hähnel guppies had somewhat longer fins, although this advantage was only held briefly as the other guppy "greats" of the day improved their own strains. In short, while the British were focusing their attention on swordtail types, Americans were developing male guppies with broad, colorful tails, with Hähnel being the first breeder during this period to receive widespread acclaim for his broadtails. By 1950, fish derived from his stock began to appear in local shows in the eastern part of the United States where they took the guppy world by storm.

These early broadtailed guppies were somewhat indefinite in tail shape. One, of large body and fairly wide tail, was referred to as a "veil tail." Another, with smaller body, less color, but larger tail, was called a "triangle tail." This American development was something the British could not ignore and the introduction of broadtailed strains into Great Britain prompted the FGBS to develop two new standards in 1951: veiltail and scarftail. These standards were quite premature, however, as the overall development of broadtailed strains was barely underway.

In the United States, interest in broadtailed guppies (deltatails and veiltails) was intensified. Breeders such as Hähnel, Sternke, Alger, Wenk, Konig, Rutkowski, McAlister, Scala, Sweeney, and others made their contributions and developed their strains. In 1957 a milestone on the American scene occurred with the formation of the American Guppy Association (AGA). Although many participated in the development of this organization, Lawrence Konig was its recognized driving force. In appreciation of his efforts, the Northeast Council of Aquarium Societies named him Man of the Year for 1957-58. Dr. John Rutkowski was named Interim President, and William Sternke was issued Membership Card No. 1, a well-deserved honor in view of his long service and many contributions to the guppy hobby.

To stimulate further interest in the guppy, Konig and his colleague, Dr. Rutkowski, offered a free pair of their guppies to every aquarium

society willing to form an AGA group among its members. Henry Kaufman, Phil Scala, Lewis Rexford, and Arnold Sweeney supplemented their stock and over 250 pairs of prime breeding stock were distributed. This single act, unprecedented in the history of the aquarium hobby, rocketed the guppy specialty to a prominence never before attained.

Standards and More Standards

An abortive and somewhat ludicrous attempt to be the first to prepare American guppy standards was that of the so-called "American Federation of Guppy Societies," an organization that existed mostly on paper. Its standards, published in 1957, copied the British standards but were virtually ignored by serious guppy fanciers on both sides of the Atlantic. German guppy breeders essentially adopted the FGBS standards, and a number of truly international shows were subsequently held in Europe. However, the FGBS veiltail and scarftail standards proved unworkable since the newer and more popular American strains did not conform to them.

In 1959, the Secretary of the Lancashire section requested that the FGBS devise standards for these broadtailed fish but the Management Committee of the FGBS refused. Consequently the Lancashire section disbanded, reorganizing in 1960 under the leadership of Jim Kelly as the Fancy Guppy Association (FGA). In 1961 they published their own standards and soon outdistanced the FGBS in number of members. In the United States the Better Guppy Guild of Chicago proposed a set of standards in 1957 that did have considerable merit, but they were not illustrated and consequently were of little practicable guidance to judges. In 1961 the AGA's own standards were adopted (they were revised in 1965) and, although criticized by some groups, came to be widely used.

As the British and Germans before them, American guppy groups experienced their own fragmentation. Although as I have noted there was some disagreement over standards, the major issue was over centralized versus decentralized control. Another difficulty was that the AGA refused to issue its own publications, preferring instead to rely on the pages of the commercial aquarium publications for this purpose. Thus, local and regional guppy groups were formed and the AGA lost much of its influence at the time. Its significance in the development of the guppy specialty in the United States, however, has never been equaled. In Great Britain, the FGBS and the FGA finally agreed in 1967 to a single set of standards, and thus the situation in England and the United States bore some resemblance to each other, i.e., general agreement on standards but a proliferation of groups. American guppy fanciers did not develop a strong, centralized specialty club until the formation of the International Fancy Guppy Association (IFGA) in 1966. The roots of this organization can be traced back to 1964 when a group of Midwestern hobbyists formed an alliance later termed the "Congress of Guppy Groups" (COGS). Ed Hazle of Cuyahoga Falls, Ohio served as its first chairman until 1966 when the IFGA was formed.

he Resurgence of Interest in Guppy Genetics

In the 1920's, Winge had published much information not only on the location of guppy genes, but on sex-linked inheritance as well. Towards the end of World War II, interest in guppy genetics was reawakened and many articles on the subject appeared in the scientific journals, especially in *Heredity* and *Genetics*. In the early 1940's, H.B. Goodrich and his colleagues at Wesleyan University produced papers that dealt with new guppy genes and gene expression. Goodrich was well known for his work in the general field of genetics, particularly in the embryological development

of genetic characters in tropical fish, and in the course of these studies, he developed a new one, called the "blond guppy."

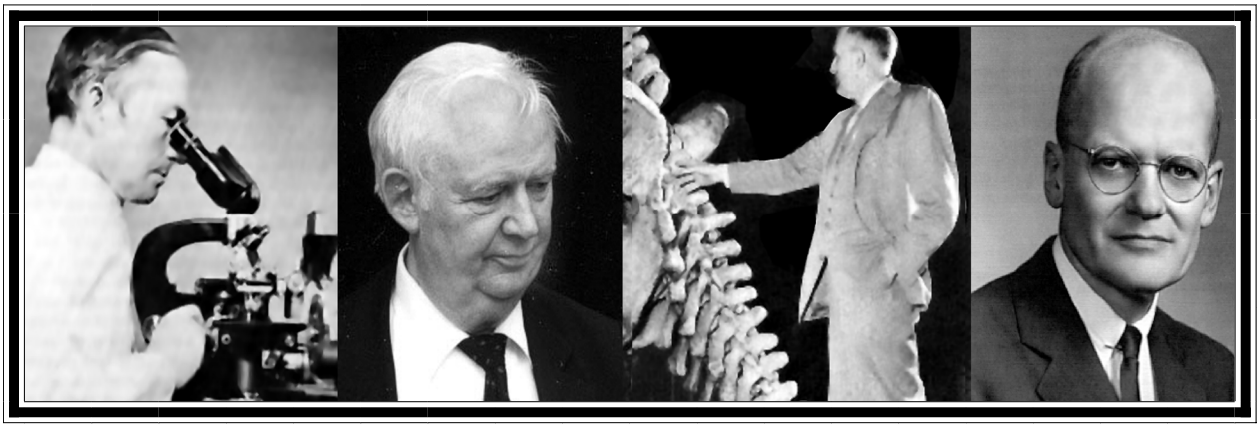
Later that decade, Caryl P. and Edna F. Haskins of the Haskins Laboratory in New York (for many years Caryl Haskins was the President of the Carnegie Institution of Washington) investigated albinism (a semi-lethal mutation in the fish), and Winge (with Ditlevsen) continued his work on color inheritance and sex determination. Dzwillo, in a classic paper published in 1959, described his genetic investigations of domesticated strains of the guppy.

This scientific work inspired the writers of the guppy books that appeared on the scene from the late 1950's to the early 1960's to include detailed discussions of guppy genetics, complete with the now very familiar inheritance diagrams, and modern books dealing with the guppy continue the practice. In the early 1960's the author had a number of papers on guppy genetics published in the periodical aquarium literature and, along with those written by other writers, the Post-War boom in aquarium articles on guppy genetics had started.

