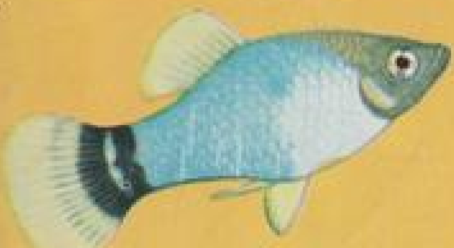
PLATIES



...as pets

A GUIDE TO THE SELECTION, CARE AND BREEDING OF PLATIES

Dr. Myron Gordon,
Fish Geneticist of the
New York Aquarium,
New York Zoological Society.

PLATIES

The four species of platyfishes: *maculatus* (top); *couchianus* (middle) *variatus* (bottom, left); *xiphidium* (bottom, right). Photo by Sam Dunton, N. Y. Zoological Society.

A GUIDE TO THE SELECTION, CARE AND BREEDING OF PLATIES

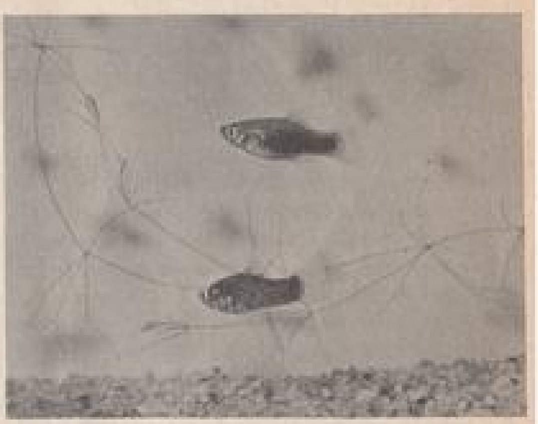
Dr. Myron Gordon,
Fish Geneticist of the
New York Aquarium,
New York Zoological Society.

T.F.H. PUBLICATIONS, Inc.
T.F.H. Building
57 Academy Street
Jersey City 2, N. J.

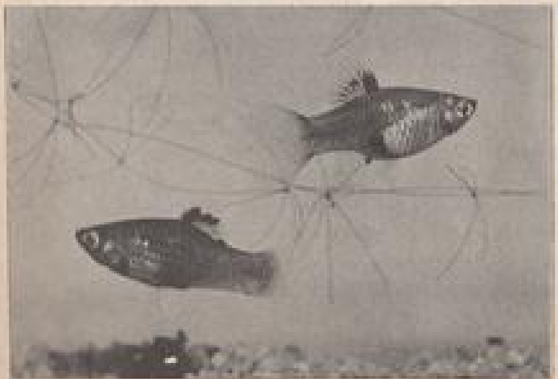
THE PLATYFISHES

Range:	Atlantic coastal waters of Mexico, Guatemala and British Honduras
Habitat:	Spring-fed pools, with abundant aquatic plants
Natural Food:	Aquatic worms, rotifers, crustaceans
Preferred Temperature:	75°F. (temporarily sterile when kept above 85°F. for a week or more)
Age of Maturity:	4 to 6 months
Longevity:	3 years
Courting Male:	Sidles, Swings Gonopodium, Thrusts Gonopodium, Nips, S-Curves, Quivers, Inserts Tip of Gonopodium
Number of Young:	Average 30 (1 to 200)
Gestation Period:	3 weeks
Interval Between Broods:	4 weeks
Family:	POECILIIDAE, the viviparous killifishes
Genus:	*Xiphophorus* (formerly *Platypoecilus*)
Species:	*couchianus*, Rio Grande del Norte, Mexico *xiphidium*, Rio Sota la Marina System, Mexico *variatus*, Rio Panuco System, Mexico *maculatus*, Rio Jamapa, Mexico; Lake Petén, Guatemala; Belize River, British Honduras
First Discoverer:	Charles Girard, namer of *couchianus*, 1859
Second Discoverer:	Albert Guenther, namer of *maculatus*, 1866
Third Discoverer:	Seth E. Meek, namer of *variatus*, 1904
Fourth Discoverer:	Carl L. Hubbs and Myron Gordon, namers of *xiphidium*
Introduced as Aquarium Fish:	*maculatus*, 1907; *variatus*, 1932; *xiphidium*, 1932; *couchianus*, 1932

The Black-bottom platies originally derived from one male caught in the Arroyo Xiphophorino that flows into the Rio Tonto, Oaxaca, Mexico. Photo by Sam Dunton, New York Zoological Society.



The Tuxedo platy, above, and the Salt-and-Pepper platy, below, both came from the same stock. Photo by Sam Dunton, New York Zoological Society.



The Black-topper Platy—a variety that is found in nature. Photo by Sam Dunton, New York Zoological Society.

This map shows the distribution of the fishes of the genus *Xiphophorus* which formerly belonged to the genus *Platypoecilus*.

HOW AQUARISTS MET THE PLATYFISHES

Since their discovery in the early 1860's in some hidden jungle pool in Central America, the wild platyfish have rarely been seen and taken by collectors. Yet today these elusive thumb-sized fish are popular all over the world because most armchair naturalists maintain them in their home aquaria and scientists breed, rear and study them in their laboratories. The many brilliant home and laboratory grown varieties vie with the colors of the rainbow; indeed, no other wild backboned creature in North or Central America can match the great *natural* assortment of hereditary color markings and patterns of the wild platyfish.

Even without counting the bright colors of gold, green, red, white or blue, the platyfish has a symphony of black pigmentary patterns. Some of these individual markings resemble the outlines of celestial bodies such as single and double stars, the crescent or the full moon, and the comet. Some black forms have a halo — like a sun in full eclipse; some overall patterns are as infinitely dotted as the milky way on a dark night in August.

The explanation why the playfish is so excessively variable, especially so when its closely related species and neighbors are markedly uniform, is still in the speculative stage. Some biologists have suggested that the multiplicity of patterns express a state of active evolution in the platyfish. They say that the heritable patterns are associated with hidden properties and are being tested for their survival value to the fish in various localities. Still other scientists point out that an accumulation of some of these slight pigmenary changes in playfish in isolated populations may create, over a long period, a new type of platyfish, perhaps a new race better fitted for survival. As one counts and studies the frequencies of these color patterns in the various races of platyfish, evolutionists say, one may trace the first processes in the origin of species.

Headwaters of the Rio Tamesi. Home of the variatus platy. Photo by Myron Gordon.

The practical fish fancier may not be interested in these scientific theories and problems of evolution, but if he hopes to create new color varieties, the many markings of the platyfish are the raw materials with which he has to begin his work. Out of a simple tail pattern, like *Comet*, the striking Wagtails were created.

