The Search for a "Phantom" Fish in Northern Colombia

By Frans Vermeulen
Photos and drawings by the author except as noted

It was June 2006. About 5000 meters beneath me, the expansive blue of the Caribbean Sea changed to the brown desert landscape, with hills and dry watercourses, of the La Guajira peninsula. The Bay of Maracaibo was shining in the sun, blue like a swimming pool. A few minutes later, the flight became very turbulent as we passed over the huge mountain massif of the Sierra Nevada, and I was thrown about in my seat, in spite of being firmly buckled in. We passed the 5775 meter high, snow-covered, peaks to the right, and it was a strange experience to see, from the altitude at which we were flying, the mountaintops protruding above the clouds.

Colombia is not a destination commonly chosen by foreign scientists. For the past 35 years or more it has been, and continues to be, plagued by various guerrilla groups and armed militias who have little respect the lives of others. It is, therefore, a very dangerous country for foreign scientists to explore. In many provinces total anarchy rules because the police and the authorities of the villages and towns have either been bribed and are under the influence of the guerrillas, have been killed, or have moved to safer areas.

In spite of these risks, for some time it had been my wish to visit that large, interesting country. My goal was to find some of the killifishes that had been scientifically described, in some cases more than 130 years ago, but which had never been re-collected or introduced alive to aquarium hobbyists. At the Natural History Museum of Vienna (NHMW) there is once such case, a single conserved specimen of a fish collected by F. Steindachner during his expeditions to northern Colombia in 1875. This fish is described as *Cyprinodon martae*.

Cyprinodon martae has been the subject of study by several modern scientists, such as Dr. Jean Huber of France, and it has become clear that it is incorrectly classified and is not a *Cyprinodon* species. This case had thus become of special interest to me.

The genus *Cyprinodon*, described in1803 by Baron de Lacépède of Paris, is a large genus that includes approximately 50 species. The type species is *Cyprinodon variegatus*. Most species belonging to this genus inhabit saline or brackish waters in the southern USA, the northern part of the central and South American coasts, and the offshore islands of the Caribbean Sea. In order to resolve its taxonomic status and

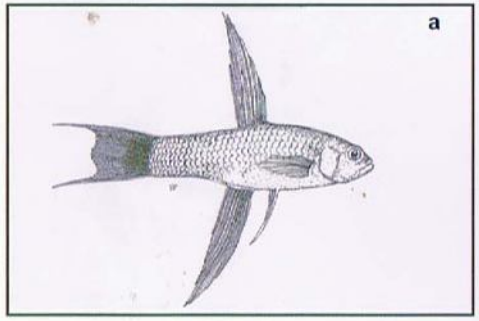
determine the true identity of this fish it would be necessary to re-collect it to obtain live specimens for further study.

Dr. Jean Huber, who was working to solve the puzzle of this "phantom" fish, needed more specimens and additional information, such as that concerning the distribution range and type of habitat, in order to examine its relationships to fishes of other genera. Based on the single type specimen at NHMW the body structure of *Cyprinodon martae* resembles that of the genus *Austrofundulus*, and the elongated fins resemble those of *Terranatos dolichoptherus*, the known distribution of which is in the Llanos of the upper Orinoco River in Venezuela (Figures 1a and 1b).

No precise information was given in the original description of *Cyprinodon martae* regarding the type locality, which was simply described as: "Santa Marta, near the delta of the Rio Magdalena." This description covered an area of approximately 400 sq. km and searching for the fish would be somewhat like searching for the proverbial "needle in a haystack". It should be kept in mind that when this fish was originally collected, travelling in countries such as Colombia was difficult and time-consuming, and an expedition took many months of hard work with no possibility of keeping any collected animals alive. Because of the times and circumstances, information that could be determined and provided about locations was often vague and inaccurate.