The First Significant Books About The Guppy

Alec Fraser-Brunner's 1946 book, *The Guppy*, still remains as one of the most valuable resources on the history of the guppy. It appeared first in *The Aquarist and Pondkeeper* in September 1946 and was issued in booklet form shortly afterwards. In addition to discussing the early history of the guppy in Great Britain, and Robert John Lechmere Guppy and Dr. Plantagenet Lechmere Guppy's involvement with the fish, Fraser-Brunner cleared up the mystery of the correct pronunciation of the name. The Guppy family pronounced it to rhyme with "cup," not "goop." Paul Hähnel, by the way, regularly pronounced it as "goopy."

Fraser-Brunner was not only an aquarist but a professional ichthyologist as well. The Eschmeyer Fish References (an authoritative list of scientific ichthyological papers) cites 29 of his papers, ranging from those dealing with marine species to some describing well-known aquarium species in the genera *Corydoras* and *Acanthophthalmus*. In 1973 he wrote a 128-page book titled *Danger in the Sea* that described the hazards posed by certain marine



Four Scientists Who Contributed to Our Knowledge of Guppy Genetics

FROM LEFT TO RIGHT: Öjvind Winge (1886-1964), Michael Dzwillo*, Hubert B. Goodrich (1887-1963), and Caryl P. Haskins (1908-2001).

* Dzwillo was Curator from 1963 to 1995 of the Department of Invertebrates at the Zoological Institute and Zoological Museum (Hamburg) and at this writing is still living.

LEFT: Dr. Jon Alfred Mjoen, eminent Norwegian eugenicist; RIGHT: Leon F. Whitney.

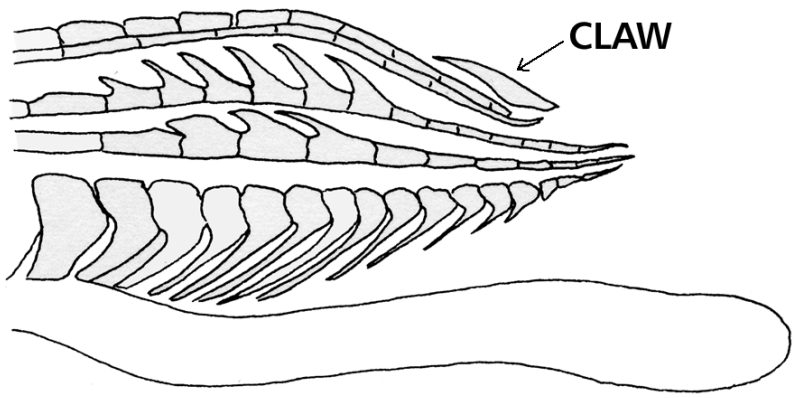
fishes and animals. In 1964, Fraser-Brunner, then curator of the now-defunct Van Kleef Aquarium in Singapore, was commissioned to design an emblem for the Singapore Tourist Promotion Board. He created the Merlion, a creature with a lion head and a fish body resting on a crest of waves. The lion head symbolized the discovery of Singapura ("lion city" in Sanskrit, dating from 11th century AD) as depicted in the Malay annals. The fish tail symbolized the ancient city of Temasek (Singapore's present location) destroyed in 4th century AD, and represented Singapore's beginnings as a small fishing village. The Merlion statue in Singapore created in 1972 weighs 77 tons and stands 28 feet high.

Probably the best of the guppy books that appeared after World War II was Leon F. Whitney's, *All about Guppies*, Practical Science Publishing Co., 1952. The book was dedicated to "Paul Hahnel, America's Greatest Guppy Breeder" and after an introduction to the fish it discussed guppy anatomy, the physical equipment needed, food, heredity, practical guppy breeding, guppy diseases and ailments, and exhibiting guppies. In his foreword Whitney noted, "This is the first popular book about guppies," even though the 1946 Fraser-Brunner book was listed in the bibliography. However, since the two books differed significantly, I won't quibble over the claim.

There are two photos of Hähnel's tanks and a caption mentioning that the "finest" guppies in the world were raised here but there was nothing in the text of the book that indicated that Hähnel contributed to any part of its authorship. Indeed, Hähnel's small setup paled in comparison to Whitney's more impressive one. In 1955, however, a second edition was published with Hahnel listed as a co-author. Whether this was just a courtesy, acknowledging Hähnel's contributions to the work or whether he actually wrote anything is not known. What is certain, however, is that the two men definitely collaborated.

Leon Fradley Whitney was born in 1894 and died in 1973. He graduated with a B.S. from Massachusetts Agricultural College in 1916 and was a clinical instructor of pathology at Yale University's School of Medicine from 1946 to 1960. He was responsible for the Peabody Museum's Collection of Dogs (a Collection that contained many stuffed specimens of famous dogs), which was named after him. Whitney started writing early and had books published in the 1920's and 1930's. He wrote about all sorts of animals, especially cats and dogs, but was especially known for his eugenics writings.

In addition to his membership in the American Veterinary Medicine Association, he was a Member of the American Psychological Association, the American Genetics Association, and the Eugenics Research Association. He was also a member of the American Eugenics



THE GONOPODIUM OF THE GUPPY
In addition to its many hooks, the gonopodium has a single bone, the claw, that is very prominent. Although removing this claw somewhat impairs successful matings, the male guppy can still mate. *Micropoecilia* species do not have this claw.

Society and held the posts over time of Executive Secretary and Director.

Whitney was a close friend of Madison Grant the many who created what is called the "racialist moment" in American history. He, for example, concluded that America should abandon a largely open-door immigration policy. He favored a eugenics program that would promote the Nordic race and discourage the expansion of the colored races in the white world. In particular, he condemned miscegenation. Grant wrote two of the seminal works of American racialism: *The Passing of the Great Race* (1916) and *The Conquest of a Continent* (1933). Despite disavowals by American eugenicists, Nazism began to erode support for the eugenics movement and the movement finally collapsed during the war with Nazi Germany.

In 1934 one of Hitler's staff members wrote to Whitney and asked in the name of the Führer for a copy of Whitney's recently published book, *The Case for Sterilization*. Whitney complied immediately, and shortly thereafter received a personal letter of thanks from Adolf Hitler. In his unpublished autobiography, Whitney reported a conversation he had with Madison Grant about the letter from the Führer. Because he thought Grant might be interested in Hitler's letter he showed it to him during their next meeting. Grant only smiled, reached for a folder on his desk, and gave Whitney a letter from Hitler to read. In this, Hitler thanked Grant for writing *The Passing of the Great Race* and said, "the book was his Bible." Whitney concluded that, following Hitler's actions, one could believe it.

Hybridization and the Species Question

A dozen years after the end of World War II, Donn E. Rosen wrote an important article (*The Aquarium*, April 1957) that introduced several questions bearing on the development of the fancy guppy. The article was prompted by a shipment of guppies, along with three other livebearer species, i.e., *Micropoecilia melanzona, M. branneri, and M. parae* (the first is now considered a synonym of *Micropoecilia parae*), from Ross Socolof from British Guiana (which nine years later became the independent nation of Guyana).

***Micropoecilia minima*, one of the Micro species that closely resemble the guppy.**

Rosen was struck by the similarity in size, shape, and type of coloration between *Micropoecilia branneri* and the guppy, and there were enough similarities between the other two and the guppy to, as Rosen put it, "…to call for, at least, a raised eyebrow." Indeed, some of the Micropoecilias rivaled and even surpassed the average guppy in color and form. Rosen then posed the question, "On what grounds can two groups of fishes that are so obviously alike in so many ways as the guppy and the Micros be rigidly separated into two genera, *Lebistes and Micropoecilia* respectively?"