Exactly where in Central America and when Monsieur Salle collected the first two specimens of platyfish ever brought to the attention of a scientist, no one knows. His two original fish may still be seen at the British Museum in London. Salle must have collected the two platyfish before 1866, because in that year the Curator of Fishes at the British Museum, Albert Guenther, gave the platy its technical name, *Platypoecilus maculatus*, recording it in the Museum's Catalogue of Fishes in 1866. He must have been thinking of a "broad little fish with a variegated pattern," for that is what the technical words mean. This tongue-twisting label was much too long for aquarists to use or pronounce; but, curiously, the name in print just about measures the length of a large adult fish. Be that as it may, American aquarists chopped *Platypoecilus* down to the first two syllables; to them, the fish's moniker is just "platy."

A year later in the United States when Dr. Francis Sumichrast was sent down to old Mexico, in 1867, on a collection trip for the then budding Smithsonian Institution of Washington, he found thirteen beautifully marked specimens in the Rio Papaloapan near the sun-stupored village of Cosamaloapan in the southern state of Veracruz. Then at the turn of the century, in 1902, Seth E. Meek, Chicago Natural History Museum's Curator of Fishes, on the first major ichthyological expedition to Mexico collected 68 platyfish at El Hule, the village of rubber, on the Rio Papaloapan, the river of butterflies. His platyfish collection fascinated him, for the fish had an extraordinary number of different color patterns. After studying them carefully he came to the conclusion that these fish were the most variable in color markings of all the fishes he had ever seen. To substantiate his claim he published twelve photographs showing a small sample of the fish's remarkable individual markings. It turns out now that Dr. Meek had seen only a small fraction of the incredible array of color patterns of the wild platy. He was entirely unaware of the evolutionary significance of some of those patterns. And for the record neither was I, until we began to explore the natural habitats of the platyfish and had collected hundreds of them from many places in Southern Veracruz, Tabasco, northern Guatemala and in British Honduras. For some reason, as yet unknown, platyfish are found natively only in streams that flow into the Atlantic Ocean; they are not indigenous to the rivers of Pacific slopes.

The Rio Axtla where variatus lives with the pygmy and Montezuma swordtail. These species do not hybridize in nature. Photo by Myron Gordon.

Despite the fact that only a few platyfish were ever taken alive to Europe, probably for the first time in 1907, the fish fanciers have done wonders with them in heightening their colors by selective breeding within a few years. This was accomplished owing to the fortunate discovery that platyfish will hybridize with the swordtail. It turned out that the swordtail had an unique ability to enhance the basic color patterns of the platyfish. Fortunately some of the brilliant platyfish-swordtail hybrids were fertile and the fish fancier was able to intensify, perfect and fix the color effect he liked. In this way he created many new platyfish varieties. Hybridization procedures and selective breeding worked to the advantage of the swordtails, too; actually there are almost as many color varieties of the swordtail as of the platyfish.

While the histories of most of our domesticated animals are shrouded in the mists of past time and the passage of countless generations, the whole story of the platyfish may be traced back to December 1907, the time of its first importation into Germany. And by applying the detecting techniques of geneticists who study the fish's inheritance of color traits, generation after generation, many of the incomplete and frustratingly inaccurate accounts can be checked to get at the historical truth. Some of the so-called mystery color patterns of the fancy domesticated swordtails had to be reconstructed by matings between the wild platyfish, straight out of its jungle home, and equally feral swordtails. By this laborious method the precise ingredients that make up the fancy platy and swordtail types became known. This knowledge was valuable because, by manipulating some of the ingredients or by adding some new items to the mixture, still newer types have been and may be created.

In 1934 I wrote "A History of the Common Platyfish in Aquaria from the Earliest Times," for J. L. Troemner, editor of the Fish Culturist and a remarkable aquarist. I said that the first story ever written about the aquarium dwelling platyfish was by Herr Georg Gerlach whose article, "Neure lebengebarende zahnkarpfen *VIII Platypoecilus maculatus* Gunther," was published in the German magazine, *Wöchenscrift für Aquarien und Terrarienkunde* for *1909*. His story "New Livebearing Toothed Carp" was the eighth in a series devoted to the description of new importations of aquarium fishes. Gerlach had actually seen the original trio of platies that were sent to Paul Matte and Bertha Kuhnt from some undisclosed spot in Central America. Matte and Kuhnt were famous importers and aquarists who had built up one of the largest establishments for the sale of tropical fishes in the early days in Germany.

Among the two females and a male that formed the foundation stock, Gerlach noticed three black markings near the origin of the tail; some platyfish had a one-spot, or a twin-spot or a crescent pattern. For the latter variety the Germans used the word "halbmond" or, translated, "the half moon." It was this variety that provided the early common name for the species, that is, the "moon." Some aquarists thought that the name "moon" reflected the roundish shape of the fish, but this seems unlikely, for the males are seldom plump and moonlike. But the name "moon" was a poor and an ambiguous one, because it denoted only one of the many color patterns of the fish. The name "platy" was suggested as a substitute for the "moon" later by some bright person and, in the course of time, it has won out in popular usage, at least in the United States.

In 1909 another shipment of platyfish again from some undisclosed port in Central America was imported by Sigglekow, a tropical fish dealer of Hamburg, Germany. The shipment was described by Herr Wilhelm Schreitmüller, one of the most prolific writers and aquarium fish reporters in Germany. In 1910 he wrote three articles on the platyfish alone. The great variability of the species puzzled him so that at first he wasn't sure that *Platypoecilus maculatus* was the correct identification. After he decided that it was a true *maculatus platy*, he was puzzled all over again concerning the appearance in mated pairs of some color patterns and their non-appearance in their offspring. For example, some unspotted female platyfish, he said, produced spotted young, while some spotted females produced young, some of which were unspotted. This great enigma was discussed by fish fanciers at the meetings of the German aquarium societies and according to the reports the conflicting data aroused some heated comments.

Had the aquarists isolated each producing platyfish female, and had they known with which colored males each isolated female had mated, and had they kept accurate records of the number of variously colored young each female produced, then perhaps some common sense and agreements could have been obtained, because we know now that most of the patterns of the platyfish are inherited according to defnite hereditary principles.