Nevertheless, I planned to travel to Santa Marta. Unfortunately, fighting in the area between guerrillas and the Colombian army occurred frequently so I was forced to wait several years to implement my plan. Meanwhile, I collected more information about Colombia and made contact with scientists in Medellin and with people at institutions such as the Alexander von Humboldt Biological Resources Research Institute in Bogotá. I also used the time to improve my Spanish language capabilities. I learned more about the weather conditions in northern Colombia, because I expected the species to be an annual fish and, therefore, the timing of my visit with respect to the rainy season would be crucial. During the latter stages of dry periods annual fishes are only present in the form of eggs buried in the clay substrate of the habitats. On the other hand, at the peak of

Figure 1a: Drawing of *Cyprinodon martae*, based on a single specimen in the Natural History Museum in Vienna. © 2009 by F. Vermeulen. **Figure 1b:** *Terranatos dolichoptherus* Isla Raton RDB 92–22. Photo by A. Terceira. Note the similarity between *Cyprinodon martae* and *Terranatos dolichoptherus* in the shape and proportions of their respective unpaired fins.



the rainy season wide areas become flooded and water levels are far too high to enable the collection of killifishes.

Eventually, the unstable political situation improved to the point that, although still somewhat risky, a journey into the area could be undertaken. I planned a short trip of only one week duration, and one of my Colombian workers accompanied me to assist in the field and to help with any communication problems. Together we took a flight to Barranquilla and after that a bus to Santa Marta. From Santa Marta, we made several excursions along the slopes of the Sierra Nevada. To the north was the province of La Guajira, a peninsula that is formed by the Northeast-passat, a dry moon-like landscape with low bushes, cacti, and some seasonal pools.

South of Santa Marta, there are banana and palm plantations as far as the eye can see, interrupted in places by areas where cattle graze. The region receives a good amount of rainfall, and there are many rivers, usually very cold and swift, that flow down through forests from the Sierra Nevada. Most of these riverbeds are filled with huge boulders and gravel. Santa Marta, a moderately large city, is located between the slopes of the Sierra Nevada and the sea. It is divided by a mountain, the two parts being linked by a mountain road.

I was unsure where to begin my search, but I chose the southern route first, toward the village of Fundacion. To achieve this, we hired a taxi and driver, as no rental cars were available that day, and we spent the entire day driving through the area, stopping at every body of water we saw. When it started to become dark we were forced to return to our hotel, and we had still not

Figure 2: *Austrofundulus guajira* COL 2006–01. Male.

found any killies. The next morning our rental car was available and we drove to the northeast. This time we were able to collect killies, although not the "phantom" fish. I was aware that *Austrofundulus* and *Rachovia* species had been collected from neighbouring Venezuela, so I was pleased to find these beautiful fishes in Columbia as well.

Our first collecting place was a mud hole where cattle came to drink (COL 2006-01). There we found adult specimens of *Austrofundulus guajira* and *Rachovia hummelincki* (Figures 2, 3 and 4). Of course, I wanted to keep the fishes alive but because the habitat water was so muddy and warm, more than 33°C, it was necessary to find cleaner, cooler water for the fish as soon as possible. We found a deeper pool some kilometers further on that provided the necessary cleaner water. Unfortunately, for some of the fish this water change, made about 30 minutes later, came too late and we had some losses.

As we drove northward toward Riohacha, a small harbour town situated on the northern coast, we stopped at a small roadside ditch, about 10 kilometers from the first collecting locality, containing stagnant, cloudy water over a muddy bottom (COL 2006-02). There we were able to collect beautifully colored *Austrofundulus guajira*, with a brick-red margin on the caudal fin (Figure 5). We found only a few specimens of this species at this locality and all were infected by anchor worms, a crustacean parasite known as *Lernaea*. At this locality we also found *Rachovia hummelincki*, some of which had a red color along both the lower and upper margins of the caudal fin. In this species the red marginal band is most commonly restricted to the lower edge of that fin.

Figure 3: *Austrofundulus guajira* COL 2006–01. Female.

Figure 4: *Rachovia hummelincki* COL 2006–01. Male.

Remarkably, at both localities there was a large temperature difference between the upper and lower water layers. At the surface, the temperature was as high as 33°C and about 40 cm deeper, close to the bottom, the temperature was about 27°C. We also determined the GPS coordinates, and we measured the water quality.

The larger *Austrofundulus* inhabited the middle and deeper, and cooler, parts of the pools, whereas the smaller *Rachovia* were found mainly at the edges (Figures 6 and 7). I cannot imagine that the *Rachovia* would have chosen to occupy the much

Figure 5: Austrofundulus guajira COL 2006–02. Male.