These fishes all belong to the family Poeciliidae whose members are characterized by the presence of a gonopodium in the male. It was long discovered by ichthyologists that the great profusion of spines, hooks, barbs, and teeth at the tip of the male's gonopodium could be used for purposes of both identification and classification. One question that arose was how the male livebearer used his gonopodium during courtship and mating and one thought was that the claws and hooks might be used as a holdfast device to secure a firm contact with the genital opening of the female. To this end the prominent claw was removed from the tip of the gonopodium in test animals and it was observed that although removing this claw somewhat impairs successful matings, it is not indispensable. As a matter of fact, the *Micropoecilia* do not have hay such claw and, as Rosen pointed out, "… do very well without it." These observations later led Rosen and Bailey to lump *Lebistes, Micropoecilia, Limia*, and *Mollienesia* with *Poecilia*.

More importantly, however, was that Rosen noted, "Members of a domesticated strain of the guppy have successfully mated with one of the more common Micro species." Rosen did not identify the species in the article but it most likely was the then most common species, *Micropoecilia branneri.* Rosen pointed out that the very guppy-like *Micropoecilia branneri* was not uncommonly included in shipments of fishes from Northern South America and "Perhaps, because of their striking colors, such Micro males may have been selected unknowingly time after time to be used in matings with female guppies." Unfortunately, the proof of this suggestion would have to involve hybridization experiments with pure strains of the species in question and, as in the case of Endler's Guppy, human introduction of these species into all parts of the world for mosquito control and the breeding of fancy guppies by aquarists also all over the world make it extremely dubious that such experiments can be carried out today.

Conclusion

In this history of a little more than a century of the guppy I have sought to bring the past alive and to the surface. Thoreau once said, "Wherever men have lived there is a story to be told, and it depends chiefly on the storyteller or historian whether that is interesting or not." I am reminded also of the old German proverb, "There is much good sleep in an old story." Whether I have succeeded or not, therefore, is up to the reader.

Because my own entry into the aquarium hobby dates from after World War II (my first aquarium article was published in 1950), I have been reluctant to offer my own interpretations of the postwar period, short of the most significant events up to the end of the 1960's. It is my hope that another aquarium historian will come along to follow up this history of the guppy hobby. But for now, I salute the guppy, that tiny fish that has given so much enjoyment to so many people, and I raise a toast as well to those great hobbyists and scientists who have made this history and contributed to its story.

ADDENDUM I

Samuel Garman:
Gifted Ichthyologist or Paranoid Misanthrope?

Along the way I now and then encounter amusing incidents involving eminent scientific personalities that deserve a chuckle. The ichthyologist, Carlo Bonaparte, once thought to name a fish in honor of the ichthyologist, Cocco, and came up with the monstrosity, *Ichthyococcus,* which sounded more like a fish disease than a fish name! The great British ichthyologist whom we have mentioned in this history of the guppy, Albert Guenther, understandably was a bit miffed at this, reflecting that such names have "always been considered as a nuisance." Consequently, he changed the name to the more reasonable, *Coccia*, but unfortunately, according to the International Rules of Zoological Nomenclature, *Ichthyococcus* still stands today as a valid name.

I have also encountered ichthyological personalities who are true eccentrics, and in an article in TROPICALS MAGAZINE (March-April 1964) I recounted the story of perhaps the greatest joke in ichthyological history, one involving Constantine Samuel Rafinesque-Schmaltz, better known to hobbyists simply as "Rafinesque."

Rafinesque was an acquaintance of the great ornithologist and painter of birds, John James Audubon, and in 1818, he found himself a guest at Audubon's home at Hendersonville, Kentucky. Audubon's own personal formula for relaxation was to play the violin and he owned quite an expensive instrument. Unfortunately for the great ornithologist, the violin happened to be kept in the room occupied by Rafinesque. One night bats entered the window and Rafinesque was immediately persuaded that they were a new species. Needing something with which to club them down, Rafinesque seized Audubon's prized violin and proceeded to capture his specimens, demolishing the instrument in the process.

To say that Audubon was annoyed when he learned what happened to his violin is an understatement and he vowed revenge by sitting and painting several mythical fishes, showing them to Rafinesque with the comment that they were seen by him, "down by the river." Rafinesque was delighted and, based on these drawings, promptly described three new genera in a paper entitled, "Further Discoveries in Natural History." One of them, *Litholepis*, literally means "stone scaled" since Audubon had told him with a straight face that the fish in question was known locally as the "Devil-jack Diamond Fish," the scales of which would "turn a rifle ball." It took ichthyologists some time to sort out from the scientific literature these make-believe fishes and, alas, it is not recorded what Rafinesque said when he learned about Audubon's hoax.

Samuel Walton Garman – Early Years

This brings us to the story of Samuel Walton Garman, whose name is well known among aquarists, especially killifish fanciers. Little known to hobbyists, however, is that Garman was also a genuine eccentric, perhaps rivaling Rafinesque in this regard. Since his name has been mentioned in this history of the guppy, this is a suitable opportunity to acquaint readers with the full story.

Garman was born in 1843 to a Quaker family living in a part of Pennsylvania dominated by the Society of Friends. As a young man he took part in surveying the routes for the Union

Samuel Walton Garman (1843-1927)

Garman will be long remembered for a colorful youth, great anatomical work, and useful ichthyological monographs, followed by an eccentric old age.

Pacific Railroad and, having left home very early, he fought Indians and shot meat for the working crews while hardly more than a boy. In the winter of 1867-1868, Garman took a geology course taught by John Wesley Powell, a man who had made a name for himself during the Civil War and who would later become the Chief of the U.S. Geological Survey. Powell was in the process of organizing an expedition in 1868 to explore the Rocky Mountains in Colorado, and Garman volunteered to accompany General and Mrs. Powell and nineteen other men as the junior entomologist.

One goal of the trip was to climb Long's Peak, since no one on record had previously climbed this 14,255-foot mountain. After reaching the summit, a monument of stones was erected and Powell made a short speech commending the men for their achievement. Someone had brought along a bottle of wine and, after the monument was duly christened, the remainder of the wine was finished off by the group, everyone that is except Garman and one other who refused to drink. As a strict Quaker, he was quick to point out in a letter to a friend that "2 of us withstanding all entreaties did not drink on Long's peak, whatever the papers may say to the contrary."

He continued to travel with the Powell group but somewhat separately from it. That there was some friction is suggested in one of Garman's letters: "Mrs. Powell thought me too independent and tried to make me understand that herself and the major commanded the expedition and members."

After graduation from college in 1869, Garman became the principal of the Mississippi Normal School (now the University of Southern Mississippi), and in 1871 taught natural science at the Ferry Hall Seminary (now part of Lake Forest University). Garman had previously met and corresponded with Edward Drinker Cope, the most prolific taxonomist in the history of vertebrate paleontology, and also active in ichthyology and herpetology (the journal *Copeia* is named after him and Cope is also well-known for his infamous feud over fossils with Othniel C. Marsh). Cope thought Garman to be "well informed and especially interested in scientific affairs" and decided to invite him in 1872 to join an expedition to Yellowstone. Garman leapt at the offer.