HOW PLATYFISH LIVE IN THEIR NATURAL HABITAT

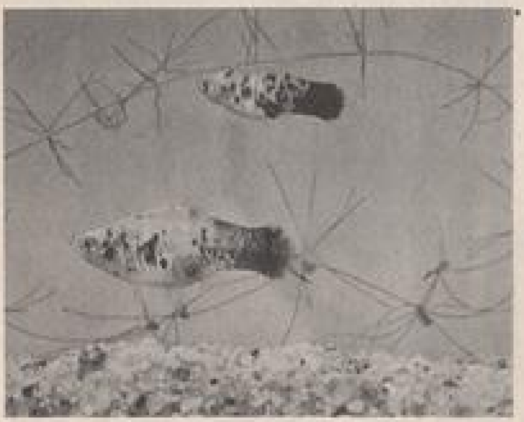
I have learned much about the needs of fishes that are kept in aquaria by observing their way of life in their own native waters. I have probably captured more than 10,000 platyfish in many areas of Mexico and Central America and yet had I waited until I had actually seen a platyfish swimming about in its home territory before I went after it, I would not have been able to collect a single one. This is because platyfish live among dense strands of submerged plants, among the entangling roots of floating plants and in the shadow of overhanging river banks. In these protected niches they are out of sight of kingfishers, herons and other fish-eating birds. At the same time they are less likely to be seen by *Belonesox*, the pike-killy, the fresh water counterpart of the oceanic barracuda to which it has a remarkable resemblance.

When platyfish are trapped in isolated pools, former river beds or in land depressions in the paths of seasonal flood waters, where aquatic plants are unable to establish themselves in such temporarily wetted areas, the small fish hover and feed close to the brownish gray muddy bottoms. There their olive body coloring blends into their background and obscures them as discrete organisms. This practice of camouflage is made even more effective by the usual murkiness of the water which is constantly being stirred up by the erratic movements of tadpoles, by surface winds over the shallow waters and by the feet of cattle, horses and wild animals that come to drink and sometimes to wallow in the mud.

When I am in platyfish country, I search around for water areas ecologically suited for them. If I were looking for platyfish alone, I would pass up the large, deep, fast flowing rivers. I would avoid the small clear streams that flow in the mid channels of wide river beds because they are far removed from the overhanging banks. If I were to find a small, slow flowing brook that twists and turns, cutting under its banks I would work my seine well under the overhang and lift it up scraping the overhanging bank to trap every living thing hidden there. Or if I should locate a swampy, water-lily covered body of water, I would put the lead line of my seine well down on the muddy bottom, circle a small area and gather in all the water plants within reach. I would then drag my seine with the weedy mass to the solid shore for a thorough inspection of its contents. In order to get the platyfish out we have to shake each cluster of weeds over the net.

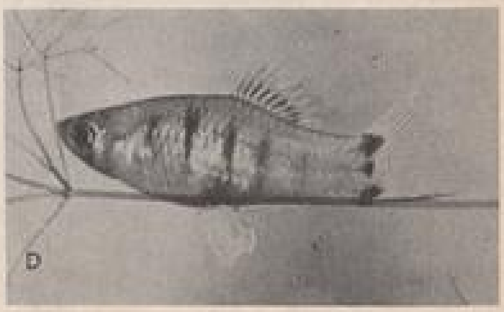
In isolated pools of water that were free of aquatic plants and without overhanging banks, I fished for platies in the early morning hours when the pond waters are still cool. In spots like this, we would drag the lead line of our seine well under the loose bottom mud of a small area and pull it to the nearest shore line. We had to sift the mud carefully to reveal the fish. When the mud was of the gluey kind we had to wash the platyfish off before putting them into our collection bottle. I could tell by their lack of vigorous movements that platyfish taken in waters free of vegetation were at a disadvantage. They were more subject to disease than those obtained from clear water in which plants grew luxuriously.

The author's first platy photograph. An old fashioned rubra female with a goldplaty male—one of the first experimental matings the author made, in 1925, for the study of the inheritance of color patterns.



The Leopard Platyfish — a light colored fish with deep black spots, sometimes called the Milk-and-ink platy. Photo by Sam Dunton, New York Zoological Society.

The Three-spot platy is actually a combination of a Twin-spot and a One-spot; from a natural population. Photo by Sam Dunton, New York Zoological Society.



In keeping with the fact that platyfish seek growing plants in their native waters, I provide their aquaria with plenty of aquatic plants. The platyfish are benefited by plants in a number of ways, some of which are more important than the plants' ability to impart oxygen to the aquarium water. Platies are more peaceable than most aquarium fishes but even they, when placed together in groups of threes or more in a limited space, interact with each other. Eventually, like chickens in the hen yard, one becomes dominant and overaggressive to the others. Thickets of plants provide a welcome and necessary sanctuary for the weaker members of the group. Here the meekest is free to browse on natural food when other foods are denied it by bullying tank-mates.

Another function of plants in the aquarium is to transform raw tap water and make it fit for aquarium fishes. This ability of plants to condition water is equal in importance to their beneficial qualities of oxygenating water and providing a sanctuary for the tiny and the meek members of a community tank. One species of water plant stands out as being one of the best indicators of the suitability of fresh water for platyfish — it is the alga, Nitella. Even though a new aquarium has been filled and allowed to stand 48 hours, the crucial test of its adequacy for fishes is whether or not Nitella can survive in it for 24 hours. If the fine green filaments of the Nitella in the presence of good light turn brown and form scummy fragile threads, the water is unsuitable for platyfish. On the other hand, if the filaments remain firm and green, the chance are good that the aquarium is ready for stocking. Nitella deserves greater popularity not only during breeding and spawning time but throughout the year. When Nitella ceases its vigorous growth despite plenty of light, look for some toxic substance in the water.

PROPER WATER TEMPERATURES FOR PLATYFISH

Many thermostatic controls that are sold commercially cannot be regulated to provide water temperature below 80°F. These should be rejected by the platyfish fancier because the ideal temperature for them is around 74°F. Keeping platyfish at 80°F. or over for a month or more may not kill them but this high temperature will probably sterilize them at least temporarily. Many aquarists who say that platyfish are difficult to breed may have been keeping them too warm. Our experience in the laboratory in New York City shows us that the months of July, August and September are the poorest in productivity.

My experience in collecting platies in southern Mexico confirms my conclusion that this species likes temperate water. We found an open pool about 150 feet in its longest dimension that was kept from drying out by a tiny spring at one end. The pool was adjacent to a banana grove and exposed to the strong Mexican sun. We fished first in the portion furthest away from the spring — in the water that was decidely hot; the thermometer registered 86°F. We got only a few specimens, chiefly mollies and one or two platyfish. In the middle portion of the pool we found the temperature of the water lower, down to 80°F. Here we got many more fishes. But within the spring run, where the temperature of the water was 74°F., we made our best collections.

In another spot we caught fishes by the thousands in the early morning when the water temperatures were around 74° F. In the same pool we caught any at all in late afternoon when the water went above 80° F. When we retur the same area the next day, again in the early morning hours, we caught thou more of them. Between noon and late afternoon, as the temperature rose in re to the tropical sun, the fishes had burrowed into the cool mud and did not e until the water temperatures returned once more to a bearable level.

In my home aquarium I would much rather have a temperature of 70° F 80° F., provided that I was sure it would not drop much below 70° F.