Figure 6: The author (left) and his assistant seine for killifish at locality COL 2006–1.

warmer marginal zones if the *Austrofundulus* had not been present in the same habitat. It is possible that the larger *Austrofundulus* prey on the smaller *Rachovia* which, in order to reduce the chance of being eaten, move into the less desirable and much warmer marginal zones of the habitat. The habitat substrate consisted of very soft gray clay, into which we sometimes sunk to knee depth. Unlike many killifish species living in the rain forest, these annual fishes exist in turbid water and do not like water with a low pH. The water is neutral to slightly alkaline, and the lowest pH value measured was 6.75. This knowledge is essential for successful maintenance and breeding of these species.

After collecting at these localities it was necessary to return to Santa Marta because of impending darkness and the possible presence of the FARC, the most feared guerrilla group.

Despite finding no trace of our "phantom" fish, the second day's collecting had already made the trip worthwhile. We had been successful in collecting some very nice fish, and at the hotel we were able to refresh the water of the fishes and transfer them to several plastic bags. As my plastic bags were too small for the large *Austrofundulus guajira*, I stored a group in a large plastic trash bag.

For that first night I stored the fish bags under our beds. As some fishes tend to do when in bags, they spent the night jumping out of the water. I am used to hearing this activity by the fishes but my travel companion was not, and he could not sleep at all because of the noise the fishes made. From then on, we stored them in

Figure 7: Specimens of *Austrofundulus guajira* and *Rachovia hummelincki* in the seine after after capture at locality COL 2006–1. The larger specimens are *Astrofundulus guajira* and the two smaller specimens are *Rachovia hummelincki* (yellow arrows).

the shower every evening so that he could sleep undisturbed. Every morning before breakfast and before we ventured out for another day of collecting we changed the water in all the bags. We had also collected several livebearers, including the beautiful and rare species *Poecilia caucana* (Figure 8) and various dwarf cichlids.

We then went south again, but this time we wanted to penetrate far into the unknown interior and in a westerly direction to the Magdalena River. While

Figure 8: *Poecilia caucana*. Female–top, male–bottom.

heading south on the road from Cienaga to Fundacion, close to the latter town we stopped at a culvert under the road which had some standing water in it. There we found the beautiful *Rachovia brevis*, which had not been in the hobby for the past 34 years and was also on my "wish list." The approximately 3-4 cm long fishes were clearly *Rachovia brevis* and I was especially delighted about this discovery. Many killifish enthusiasts had been waiting a long time for this species to return to the hobby. I was not, in fact, the first person to rediscover this species in Colombia, because Professor Jamie Thomerson had found them in the same area in 1972.

From Fundacion we traveled in a westerly direction, on a dirt road with deep muddy holes. In this marshy area we saw many Rancheros on mules (Figure 9), creating the impression that time had stood still for hundreds of years. At several places in this area we found populations of *Rachovia brevis*, representing different color variations of the species.

At one place, about 165 km west of Fundacion, we stopped at a small farm, where there were some pools visible beyond the farmhouse. We asked permission from the farmer to access the pools and again found *Rachovia brevis* (Figures 10 and 11). Among the captured fishes there were also specimens of the livebearer *Poecilia caucana* and something else that was very strange–three specimens of a *Trichogaster* species that is native to Asia and the last species I expected to find in Colombia. Later I learned that these fishes had spread throughout the entire Magdalena area during major flooding years ago that resulted in the "release" of thousands of these fishes from a fish nursery. Among the *Rachovia*