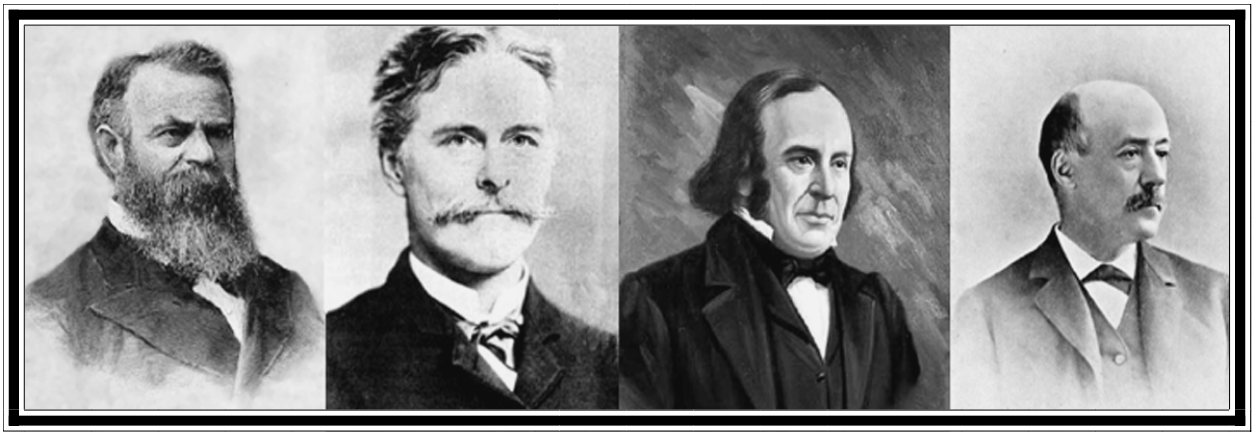
The expedition party was forced to spend three weeks at Fort Bridger in southwest Wyoming before suitable transportation could be obtained, and although exactly what happened during this time is not clear, tensions arose between Cope as the leader of the expedition and Garman as the student. Apparently the prior agreement was that Garman was essentially a volunteer, would be paid for expenses on special expeditions, and would be able to keep

some specimens. According to Cope, just before leaving the fort on the start of the expedition, there was a disagreement as to how much a "volunteer" should be paid and Garman and two other assistants were left at the Fort. Cope, who like Garman also was born to Quaker parents, was furious at having lost three assistants on an important expedition and wrote to his brother that "[Garman] passed himself off as a Friend but I suspect this to be false, and his whole scheme was to get up an expedition of his own. I am glad to be rid of him…" These disputes with Powell and Cope clearly were an early symptom of his tendency to irritate his colleagues in later years.

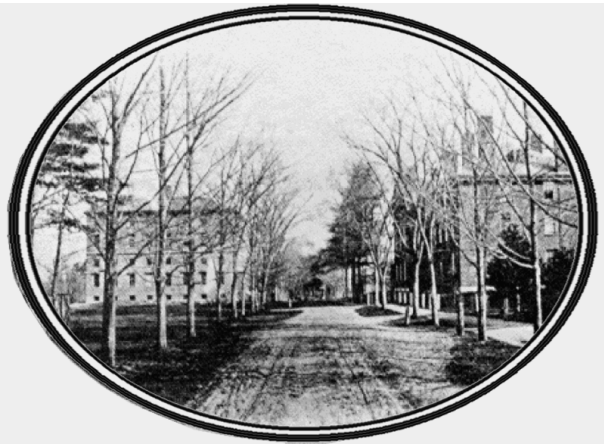
Garman Meets Agassiz

From these fossil fields Garman traveled west to San Francisco and there on board the survey vessel *Hassler* he met an ailing Louis Agassiz. Garman accompanied Agassiz back to Harvard's Museum of Comparative Zoology (MCZ) and, after becoming one of Agassiz's favorite pupils, settled into the scientific community of the Boston area, participating in several scientific societies and publishing papers in their journals.

On the death of his father in 1874, Alexander Agassiz was made curator of the MCZ. Garman's affection for Louis Agassiz and his lifelong friendship with his son amounted almost to hero worship, indicating a worthy spirit of loyalty. In that same year, Garman accompanied Alexander Agassiz on an expedition to Lake Titicaca and the high Andes, and it was on this trip that Garman collected an Andean Condor. One day he climbed a steep rock face and at the top sat to eat his lunch. He had been using an old muzzleloader to collect bird specimens and although he had black powder, he was out of shot. A soaring condor rode thermals back and forth along the edge of the cliff, so close that he could almost touch the bird. He improvised ammunition for the muzzleloader from a suspender button and collected the bird on its next pass by! The details varied a little from time to time and, while he always told the story with the utmost seriousness, there was nevertheless an unmistakable twinkle in his eye. This vestige of a sense of humor also surfaced when, after returning from the west after fossil hunts in the Bad Lands, he would appear in a broad hat and a flaming red necktie.



Significant Figures in the Life of Samuel Walton Garman. Left to Right: John Wesley Powell, Edward Drinker Cope, Louis Agassiz, and Alexander Agassiz.



The Museum of Comparative Zoology shown at the end of Divinity Avenue, 1860's. The Museum was founded in 1859 through the efforts of Louis Agassiz, who served as the Director of the Museum from 1859 until his death in 1873. In 1873 Samuel Garman became a member of the Herpetology and Ichthyology staff and worked at the Museum for the remainder of his professional life.

The Recluse Emerges

On the other hand, even as a young man Garman possessed a most firm dislike for personal publicity. He saw in the West the historical rivalry of Cope and Marsh (which escalated from a feud to an all out war involving personal attacks) to secure each other's fossil specimens and to forestall each other's descriptions of their discoveries. This evidently impressed him very deeply, for all his life long he maintained a singular reticence and it was only after years of intimate friendship that he would discuss any scientific work that he had in hand. Indeed he habitually put away his manuscript and the specimens that he was dissecting when a visitor rang the bell to his room. This was not by any means all from a fear that others might anticipate his results, although he did at times have this fear, as was so commonly the case with the zoologists of those times, but rather because he disliked discussing any of his work until his studies were completed.

When, at the age of 52, Garman married Florence Armstrong, the daughter of a Canadian barrister and member of parliament, the folks at the MCZ must have thought that water ran uphill and that the sun set in the East! A year before the birth of their daughter, Pauline, Alexander Agassiz' departure from the museum in 1898 was marked by a serious downturn of Garman's productivity. Though his production of scientific papers all but ceased, Garman did not retire but continued to rule the fish department from his office in the basement of the museum where his reclusive ways, odd dress, and curmudgeonly attitude made him a figure of fun in his declining years. So seldom did he go upstairs to the museum library or exhibition halls that few students even knew him by sight, for he entered early and left late from his own little grilled door in the basement.

Garman's long-time secretary wrote, "He always wore, winter and summer, the same shabby long black overcoat and a black soft hat, and he looked like something which had hung over from the last century, or perhaps a human blackbird." This portrait of gloom was pushed further with an account of what was found in Garman's office when he died. "…his desk drawers were filled with an accumulation of rubbish which it is hard to believe could exist. The crusts of his daily sandwiches were for years put in an enormous glass jar, perhaps to be fed to birds, but forgotten. The address labels from a weekly paper…were carefully cut off and hundreds upon hundreds stored away in a drawer."