FOODS AND FEEDING

The principles of nutrition are far better appreciated today than they even a few years ago. First in importance is a balanced diet with proper propo of protein, fats and carbohydrates, plus the essential vitamins and minerals.

The science of fish nutrition is poorly developed, although in the last few some definite advances have been made, particularly with respect to hatc reared cold water fishes, like trout. This is due to the splendid work initiate Dr. C. M. McCay of Cornell University and associates at the Federal Fish Hat at Cortland, New York. For the most part the feeding of aquarium fishes is an art than a science. We must think in terms of the broad principles of nut as they apply to all animals, and then we must try to meet the specific min requirements of the kinds of fishes we attempt to rear. Some fishes (like the *Belon* are strict carnivores and what vegetable matter they eat is taken in the a trying to get at the animal they are hunting. The gizzard shad, the carp an molly are supposedly vegetable eaters, which merely means that they will get on a greater proportion of vegetable food than most fishes. But all fishes will some animal food.

Some years ago when I was a student at Cornell and working with the Professor George C. Embody, we made a study of the natural food of brook this consisted of insects for the most part. We found that the proportions o various food substances were as follows, in per cent:

Crude protein	48.73
Fat	15.50
Carbohydrates	25.87
Ash	9.90

Since the heat value of the fat is 2.25 times that of protein the actual ra protein to fats is 0.71 to 1.0. In animal nutrition, this protein to fat ratio is reg as quite narrow and indicates the diet is rich in protein, low in fat. One may appreciate how narrow this 0.71 to 1.0 ratio is when it is compared with the di ratios of some domesticated animals. For instance, the ratio for horses is 1:9, for 1:7, for sheep, 1:8 and swine, which receive a comparatively larger amou protein, the ratio is 1:5. Many biochemists question the utilization of any carbohydrates in the diet of fishes, but they do serve a useful purpose in providing bulk in the diet. This question is by no means settled. Fish, like trout or *Belonesox*, with short intestines and other strictly carnivorous species probably cannot utilize much of the carbohydrate portions of their food. Other species, like mollies, eat algae or the substitute, spinach, and they seem to require some vegetable food.

Without analysis and without testing in a biochemical way the value of the diet which has been worked out for the platyfishes and swordtails in our laboratories, the following is our dietary procedure: we alternate feeding dried food, tubifex worms and wet liver food.

Dried Food: We use any good grade of commercial aquarium fish food, paying special attention to its physical form. The bulk of the better prepared fish foods have dried shrimp as their base. To this, lettuce or spinach is usually added. Some add liver, fish meal, salmon egg meal, clam meal and similar substances. This is supplemented by brewers' dried yeast and vitamins. As yet, no chemical formula of any fish food is available owing perhaps to the expense of analysis and the difficulty of maintaining rigid standards. Dried food, no matter how well suited to the species, chemically, is no good unless the fish is able to swallow the particles. If a fish cannot swallow it, it will rot, spoil the water or fertilize the plants. Thus the physical form of the food is just as important as its chemical composition.

Tubifex Worms: We feed tubifex worms twice a week. Much has been said of the dangers of feeding tubifex worms and all sorts of diseases have been attributed to them. Actually the worms themselves are not responsible for some unfortunate results that accompany feeding them. The trouble lies in the fact that the intestines of worms, when they are collected, are filled with pollution, because the worms live in filthy waters. Knowing that freshly caught worms are dangerous, we never feed tubifex worms until they have been placed in running water for at least 48 hours. After the worms are placed in a shallow dish and running water allowed to pass over, they form a closely intertwined red mat of worms. If this living mat is carefully turned over in the dish, the filth and stench of their evacuated faeces that are exposed is ample proof of the danger of feeding unwashed tubifex worms. The worms should be transferred to a clean tray and washed for another 24 hours of purging under running water as insurance against contamination. Probably the same danger lies in feeding the enchytraens, white worms. If white worms have been feeding on sour milk and bread and their intestines are still gorged with these unwholesome substances (as far as fish are concerned) it is not surprising that fish fed on worms may become sickened.

Wet Liver Food: Recipe.

½ lb. beef liver.
10 tablespoonfuls of Pablum or Seravim.
1 teaspoon of common salt.

Remove the connective tissue covering the liver and remove the lining of the larger blood vessels; then chop and chop until you have a liquid mass. I employ a liquidizer that does the job in two minutes and does a better job than can be done by hand and cleaver in two hours. Two ounces of water are added. The liver and water are mixed and then Pablum or Seravim is added to form a thick paste. The

Often the fancier who wishes to contribute to the enjoyment of aquarists by producing something new and beautiful is con fronted with the deep-seated conservatism of the hobbyist. It has been difficult to maintain certain new strains of pale platies in the face of the strong competition of the aggressively colored ones. None of these discouragements will stop the creative fancier from trying.

Platyfish given plenty of food will not eat their young, particularly if the aquarium housing them contains a good growth of Nitella or Riccia — but Nitella is preferred. The average number of young per brood is 45. These will do well in five gallons of water for about a month, after which they should be divided into lots of ten or less for each five gallons of water.

Remarkable increase in growth and in vigor are seen in those platies which are given some live daphnia or brine shrimp nauplii from the day of their birth and until they are two months old. But platies will take most kinds of food, dried, wet, canned fish, finely chopped beef or scrambled eggs. And it is a good policy to vary the kind of food they get.

CREATION OF THE WAGTAIL

In our routine scientific study of the color pattern inheritance in the platyfishes, I mated the wild Comet to an aquarium-bred Goldplaty. To my surprise and delight all the young developed into gray black Wagtails, the first of their kind! Even in the gray phase the black Wagtails made an immediate hit because a few that were placed on the market were quickly bought up.

It was a simple matter for the scientist to predict that if the gray black Wagtails were mated, brother to sister, he eventually would get some platyfish with the black Wagtail pattern on the golden body. Or, he could also get similar results by mating the gray black Wagtails back to the Goldplaty. Those are exactly the matings I made and all predictions were borne out completely. There were no tricks nor secrets in the creation of the golden black Wagtails. As a matter of fact, three independent breeders were able to get similar results from the first generation stocks presented to them. Breeders have now fixed the golden Wagtail characters and made this colorful strain true-breeding. Some imperfect Wagtail strains continue to throw a small number of plain Goldplaties and a number of Goldplaties with Comet patterns. A few generations of careful selective mating should be sufficient to establish true-breeding golden black Wagtails from those that are not.