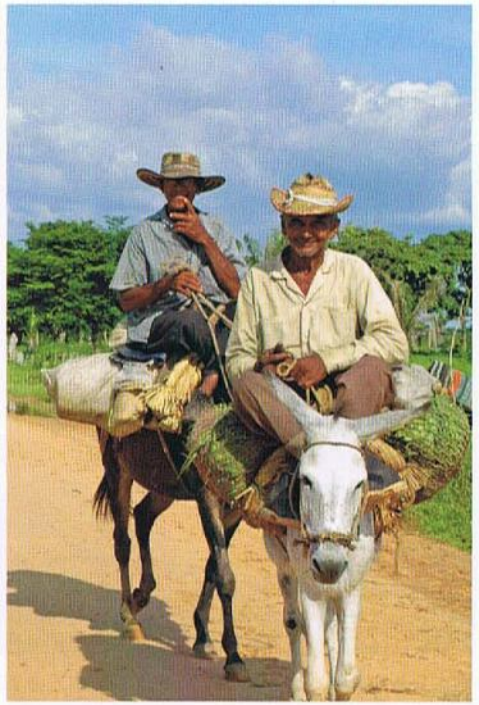


Figure 9: Rancheros on mules, in the area west of Fundacion.

brevis there was a young pair with a somewhat different color pattern and a more elongated shape that could be *Austrofundulus* aff. *myersi*.

To avoid becoming stuck in some of the very deep water-filled holes in the road it had been necessary to maintain a good speed when passing through these obstacles. As a result, by the end of the day's excursion over the dirt road our car was covered with mud from bottom to rooftop. Fortunately, some clever, enterprising local person had built a carwash at the end of the road near the entrance to the village of Pivijay. We gave him the job of cleaning the car, and it required two men more than two hours to accomplish the task. We then proceeded to the ferry terminal for

Figure 10 (above): *Rachovia brevis* COL 2006–4. Female.

Figure 11 (below): *Rachovia brevis* COL 2006–4. Female.

the crossing of the wide Magdalena River, which would then allow us to continue to Santa Marta, a distance of about 175 km. We arrived in time for the last ferry crossing of the day but were informed that there was not enough space for us on the ferry. At that point we were faced with the prospect of having to spend the night on the banks of the river in the car. However, a bribe of US$25 solved the problem, and we saved ourselves the inconvenience of staying behind. I suspect that some other unfortunate person was forced to suffer the night in their car, instead of us. It was a strange sight to see our car on the edge of the movable ramp of the ferry, outside the chain that protected other cars from falling off the ferry! Unfortunately, we could not open the doors to get out of the car to make a photographic record this situation.

The following morning we returned the car to the rental company because there were some disturbing noises coming from the front axle. After the previous day's trip on the rough dirt road this did not come as a big surprise. On that day we also visited the public aquarium of Santa Marta. I wanted to make contact with the fish specialists in the area to find out if any of them had ever heard of my "phantom" fish. Nobody there knew anything about the fish but we were given the address of someone who was known locally as "the Alemán", which means "the German." We found him at his home, which was about 30 km outside the city, in a mountainous region. It turned out that we had found the right person in Professor Eberhard Wedler. He had worked for 25 years at the University of Santa Marta and knew almost everything there was to know about the marine and freshwater fishes of the area.

Figure 12: Eberhard and Gloria Wedler.

Although we arrived at his home unannounced, he and his wife Gloria received us very warmly and listened to the reason for my visit with great interest (Figure 12). Both had not the slightest idea what fish I was looking for, but he wanted to help us find the species. Their house was a small paradise with orchids and a koi pond and was situated on the side of a mountain in the vicinity of the Río Piedras. The whole plot of about one hectare in size included a number of ponds and pools, many of them full of *Tilapia* (Figure 13). There were also barns housing aquariums in which Eberhard bred discus and other desirable fish species. As he is now retired he has an additional income by selling the *Tilapia* for the food market. Water flowed directly from the clear hillside stream into the facility and pipes distributed it throughout the plant.

Figure 13: Some of the outdoor ponds used by Eberhard for raising various fishes, including *Tilapia* for the food market.

With much enthusiasm Eberhard told us of his nature reserve "Reserva Biologia Caoba" which is situated high on the slope of a mountain, not far from the city. There he had purchased 30 hectares of forest to build a reserve for study purposes. He invited us to visit the reserve.

What we saw was like something from a fairy tale. Many ponds of all sizes were connected to each other in stepwise fashion and there was a wonderfully landscaped garden with various interesting plants and trees, many of which could be used for herbal and medicinal purposes. In the ponds there were some *Arapaima gigas* about 2 m in length, and several *Osteoglossum bicirrhosum* (Arowana).