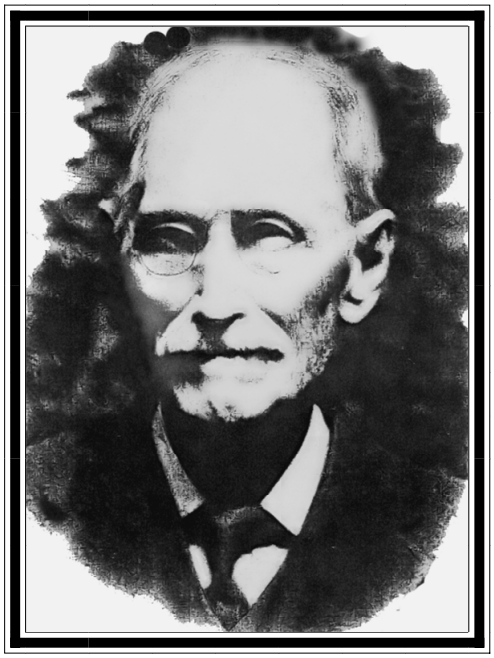
Thomas Barbour, the independently wealthy herpetologist and patron of science, popular writer, and director of the MCZ after Garman's death, was a major participant in portraying Garman as worse than an eccentric. In his popular book, *A Naturalist's Scrapbook*, 1946, Barbour comments that Garman's appointment was another example of Alexander Agassiz' poor judge of character and also takes Garman to task for over-dissecting type specimens,

miss-filing or losing types, unwarranted paranoia, book thievery, and poor preparation of bird skins. Some of this should be taken with the proverbial grain of salt, however, for the reasons for Barbour's extreme dislike can perhaps be traced to his start in the MCZ. Garman was an authoritarian curator at the best of times and, as a young undergraduate, Barbour worked in the museum in both of Garman's domains: fish and reptiles. Indeed, Barbour cannot be trusted in this regard since there is considerable inconsistency in his comments. In the biography of Garman he co-authored with David Starr Jordan shortly after Garman's death, Barbour wrote: "…the junior author [Barbour] was one who worked at his side almost daily for many years, appreciated that gradually he became more warm and kindly in his companionship, while his thorough and most accurate methods of work and his methods of training were always of the very best." Barbour, by the way, wrote only one scientific paper of any consequence during his lifetime, whereas Garman wrote scores of them.

The Verdict

In many ways, Garman epitomizes our notion of a 19th century museum-based systematist: anti-social, obsessed with trivia, slightly tyrannical and extremely productive, if not imaginative, in his pursuit of scientific truth. There is ample evidence that Garman was not an easy man to get along with, and certainly in his later years he was quite eccentric. There is also no doubt, however, that he produced a multitude of important ichthyological works. His skill with a dissecting knife, his perceptive eye for species, and his tireless devotion to descriptive taxonomy earn him a place among significant ichthyologists and, as a result, he has been honored by having a total of 23 new fish species after him.

Garman's misfortune was that he lived in a time of giants, scientists such as David Starr Jordan, Carl Eigenmann, and Carl Hubbs who would write the history of American ichthyology. While Samuel Garman was a good ichthyologist, he was not shoulder-to-shoulder with these greats. His natural reticence and the many non-scientific demands on his time prevented him from engaging in the rough and tumble dialog that is the driving force behind many great scientists. He will be long remembered for a colorful youth, great anatomical work, and useful monographs, followed by an eccentric old age. However, after viewing the rather poignant portrait of Sam Garman in his old age, I prefer that he should be remembered for his younger days as an adventurous youth, and for his later years as one who loved working in his garden, silently communicating with his bees who kept him company as he tended his flowers.



Portrait of Samuel Garman in later life.

ADDENDUM II:

ENDLER'S LIVEBEARER: INTERACTIONS BETWEEN ECOLOGY, TAXONOMY, CONSERVATION BIOLOGY, AQUARISTS AND HABITAT DISTURBANCE

The following is based upon a short side-bar contribution John Endler made to "Ecology and Evolution of Poeciliid Fishes" (Evans et al., 2011, pp. 304-305). I have added additional related material and also defined some of the more technical terms.

Endler's livebearer (*Poecilia wingei*) is also known as Endler's guppy, the Cumana guppy and the Campoma guppy, and is a close relative of guppies (Alexander and Breden, 2004). Dr. John A. Endler, Professor of Biology at the University of California at Santa Barbara found these fish along with guppies (*Poecilia reticulata*) in the Laguna de Los Patos, at Cumana in northeastern Venezuela in 1975 while examining the geographic variation of color patterns in guppies. At the time he thought that they were very different from guppies and gave them to Dr. Donn E. Rosen of the American Museum of Natural History to describe. Although he died before having a chance to do so, he gave some of the live fish to Dr. Klaus Kallman, who then introduced them to aquarists, who in turn spread them around the world, under the name of "Endler's livebearer."

Shortly after Endler's discovery, he found a collection of guppies in the University Of Michigan Museum Of Zoology collected by

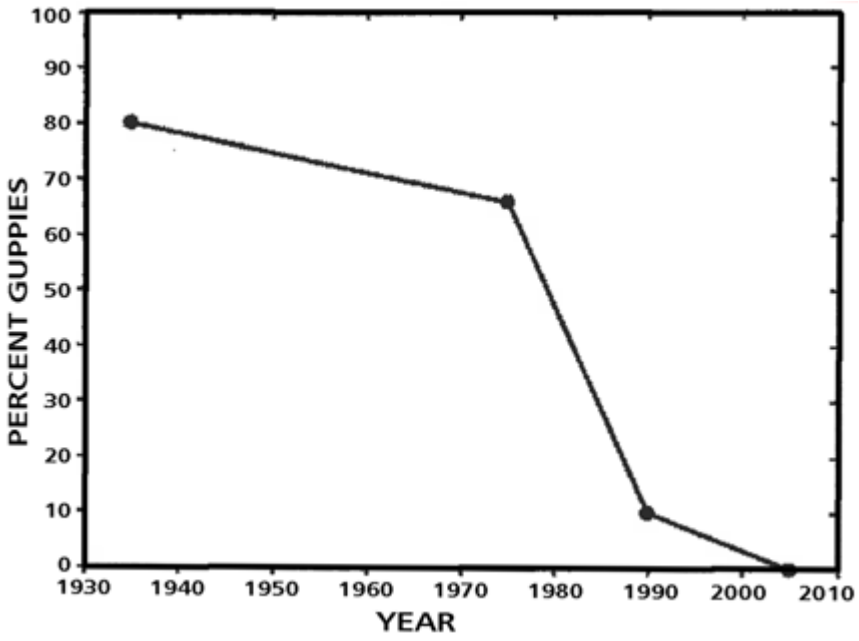
Franklyn F. Bond during 1935-1937, also from the Laguna de Los Patos. Mixed in among the many guppies in the museum jar were the same fish Endler saw in 1975. These should have been the type specimens but when Poeser described the fish as *P. wingei* (Poeser et al. 2005), he had been unable to find the Laguna de Los Patos jar in the museum. Poeser did not think that what was in the Laguna de Los Patos was the same fish that he found elsewhere in 2002, and so he used fish from Campoma (further east along the coast) as the type specimens.

Given the strong interest by aquarists in these fish, Endler encouraged people to go back to his original site and find them again, and this resulted in an interesting plot of the fraction of guppies in the Laguna de Los Patos as a function of time (see the accompanying figure).

Several things happened after Bond and Endler visited the site. When they were at the site guppies (*P. reticulata*) were more common than *P. wingei*. The figure shows they sampled the site in the early stages of the decline of the frequency of *P. reticulata* versus *P. wingei;* indeed, the most recent visitors to the lagoon found no guppies at all (credit to Armando Pou, who visited the site several times).

Endler tried to hybridize them but after trying for more than a year with many pairs of individuals and obtained offspring, he gave up. In the meantime, other breeders had managed to hybridize the two fish, and photographs taken about five years after his first collection started to show clear introgression with guppies, i.e., the movement of a gene (gene flow) from one species into the gene pool of another by the repeated backcrossing of an interspecific hybrid with one of its parent species. Consequently, the distinction between the two species in aquarium stocks began to blur. This resulted in heated debates in the aquarium literature and on Web sites (including some devoted to these fish) about just what Endler's livebearer was, as some people who had hybrids claimed that these were pure strains. Clearly something happened in the aquarium stocks after 1975, as shown in the figure.