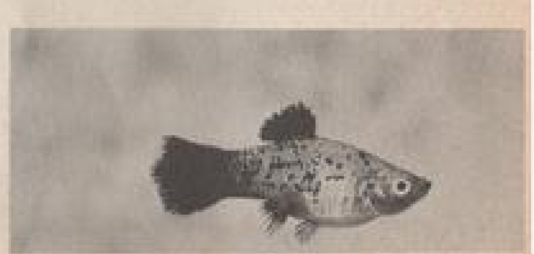
Debut in 1940

For a while the golden black Wagtails were more the curiosity of the scientist rather than the plaything of the home aquarist. The golden Wagtails made their first public debut at the 1940 Christmas meetings of the American Society of Geneticists which were held in connection with the convention of the American Association for the Advancement of Science in Philadelphia. When the show was over, I presented a pair of them to Wm. T. Innes, Editor of The Aquarium, who photographed and publicized them.

A wild platy (left) with a comet and complete crescent mark on its tail. To the right is an unmarked platy. Photo by Sam Dunton, New York Zoological Society.

This grey platy is the first step in the development of the golden wagtail platy. Photo by Myron Gordon.

An early wagtail on a spotted platy. Photo by Myron Gordon.



At the science meetings the golden black Wagtails (which were merely known by their genetic formula as Co *Ej*) were used to bring out the point that a species often takes on new heritable characters during the period of its domestication. The great diversity in dogs, cats and other domesticated animal varieties are ample proof of this. The same is proving true in the platyfishes which have only been domesticated since 1907. During the intervening years many new types have been discovered. The scientific discussion dealt with tracing the origin of the black Wagtail pattern. A wild platy with Comet, it was pointed out, when mated to a wild platy (without the comet pattern) will produce all Comet marked platies, indicating that the Comet mark was dominant over the absence of it. But when a wild Comet was mated to a domesticated Goldplaty, all the young, instead of being simply Comets, were black Wagtails. And recent experiments indicate that when the wild Comet platy is mated to a swordtail, the hybrids have the same Wagtail characters.

New Combinations Possible

Once the scientific breeder of fishes discovered that he could get black Wagtails by crossing the Comet with the Goldplaty or with any of the varieties of the swordtail (including the albino), he could then plan to combine the black Wagtail character with any available color pattern of the body. Some breeders thought that the red, black Wagtail would be a striking color scheme. It was.

Besides the sharply contrasting colors of the golden body and the black fins the golden black Wagtail platy looks as if it were wearing a black mask because its upper and lower jaws and the lower margins of the gill covers are outlined in black. This gives the golden black Wagtail platy a sort of harlequin appearance. Like a clown in a circus the golden black Wagtails in the community aquarium have the ability to arouse the observer's sense of humor.

The Turkish Black Furies, a fine pair of platyfish derived from stock obtained from Dr. Curt Kosswig of the University of Istanbul. Photo by Sam Dunton, New York Zoological Society.

A HORMONE-PRODUCED CHARACTER IN *PLATYPOECILUS MACULATUS* DIAGNOSTIC OF WILD *X. XIPHIDIUM.*

This is the title of a scientific report of an experiment designed to study the effect of a male sex hormone upon the normal sexual development of female platyfish. The results were important not only because they showed that young females could be converted internally as well as externally into male-like platyfish but that the transformed creatures sometimes acquire traits that belong normally to a different species. In the report that follows, the language of the technical article is used for the most part, which, in this case, is fairly clear. The original report appeared in The American Naturalist, volume 77, pages 569-572, 1943 and the authors were Myron Gordon, Herman Cohen and Ross F. Nigrelli.

"Fifteen two-week old genetically determined female *maculatus* platyfish were placed in three three-gallon aquaria. The water temperature was maintained at approximately 24° C. The fish were fed the usual types of food: dried shrimp, dried liver meal mixture and live tubifex worms. Every week they received, in addition, 5 mgm. of pregneninolone crystals, some of which the fish appeared to swallow with the particles of their food. The hormone was given over a period of five months. The control, untreated fish received the identical food and were maintained under similar conditions.

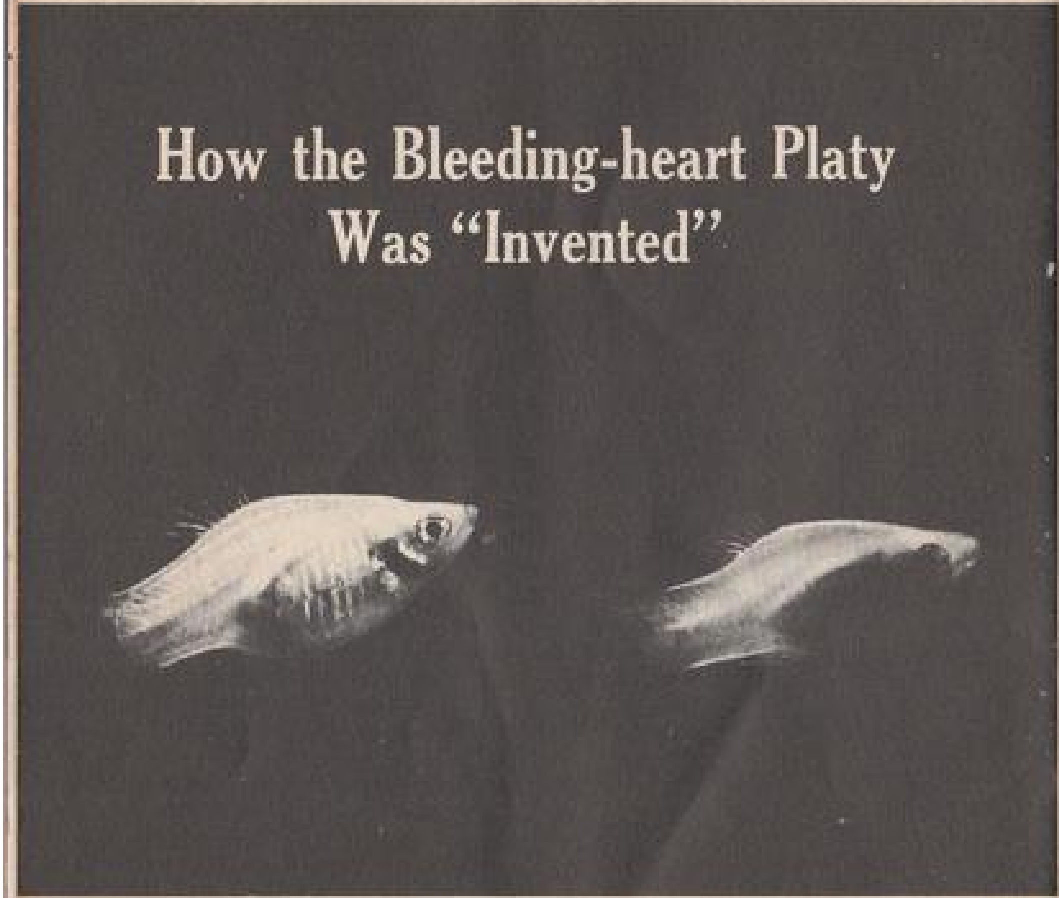
"The effects upon the pregneninolone-treated females were quite marked and were expressed in the changes seen in the gonads, muscles and various parts of the skeleton. The anal fin, unmodified in the normal female, was transformed into a male-like gonopodium and this organ was supported by a typical male-like gonopodial suspensorium and instrumented by a gonopodal muscle. The courtship behavior was typically male-like. In addition to all these effects of the androgenic hormone, a change in the structure of the ventral rays of the caudal fin was induced which is the main subject of this discussion.