There were beautiful aquarium plants like *Echinodorus* and *Eichornia*, flowering water lilies of all kinds, and *Victoria amazonica*, the giant water lily. It is a beautiful place that nature lovers and researchers can visit, and where seminars can also be held. Eberhard has invested all his savings in this reserve in order to create a paradise where people can relax and learn what the nature of South America has to offer. At the time of our visit he was building accommodations for guests, and some were completed and already in use. If you would like to know more about this project, Eberhard can be contacted at: ebwedler@yahoo.com

Eberhard agreed to accompany us for the remaining two days of our search for the "phantom" fish, because he knows the area like no one else. We visited many places where the species could possibly be. During those days he told us about the history of the area, and it became clear that, because of the development of roads and houses, various water bodies had disappeared. I realized that the "phantom" fish may no longer exist in the area. Although its status could, perhaps, be regarded as "extinct," I still hope that it can be found somewhere.

On returning to Aruba in the Caribbean, where I live, I treated the fishes by carefully removing the parasites with a lancet and placed them in my outdoor fish nursery, where water temperatures vary from 27 to 33°C. Both the *Austrofundulus* and the *Rachovia* species dive deep into the substrate, where they bury their eggs. If the female is ready to spawn the male determines the spot to dive by adopting a head-down attitude against the substrate. The female follows him, and both disappear into the substrate (Figures 14a-d). A lot of substrate gets stirred up due to their activity. Sometimes, even if the layer is thick enough to dive into, both species may also choose to lay their eggs at the surface of the spawning medium. The female uses her anal fin to form a tube to allow the eggs to penetrate deeply into the substrate.

The fish will begin spawning when only half adult size because in nature their time for breeding is short and they need to produce eggs before the habitat dries up again. The eggs remain in the deeper, moist layers of the substrate through the dry season until a new rainy season once again fills the habitats with water and those eggs that are fully developed can hatch. Not all eggs will be at a stage of full development when the first rains fall. This protects the population from extinction should the pool dry out before the full rains arrive. Since these fish have a short lifespan, they grow quickly and within one to two months are able to reproduce. During the dry season the grasses associated with the habitat will also die off. When this dry vegetation becomes inundated by the rains, a rich variety of infusorians will be produced to become the first food for the fry.

In captivity, the juveniles and adults can be fed with foods such as beef heart, mosquito larvae, and other live foods. It is assumed that in nature they feed mainly on various insects and tadpoles and, possibly, also the later-hatched fry of their own kind.

For breeding, I place the coco peat spawning medium in a container with a hole in the lid. This is placed in the breeding tank and the fish will enter the container through the hole and deposit their eggs in the coco peat. Every two weeks I collect the coco peat containing the eggs and store it in a sealed plastic bag for the duration of the incubation period. Depending on temperature, the *Austrofundulus* eggs take between 2 and 12 months to develop. At temperatures around 35°C the eggs will develop fastest. Low temperatures will cause the eggs to remain in diapauses for longer periods. When the eggs are fully developed, the iris of the embryos will be clearly visible. Immersing the spawning medium in water will result in fully developed eggs hatching within two hours. The fry will be able to immediately eat newly-hatched *Artemia* nauplii and, if given weekly water changes and sufficient food, will be of spawning size within one month. Despite the abundant supply of live food, some juveniles will grow more quickly than others. It is, therefore, very important in the first weeks to separate the bigger fry from the smaller ones to avoid the latter being eaten by the former. The females will generally lag behind the males

Figure 14: *Rachovia hummelincki* spawning. **(a)** The male points his snout toward the selected spawning site. **(b)** The female follows the male's lead, diving into the substrate. **(c)** The male dives into the substrate alongside the female. **(d)** Only the caudal fin of the male remains visible above the surface of the substrate.

in terms of growth rate, so separating the larger from the smaller will also preserve more females and provide them with a better opportunity to reach full adult size.

Finally, I can say that during the course of this collecting trip I learned a lot about the fishes of Columbia, as well as the culture and landscape of that country. And, what of my "phantom" fish? Well, perhaps it is extinct or is still waiting somewhere until I travel to Colombia again to look for it.

To see more about the killies of the South American continent, I invite you to visit the following web site: www.itrainsfishes.net.