It also appeared that something similar happened to the fish in the Laguna de Los Patos. The collectors who went there and brought back fishes found that the two entities hybridized readily in aquaria. It is possible that the declining proportion of guppies meant that the rare-male effect (i.e., a female preference for unfamiliar males) and other effects of asymmetrical abundances of two closely related species resulted in hybridization and introgressive hybridization in the lagoon, and collectors were now sampling a hybrid swarm. This caused even greater controversy among aquarists, but also caused



problems in taxonomy. In fact, by the time Poeser visited the lagoon, he thought that *P. wingei* had been introduced there by aquarists and that the population was not suitable for being the type locality.

There has been an increasing disturbance, fragmentation and pollution in the Laguna de Los Patos. When Endler visited in 1975, the city dump was encroaching on one end of the lagoon, but the rest was intact and in reasonably good condition. Collectors who went back in the 1980s and 1990s found that the lagoon had become fragmented by development and that some parts were so polluted that no fish were present and other parts had many introduced fishes as well as native species.

It is a pity that the change in ecology, the change in the relative abundance of guppies and the extent of hybridization were not monitored over this period, because this might be a case similar to that described by Seehausen et al. (1997). What they found was that although the cichlids of Lake Victoria can interbreed without loss of fertility they are sexually isolated by mate choice. The latter is determined on the basis of coloration, and strong assortative mating (i.e., a nonrandom mating pattern where individuals with similar genotypes and/or phenotypes mate with one another more frequently than what would be expected under a random mating pattern) and can lead quickly to sexual isolation of color morphs. Dull fish coloration, few color morphs and low species diversity were found by the authors in areas that had become turbid as a result of recent eutrophication, the ecosystem response to the addition of artificial or natural substances, such as nitrates and phosphates, through fertilizers or sewage, to an aquatic system. By constraining color vision, turbidity interfered with mate choice, relaxed sexual selection, and blocked the mechanism of reproductive isolation. In this way, human activities that increase turbidity destroy both the mechanism of diversification and that which maintains diversity.

Therefore, as in the Lake Victoria cichlid system, eutrophication, pollution and concomitant changes in the visual and chemical environment may have caused or abetted the hybridization between *P. wingei* and *P. reticulata*. It also stresses the importance of good long-term records, which were not taken here since the process was not obvious before 1980.

This business of good long term records was argued by David Reznick and his co-authors (Reznick, et al., 1994): **"The accurate perception of change requires a period of continuous observation. For species conservation, change has often not been anticipated, so such periods of observation are generally not available. We instead usually have to deal with the imperfect recollections of individual investigators. We argue here that it may be possible to do better than this by making use of old field notes or museum collections. In some cases, these sources can provide accurate descriptions of at least some aspects of past community structure. Our first example is for freshwater streams from Trinidad."**

In the first example, one of the authors (John Endler) had studied streams for 19 years and the available data include repeated visual censuses of fish communities. These censuses contained at least a qualitative index of change in the fish communities accompanying anthropogenic changes in the habitat. Their second example included three types of data gleaned from collections made in Costa Rican streams during the 1960s and 1970s, and housed at the University of Costa Rica. They showed how these collections can be used to describe species abundance and diversity for entire watersheds, yield detailed descriptions of the composition of the community at individual collecting sites, and reveal much about the life histories and ecology of resident species. All of these descriptions

can be used as a frame of reference for evaluating what present communities are like in the same areas, and hence for evaluating how these communities have changed. They argue that similar quantitative descriptions are available for many fish communities throughout the world, and for some other groups of organisms.

Endler posits that the same process may be at earlier stages in the other populations described and mapped by Poeser. *P. wingei* is particularly vulnerable to human disturbance because all known populations are found below 820 feet meters in elevation, and these lowlands are particularly popular for human development, both urban and agricultural. Such disturbances not only endanger this interesting relative of guppies but also makes it difficult even to know exactly what the species is (an as example, just compare Alexander and Breden's views of 2004 with Poeser et al. views of 2005!), further thwarting our understanding of the process of divergence (least to semispecies status), the coexistence of closely related species or semispecies, and speciation itself. The situation is further complicated by the actions of aquarists and fish breeders, as well as introductions of aquarium fishes back into the wild.

As Endler further puts it, **"Here we see a cycle of human disturbance possibly causing hybridization and replacement of two species by a hybrid swarm that confuses the species status in the affected population and confuses the taxonomic status of the entire entity, making conservation as well as ecological and evolutionary studies difficult. This problem is not limited to poeciliids. But it is a problem that perhaps could be best addressed experimentally and theoretically with poeciliids and may help us to conserve other species as well as understand conservation problems more deeply."**

BIBLIOGRAPHY

Alexander, Heather J. and Felix Breden, "Sexual isolation and extreme morphological divergence in the Cumana guppy: a possible case of incipient speciation," *Journal of Evolutionary Biology*, 17, pp. 1238-54, 2004.

Alexander, Heater J., John S. Taylor, Sampson Sze-Tsun Wu and Felix Breden, "Parallel Evolution and Vicariance in the Guppy (*Poecilia reticulata*) over Multiple Spatial and Temporal Scales," *Evolution*, 60(11), pp. 2352-2369, 2006.

Bade, Ernst, *Süsswasser Aquarium*, 3rd Edition, Verlag Fritz Pfennigstorf, Berlin, 1909.

Barbour Thomas, *A Naturalist's Scrapbook*, Cambridge: Harvard University Press, 218 p., 1946.

Bayliss, E. Calver, "Comments On Guppies," *Aquatic Life*, editor August Roth, November, 1960.

Bleher, Heiko, "Fishes in Nature and in the Aquarium, Guppies and their History," *Nutrafin Aquatic News*, No. 2, 2002.

Bolsius, Jr., J., "Albino Guppies, Yes & No." *The Aquarium*, editor, Alan M. Fletcher, April 1969.

Boulenger, Edward G., "Notes on the Breeding of the 'Millions' Fish (*Girardinus poeciloides*)," *Proceedings of the Zoological Society of London*, 906-908,1912.

Brind, Walter Lannoy, *" 'Guppies', 'Platys' and Their Near Relations*," monograph published by Walter L. Brind, New York, NY, 1931.

De Filippi, F., "Note Zoologiche. IV. *Lebistes* nuovo genere di pesce della famiglia dei Ciprinodonti," *Arch. Zool. Anat. Fisiol. (Genova)* v. 1: 69-70, Pl. 4, 1861.

Dendy, P., "The Guppy - King Of Tropical Fish," Part 1/Part II, *Aquatic Life*, editor August Roth, November, 1960/January 1961.

Dendy, P., " The Guppy, As Popular As Ever," *Aquatic Life*, editor August Roth, January 1961.

Dzwillo, M., "Genetische Untersuchungen an domestizierten Stämmen von *Lebistes reticulatus* (Peters)," *Mitt. Hamburg Zool. Mus. Inst.* 57: 143-186, 1959.

Eigenmann, C. H., "The poeciliid fishes of Rio Grande do Sul and the La Plata Basin," *Proc. U. S. Natl. Mus*. v. 32 (no. 1532): 425-433, 1907.

Eigenmann, C. H., "Catalogue of the fresh-water fishes of tropical and south temperate America," In: *Reports of the Princeton University expeditions to Patagonia 1896-1899,* Zoology, Catalogue v. 3 (pt 4): 375-511, 1910.