"The caudal fin of normal male and female *maculatus* is symmetrical. The caudal fin of pregneninolone-treated females is asymmetrical: some of the fin rays of the ventral sector are much shorter, while other are much longer than their counterparts in the dorsal sector. Specifically, rays number 7, 8 and 9 of the caudal fin, counting from the ventral to the dorsal region, are abnormally short, while ray number 6 is considerably longer than its dorsal counterpart. The shortening of some rays and the lengthening of another produces the appearance of the "sword" in the experimentally masculinized female*maculatus*. This tail structure resembles the normal "sword" of the male xiphidium platyfish.

"The above leads us to postulate that it is likely that platyfishes, as well as swordtails, have genetic factors for sword formation. The genic complex for this structure varies with the species and with the sex of the species involved. These underlying complexes reflect the over-all genetic differences between the species. The normal manifestation of the hereditary factors for long sword, short sword or no sword at all are subject to changes under the influence of exogenous agents, specifically by treatment with unusual doses of sex hormones. Under these conditions, swords may be induced in female *X. helleri* or in female *P. maculatus;* others of the group have not yet been tested."

In following up the results of sexual transformation of females to males, the converted males were incapable of mating effectively — they were sterile.

How the Bleeding-heart Platy Was "Invented"



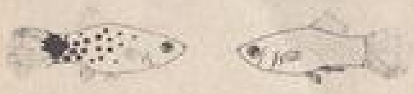
In the flying cage in the Zoo's Bird House I was entertained, several years ago, by a variety of birds from many parts of the world. Some were almost constantly in flight, others waded in the pool below the fountain. Near one corner where I stood, an inconspicuous gray-blue-backed pigeon was lying, resting on the clean, white, dry sand. It rose slowly and walked toward me in hesitating steps. Now I saw its white breast clearly and the frightening fact that some of its breast feathers were stiff and streaked with blood-like crimson. My impulse was to call the keeper, but I first searched the picture labels to find the bird's name. The picture was unmistakable, and the name allayed my fears – it was called the Luzon Bleeding-heart Pigeon. So the "blood" was part of the natural color pattern!

When, some years ago, a bright ruby-throated platyfish was developed in the Society's Genetics Laboratory, my mind flashed back to the pigeon with the crimson breast, and I thought that "Bleeding-heart" was just the right name for the new fish. Now "Bleeding-heart Platy" is the name it bears in the aquarium world. This is the story of its discovery, or, rather, of its development, for the Bleeding-heart Platy is completely man-made as far as its markings are concerned. In that respect it differs little from the man-made breeds of dogs, poultry, cattle and so on; the difference is that we usually know very little about how, when and by whom these domestic breeds were developed, whereas every stage in the creation of the Bleeding-heart Platy fish is on record.

The Bleeding-heart had its origin in two distinct lineages, one wild, the other long domesticated. The domesticated element was another creation of the Genetics Laboratory – the so-called Ghost Platy. Since it played such an important part in the breeding of the Bleeding-heart, I shall first explain how we "made a ghost." It was one result of certain genetic experiments being run off in the laboratory.

In these experiments, a Leopard Platy with black spots on a white background was crossed to a clear Goldplaty. Their contrasting characters were these:

Leopard Platy	Goldplaty
Black spots	No black spots
White body color	Golden body color

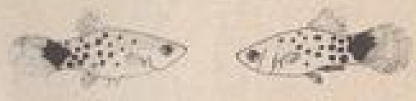


"A Leopard Platy was crossed to a clear Goldplaty."

The trick was to extract the white body coloring of the Leopard and the unspotted feature of the Goldplaty and to combine these two desirable features.

Now, in terms of Mendelian factors of inheritance, it may be said that the black spots of the Leopard Platy parent are dominant over the non-spotted condition of the Goldplaty, so that the spots would persist in the first generation offspring. At the same time, the gold body color of the Goldplaty is dominant over the white body coloring of the Leopard Platy, so that the first generation offspring would be gold instead of white.

Thus, just as I had reason to expect, when the Leopard Platy and the Goldplaty were crossed, their offspring were black-spotted fish with gold body coloring.



"Their offspring were black-spotted fish with gold body coloring."

These black-spotted-gold hybrids were not, in themselves, what I wanted but they had within them the traits that I could now proceed to extract. Their really valuable combination of characters was being carried as recessives – whiteness and unspottedness. By mating two of these hybrids I should get what I wanted – a white, unspotted fish – in the proportion of 1 out of 16 offspring.

9 OF THESE
Black-spotted and golden, like the first generation fish.

3 OF THESE
Black-spotted and white, like the grand-parent Leopard Platy.

3 OF THESE
Unspotted and golden, like the initial grand-parent Goldplaty.

1 OF THESE
Unspotted and white — the new Ghost Platy — the desired combination.

"By mating two of these hybrids, I should get . . . a white, unspotted fish in the proportion of 1 out of 16 offspring."

For my immediate purpose of producing a colony of filmy white, almost transparent fish, only one out of sixteen second-generation offspring was valuable, of course. But quite large numbers of young were produced, so that there were plenty of Ghost Platy brothers and sisters to breed together to establish a real colony. I could be sure of their offspring being white – they carried a combination of recessive hereditary factors so that they always "breed true."

So much for the domesticated side of the Bleeding-heart Platy's inheritance.

NOW FOR THE REMAINING ELEMENT in the production of this new fish – the wild side of the Bleeding-heart's ancestry. It was the side that contributed the distinctive crimson splash on the throat – the "bleeding-heart."

The members of natural populations of wild platyfishes that live in the quiet waters of Mexico, Guatemala and British Honduras, and probably in many other as-yet-unexplored territories of Central America, are exceedingly variable in their coloring. More than one hundred and fifty different markings in black are known from the platyfish that were collected in their native jungle pools and streams and, in addition, the platyfish have four distinctive red or orange patterns.

You might think that since the wild fish already have the red markings of the Bleeding-heart type, chance would have produced some wild fish exactly like the one we were striving to create in the laboratory. The fact is that despite the great variability in the coloring of the wild types, the Bleeding-heart pattern of a red "heart" and a white body is man-made.

In 1939 the New York Aquarium's expedition to Mexico brought back a substantial stock of wild platyfish from the lowlands of the Rio Jamapa. The fish were caught in weedy jungles of aquatic plants in a roadside ditch, only a few miles from the city of Veracruz at a place appropriately called Plaza de Agua. In the profusion of multicolored platyfish that were netted, there were many males with copper-tinted throats and undersides, but their bright coloring was in combination with patterns of blacks and grays.

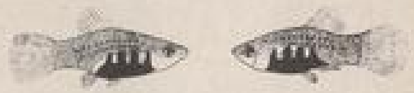
The brighter-colored wild fish we called "Ruby-throat Platys," regardless of whatever other color patterns they may have had.

Looking at these wild fish with their red throats, it occurred to me that the red would be emphasized if we could eliminate the black and the gray on the remainder of the body. The obvious thing was to transfer that red throat to the white-bodied Ghost Platy that had already been developed. The first step was to mate a Ghost Platy and a wild Ruby-throat. Their contrasting characters were these:

GHOST PLATY	WILD RUBY-THROAT
White body coloring	Gray body coloring
Unspotted	Black-spotted
	Ruby-throated

"The first step was to mate a Ghost Platy and a wild Ruby-throat."

An abundant brood was obtained from this mating, and all the young fish resembled their wild Ruby-throated parent. This was because the gray body coloring is dominant over white body coloring, black-spotting is dominant over unspottedness, and the ruby-throat trait is dominant over absence of this character.



"All the young fish resembled their wild Ruby-throat parent."

There was just one more step in the creation of the fish I had decided to create, the Bleeding-heart. These first generation offspring of the Ghost and the Ruby-throat had genetic characters all ready to fall into place, and when they were inbred, brother to sister, 3 out of every 16 second-generation offspring were ruby-throated and white-bodied – in other words, the Bleeding-heart Platyfish I was seeking.

3 OF THESE
Gray, the wild type.

1 OF THESE
White, the Ghost type.

9 OF THESE
Black-spotted, ruby-throated, gray, like the original wild type.

3 OF THESE
No Black-spotting, ruby-throated — the desired Bleeding-heart Platy.

"When they were inbred . . . 3 out of every 16 were ruby-throated and white-bodied —the Bleeding-heart Platyfish."

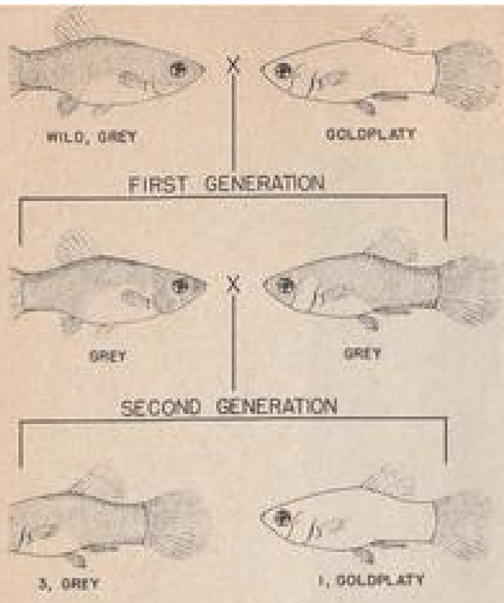
Wild Platyfish were taken in nets from such shallow and muddy pools as this, near the Rio Papaloapan, Mexico. The collector is wearing a net because of the mosquito swarms.

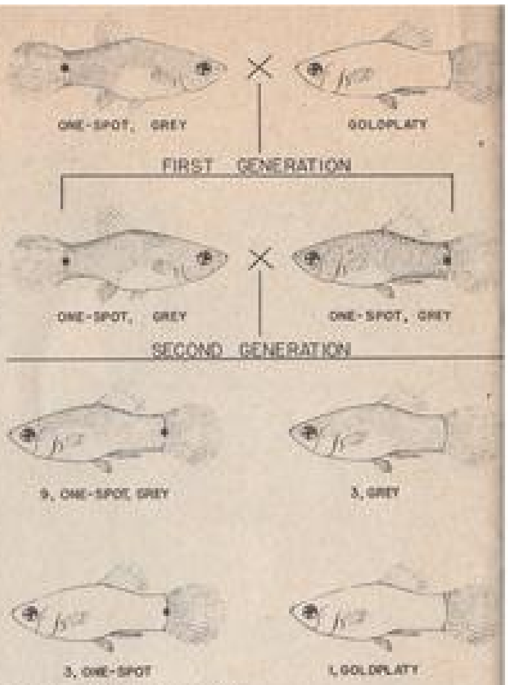
So, at last, after all these steps and stages (which are really quite simple ones, as selective breeding goes), we had the fish we set out to create. It was fortunate that the black-spotting of the wild Ruby-throat was reduced by the Ghost trait of unspottedness, for spotting is attached by inheritance to the Ruby-throat trait and is not readily broken. By watching broods of Bleeding-heart Platys carefully, better and cleaner-cut variations have been selected and bred, so that now we have fish with clear bleeding-heart markings and virtually pure white bodies.

One problem remains for the keen breeder of aquarium fish. The Bleeding-heart character has not as yet been developed in the female platyfish – only the male has the brilliant red coloring. But I am confident that soon the female will be as colorful as the male; such developments are not without precedent.

The Bleeding-hearts were first put on public display in 1948 at the Aquarium in the Zoo as a demonstration of a new variety for the home aquarium. In the summer of 1949, my friend, Dr. Frederick Proewig, suggested that I give him a stock of Bleeding-hearts so that he might take them to Germany. He accomplished his mission and he tells me that the German aquarists were delighted by the colorful new variety of one of their favorite species. Recently, a note in one of their new aquarium magazines recorded the Bleeding-hearts' arrival in German aquaria with enthusiasm.

Many of the native Central American aquarium fishes, including the platyfish, did not come to the United States directly from our adjacent continent, but from European fish culturists who got them first and developed them. Now, in some measure, American aquarists have repaid a debt to European aquarists.