Endler, John, "Endler's livebearer (*Poecilia wingei*): Interactions between ecology, taxonomy, conservation biology, aquarists, and habitat disturbance," pp. 304-305 in Evans et al. "Ecology and Evolution of Poeciliid Fishes," University of Chicago Press, 2011.

Fowler, Henry.W., "Os peixes de agua doce do Brasil" ("Freshwater Fishes of Brazil") , *Arq. de Zool. do Estado de Sao Paulo*, 1954.

Garman, S., "The Cyprinodonts," *Mem. Mus. Comp. Zool*. v. 19 (pt 1): 1-179, Pls. 1-12. 1895.

Goodrich, H. B., Harrison, R. W., Josephsen, N. D. and Trinkaus, J. P., "Three genes in *Lebistes reticulatus,*" *Genetics*, **28**: 75, 1943.

Goodrich, H.B., Josephson, N.D., Trinkaus, J.P., Slate, J.M., "The cellular expression of two new genes in Lebistes reticulatus," *Genetics* 29: 584-592, 1944.
Gosline, W. A., "A revision of the neotropical catfishes of the family Callichthyidae," *Stanford Ichthyol. Bull*. v. 2 (no. 1): 1-29, 1940.
Gosse, Philip Henry, *The Romance of Natural History*, Gould and Lincoln, Boston, 1861.
Günther, A., "Catalogue of fishes in the British Museum. Catalogue of the Physostomi, containing the families Salmonidae, Percopsidae, Galaxidae, Mormyridae, Gymnarchidae, Esocidae, Umbridae, Scombresocidae, Cyprinodontidae, in the collection of the British Museum", *Cat. Fishes* v. 6: i-xv + 1-368. 1866.
Haskins, C.P. & E.F. Haskins, "Albinism, a semi-lethal autosomal mutation in *Lebistes reticulatus*," *Heredity* 2: 251 – 262, 1948.
Haskins, C. P., and E. F. Haskins, "The inheritance of certain color patterns in wild populations of *Lebistes reticulatus* in Trinidad," *Evolution* 5:216–225, 1951.
Heckel, J. J., "Eine neue Gattung von Poecilien mit rochenartigem Anklammerungs-Organe," *Sitzungsber. Akad. Wiss. Wien* v. 1 (pt 1-5), 289-303, Pls. 8-9, 1848.
Heede, Christian J., "Poecilia Guppyi," *The Bulletin of the Brooklyn Aquarium Society,* editors De Voe, Lienau and Wilco, The Brooklyn Aquarium Society, Brooklyn, New York, November 1911.
Jacobs, Kurt, *Vom Guppy dem Millionenfisch*, 2 volumes, Landbuch Verlag, Germany, 1976.
Jordan, D. S. and C. H. Gilbert, "Synopsis of the fishes of North America," *Bull. U. S. Natl. Mus*. No. 16: i-liv + 1-1018, 1883.
Jordan, D. S., "A preliminary list of the fishes of the West Indies," *Proc. U. S. Natl. Mus*. v. 9 (no. 595): 554-608, 1887.
Jörgensen, Tröst, *Guppybogen*, Borgen, Germany, 1967.
Kelly, Jim, "English vs. American Guppy Breeding," *Aquatic Life*, editor August Roth, January, 1966.
Kelly, Jim, "Irreverent But Relevant (Formation of Guppy Groups in Great Britain)," *Aquarium Illustrated*, editor, Albert J. Klee, Vol. 1, No. 1, January-February, 1966.
Kelly, Jim, "Irreverent But Relevant (Size Differences In U.S. and European Guppies)," *Aquarium Illustrated*, editor, Albert J. Klee, Vol. II, No. 1, January-February, 1967.
Klee, Albert J., "Non Sex-linked Factors in the Body Coloration of the Guppy," *The Aquarium*, October, 1964.
Klee, Albert J., "The Genetics of the Deltatail Guppy," *The Aquarium*, November 1964.
Klee, Albert J., "The Genetics of the Guppy," *The Aquarium*, April 1964.
Klee, Albert J, "Rafinesque to you, too!" *Tropicals Magazine*, editor, Earl Lyons, March - April 1964.
Klee, Albert J., *Know Your Guppies***, The Pet Library Ltd, New York, NY, 1966.**
Klee, Albert J, "A History of the Guppy," *Aquarium News*, editor, Frederick J. Kerr, March – September 1977.
Klee, Albert J., *The Toy Fish - A History of the Aquarium* ***Hobby in America*****, Finley Aquatic Books, Pascoag, RI, 2003.**
Langer, W. F., "Beiträge zur Morphologie der viviparen Cyprinodontiden," *Morph. Jahrb*. Leipzig v. 47 (nos. 1-2): 193-307, 1913.
Meek, S. E., "New species of fishes from tropical America," *Field Columbian Mus. Zool.* Ser. v. 7 (no. 7): 207-211,1909.
Mikkelsen, Dahl, *Guppy*, Clausens, Denmark, 1970.

Mikkelsen, Dahl, *Bogen om Guppy*, Claussens, Denmark, 1977.
Milewski, A. W., "Zur Biologie, Morphologie und Anatomie der lebendgebärenden Zahnkarpfen," *Internatl. Rev. Ges. Hydrobiol. Und Hydrograph.*, vol. 8, pp. 592-625, 1920.
Morell, V., "Predator-free guppies take an evolutionary leap forward," *Science* 275(5308): 1880, 1997.
Paepke, H.J., "Neues zur Entdeckungsgeschichte von *Poecilia reticulata*," *Aquarien Terrarien*, Heft 6/86, 192-194, 1986.
Paepke, H.J. and L. Seegers, "Kritischer Katalog der Typen und Typoide der Fischsammlung des Zoologischen Museums Berlin," Teil 1: Atheriniformes. *Mitt. Zool. Mus.* Berlin, v. 62 (no. 1): 135-186, 1986.
Peters, W. K. H., "Eine neue von Herrn Jagor im Atlantischen Meere gefangene Art der Gattung *Leptocephalus*, und über einige andere neue Fische des Zoologischen Museums," *Monatsb. Akad. Wiss.* Berlin 1859: 411-413,1859.
Petzold, Hans-Günter, *Der Guppy* (*Poecilia* [*Lebistes*] *reticulata*), Wittenberg, Ziemsen, 142, 1967.
Poeser, F.N. and Isbrücker, I.J.H., "Zum wissenschaftlichen Namen des Guppy," *DATZ*, 4**,** 47–49, 2002.
Poeser, F.N., M. Kempkes, and I.J.H. Isbrücker, "Description of *Poecilia (Acanthophacelus) wingei* n. sp. from the Paría Peninsula, Venezuela, including notes on *Acanthophacelus* Eigenmann, 1907 and other subgenera of *Poecilia* Bloch and Schneider, 1808 (Teleostei, Cyprinodontiformes, Poeciliidae). *Contributions to Zoology* 74: 97–115, 2005.
Regan, C. T., "On the fresh-water fishes of the island of Trinidad, based on the collection, notes, and sketches, made by Mr. Lechmere Guppy," *Jour. Proc. Zool. Soc*. Lond. 1906 (pt 2): 378-393, Pls. 21-25, 1906.
Regan, C. T., "A revision of the cyprinodont fishes of the subfamily Poeciliinae," *Proc. Zool. Soc.* Lond. 1913 (pt 4): 977-1018, Pls. 99-101, 1913.
Reznick, D.N., Shaw, F.H., Rodd, F.H. and Shaw, R.G., "Evaluation of the rate of evolution in natural populations of guppies (*Poecilia reticulata*)," *Science* 275(5308): 1934-1937, 1997.
Rosen, D. E., "A New Future for the Guppy," *The Aquarium*, Vol. 26, No. 4 (April), pp. 122-126, 1957.
Rosen, D. E., "Vicariant patterns and historical explanation in biogeography," *Systematic Zoology*, **27**,159-188, 1978.
Rosen, D. E. "Fishes from the uplands and intermontane basins of Guatemala: Revisionary studies and comparative geography," *Bull. Amer. Mus. Nat. Hist.*, 162, 267-376, 1979.
Rosen, D. E. and R. M. Bailey, "The poeciliid fishes (Cyprinodontiformes), their structure, zoogeography, and systematics," *Bull. Am. Mus. Nat. Hist*. v. 126 (art. 1): 1-176, 1963.
Roth, August M. Beginning in 1922 when he took over as Editor and Publisher of *Aquatic Life*, Roth wrote (anonymously) many short news items, abbreviated articles (often under fanciful synonyms), and fish show reports that chronicled the development of the guppy in the aquarium hobby prior to Word War II. Since they are too numerous to list here, they are referenced here simply as, *Aquatic Life*, Baltimore, Maryland, 1922-1942.
Schories, Susanne, Manfred K. Meyer & Manfred Schartl, "Description of *Poecilia (Acanthophacelus) obscura* n. sp., (Teleostei: Poeciliidae), a new guppy species from western Trinidad, with remarks on *P. wingei* and the status of the "Endler's guppy, *Zootaxa*, 2266: 35–50, 2009.