PLATYPOECILUS BECOMES XIPHOPHORUS

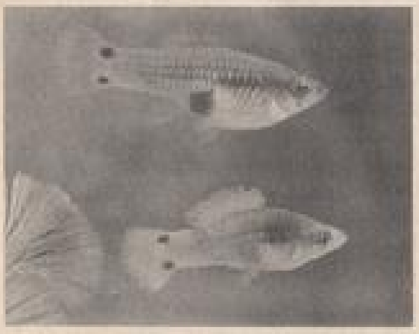
One of the bothersome points about scientific names is their strangeness and apparent complexity. They sound foreign — until by constant usage they become part of our language. Americans around their aquarium, like Americans around the cracker-barrel — or their television sets — have a way of cutting long names and terms down to size. Aquarists neatly trimmed *Mollienesia* to molly. They shortened *Tetragonopterus* to tetra. Aquarists have accepted with no change easy names like *Barbus, Rasbora, Limia, Scalare, Gourami* — all good scientific names. But when *Danio rerio's* name was changed by the scientific pundits to *Brachydanio rerio*, it remained danio to the man in a pet-shop. When many years ago, the scientific name of *Girardinus guppyi* was switched to *Lebistes reticulatus* by Regan, the master English ichthyologist, the aquarists of the world refused to budge; they used guppy then and they use it now. Guppy has become a household word. Hardly any aquarist ever referred to the platy as *Platypoecilus maculatus.* They usually spoke of it under the name of the color variety such as Gold Crescent, Red Moon, Golden Helmet, Tuxedo, Wagtail or a Bleeding-Heart. They rarely mentioned its scientific name — except in slick scientific journals, and, of course, on occasions such as this — at its demise.

Death came to the name *Platypoecilus* after a career in biological nomenclature for 85 years. It first saw the light of day in London in 1866 when Guenther created it on page 350, of the sixth volume of the Catalogue of the Fishes, in the British Museum. It was Guenther's task, as curator of ichthyology, to identify all fishes that were sent to his museum from all parts of the world. Those he could not identify he regarded as being new to science. The new ones had no names so he invented names for them in the language of science. *Platypoecilus maculatus* was one of them.

After identifying various fishes, he grouped them together in units or families. He recognized that the new member, *Platypoecilus*, belonged to the Family Poeciliidae to which other fishes with such familiar names as *Poecilia, Limia, Lebistes, Xiphophorus* and many other live-bearing killifish belonged. Guenther had no notion that *Platypoecilus*, the platyfish, was closely related to *Xiphophorus*, the swordtail. That discovery came in 1913 when C. Tate Regan, his successor at the British Museum, found by some intense detective work that the platyfishes and the swordtails were actually not far apart in their make-up when the superficial differences of length of tail and coloration were discounted. Regan uncovered the clue to their close relationship in the almost parallel structures in the males' sexually modified anal fins or gonopodia. These fins have a variety of projections and depressions that crudely resemble a key.

Xiphophorus couchianus from the Rio Santa Catarina, a tributary of the Rio Grande. Its wordly range is only ten miles from Santa Catarina to Monterrey. Photo by Sam Dunton, New York Zoological Society.

Xiphophorus xiphidium, the Purple Spike-tail platy, from the Rio Soto la Marina. Note the crescent in the male and the tail spot in the female. Photo by Sam Dunton, New York Zoological Society.



A pair of *variatus* platies. The male has a yellow dorsal and caudal fin. Photo by Gerard J. M. Timmerman.

The anal fins of the male platyfishes and swordtails resemble each other. They differ considerably from those of male guppies and mollies which resemble each other. Any good ichthyologist, with the aid of a microscope, can tell the major differences between the platyfish and swordtails on one hand and mollies and guppies on the other. Some can tell just by looking at the whole fins with the unaided eye because the former do not have, while the latter do have, a fleshy flap or palp on their gonopodia. This kind of information is supported by the experiences of the amateur fish breeder. Most aquarists know that it is possible to cross a platy with a swordtail or to cross a guppy with a molly. But the genitalia of platies and swordtails differ radically from those of guppies and mollies. Even should this strong structural barrier to hybridization be overridden by some extraordinarily persistent and vigorous male, the chances are practically nil that any issue would result. The reason for this is that the microscopic mechanical parts (the chromosomes) in the reproductive cells (the spermatozoa and ova) are different in the two groups. The ripe sexual cells of the platyfish and swordtail each contain 24 chromosomes and are matched fairly well, while those of the guppy and molly contain only 23. Each body cell of the platyfish and swordtail contains 48 chromosomes while the cells of the guppies and mollies contain 46.

From time to time reports of successful hybridization between the swordtail and guppy have come to the New York Aquarium staff but in no instance has it been supported when all of the facts of the situation and the alleged hybrids were available.

But let us go back to the platyfishes and swordtails. Considering the times, 1866, Guenther was justified in separating the platyfish from the swordtail by creating the name *Platypoecilus* even though the name *Xiphophorus* was available since 1848. For one thing, Guenther had no male platyfish to compare with the male swordtail. Even if he had, the obvious differences between the two were obviously quite striking. In his day Guenther had no intermediate species between *Platpoecilus maculatus* and *Xiphophorus helleri*. The only two he knew happened to be the extreme types in their group.

In Regan's day (1913), one additional swordtail *(montezumae)* and two additional platyfish *(couchianus* and *variatus)* were known. But the two swordtails had sword-like extensions on their tails while the three platyfishes did not. The important intermediate types were found only recently.

In 1932, a fourth member of the platyfish group was discovered *(xiphidium)*; this one had a small but strong sword-like tail. And then to clinch the matter, in 1943 a third swordtail was found *(pygmaeus)*. The pygmy member was a swordtail, not so much by virtue of its sword-like tail — for that was smaller than the sword of the *xiphidium* platyfish — but because the structure of its gonopodium was more like that of the *helleri* swordtail.

In a new study of the distinctive features between the platyfish and swordtails, based upon all seven species, the author, with the cooperation of Donn Eric Rosen in a recent publication,* decided, rather reluctantly, that the name *Platypoecilus* was superfluous because there was no systematic way to separate the four platyfish from the three swordtails. We had no choice but to retain the name *Xiphophorus* to represent the whole group of seven forms rather than *Platypoecilus* because the former was the older name. *Xiphophorus*, the swordtail, was discovered in 1848, a little more than 100 years ago, by Haeckel, from a collection of fishes from Mexico made by Carl Heller, a horticulturist collecting specimens for the Vienna Botanical Gardens.

If at first the revised scientific name of the platyfish, *Xiphophorus maculatus*, gives you a bit of a shock, possibly because an incongruous association of a fish that has a sword-like tail with one that has none, remember this: Haeckel coined the word *Xiphophorus* (which literally means sword-bearer) not because of the spike-like extension of the male fish's tail but because the male's anal fin or gonopodium was like a *sword* — narrow and pointed like a spear.

The dropping of the name *Platypoecilus* or any scientific name of an animal does not necessarily indicate any change in its common name. It still is platyfish to me and to other aquarists.

*Genetics of species differences in the morphology of the male genitalia of xiphophorin fishes. Bull. Amer. Mus. Nat. Hist., 95 (7): 409-464, 1951.