Summers, Adam P. and Thomas J. Koob, "A biographical sketch of Samuel Walton Garman," in *Plagiostomia - the Sharks, Skates and Rays*, A.P. Summers ed., Benthic Press, Los Angeles, CA, 1997.
Summers, Adam P., "Samuel Garman (1843-1927): Gifted ichthyologist or psychotic misanthrope?," American Society of Ichthyologists and Herpetologists Annual Meeting, Seattle, Washington, 1997.
Texera, Yolanda, "La exploración botánica en Venezuela (1754-1950)," *Fondo Editorial Acta Científica Venezolana*, 186 pp., Caracas, 1991.
Vessuri, Hebe, "La Ciencia En America Latina, 1820-1870," in *La Historia General de América Latina de la UNESCO*, Paris, *chapter* 23, *Vol.* VI, of "La Construcción de las Naciones Latinoamericanas," edited by Josefina Z. Vazquez y M. Miño Grijalva (in press).
Weitzman, Stanley H., Personal communication, October 27, 2003.
Whitney, Leon F., *All about Guppies*, Practical Science Publishing Co., 1952
Winge, Ö., "Crossing-over between the X- and the Y-chromosome in *Lebistes*," *Comptes Rendus des Travaux du Laboratoire* Carlsberg 14(20):1–20, 1922.
Winge, Ö, Ditlevsen, E., "Colour inheritance and sex determination in *Lebistes*," *Heredity* 1: 65-83, 1947.
Winge, Ö., "One-sided masculine and sex-linked inheritance in *Lebistes reticulatus*," *Journal of Genetics*, 12: 146–162, 1922.
Winge, Ö., "The location of eighteen genes in *Lebistes reticulatus*," J*ournal of Genetics*, 18:1–43, 1927.
Winge, Ö., and E. Ditlevsen, "A lethal gene in the Y chromosome of *Lebistes*," *Comptes Rendus des Travaux du Laboratoire* Carlsberg 22:203–210, 1938.
Zarer, Paul, "The Guppy And Sword Guppy," *Aquatic Life*, editor August Roth, Nov. 1931.

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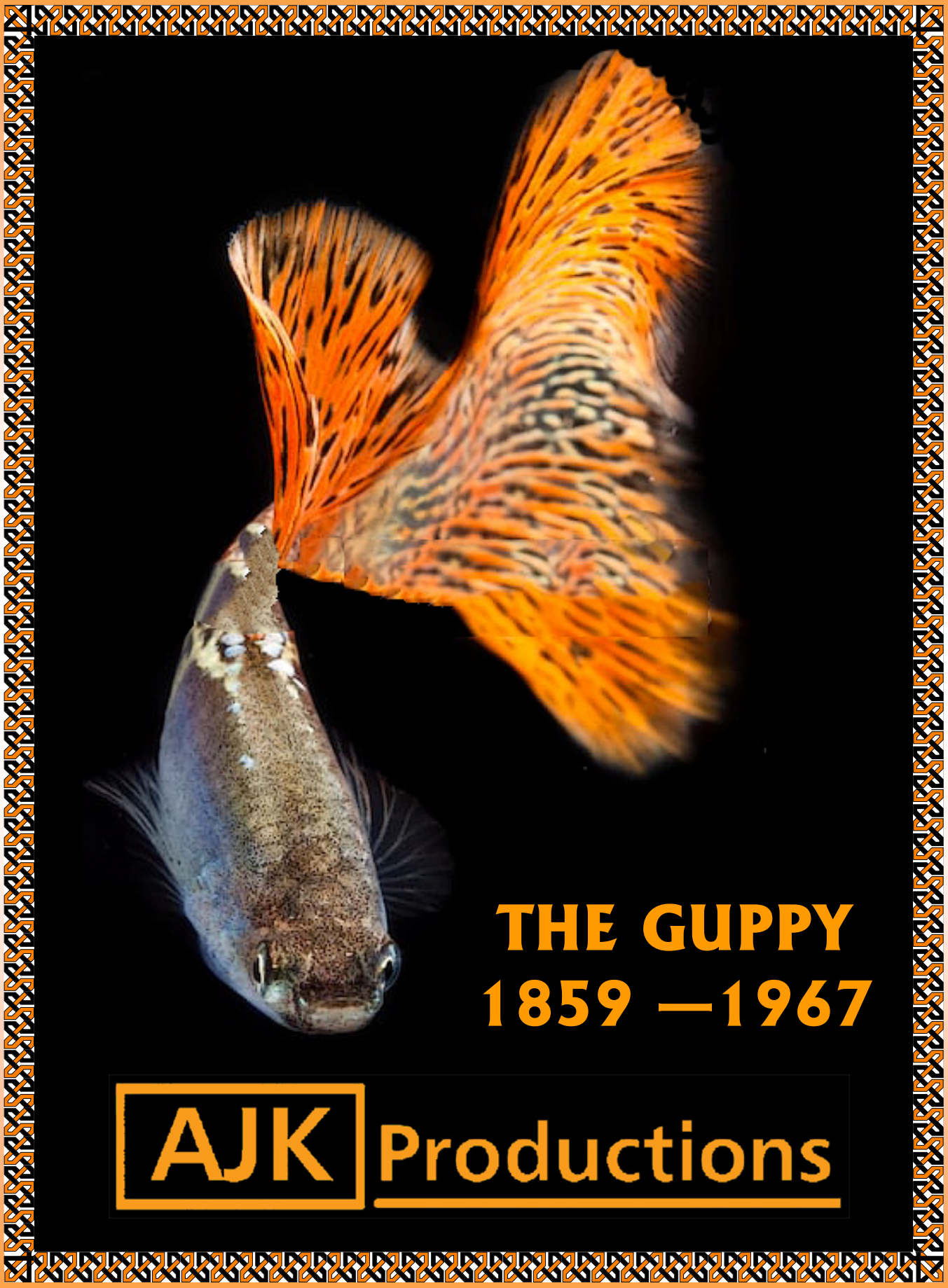
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