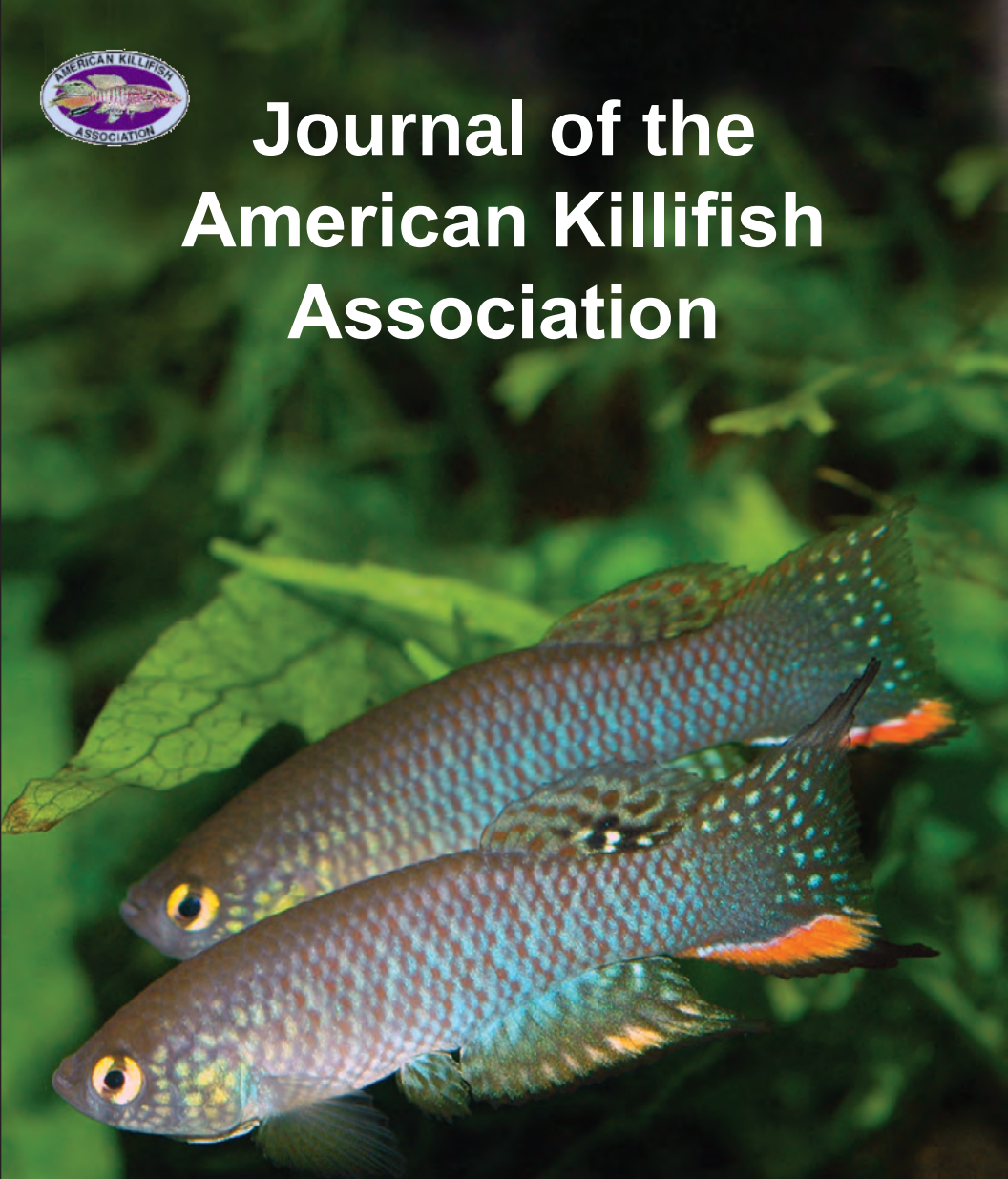
Journal of the American Killifish Association



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The Cover: Fighting juvenile males of *Rachovia* species "Plato" COL 2009-09. Photo by Frans Vermeulen.

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About the Authors

Charles H. Harrison, Ph.D. was born and educated in north Texas. He started keeping killies in 1967, is a long time member of the AKA, and organized the St. Louis Area Killifish Association in 1985. He maintains 30 to 40 tanks of mostly killies, livebearers and small fishes. He also holds the title of Supreme Grand Master Breeder in the Breeder's Award Program of the Missouri Aquarium Society.

"My first interest in parasites came in the early '70s while I was working with the Witchita County Health Dept. Being a Chemist by education I was intensely interested in treatments and how particular compounds affected what parasites. Over the years of keeping and breeding many different families of fishes I have dealt with most all the parasites that plague our fresh water community.

"I have been frustrated with over the counter cures that don't work and promises from pet stores of healthy fish. Even the best breeders are often surprised to find diseases they have passed on to trusting friends. I have found some substances which work to kill off the nematodes and protozoa that cause most of our problems."

Frans Vermeulen was born and raised in The Netherlands. As a child his fascination with all types of aquatic life was almost an obsession. As a young adult Frans became so addicted to the aquarium hobby that he made it his daily profession and opened an aquarium shop that soon became widely known throughout The Netherlands and the neighboring countries. While raising a family he kept the business growing for 15 years, and then at the age of 50 he closed the business, and together with his wife Marjan, he moved to the sunny island of Aruba in the Caribbean. His passion for killies continues and has become a way of life for him. Today his fish room contians about 250 small aquariums in which he keeps and breeds many species of killies, but only the ones from South America. Frans has made numerous expeditions to various parts of South America like Argentina, Guyana, Surinam, Venezuela and Colombia, and he readily shares his experiences as speaker at international killifish conventions in Europe, South America and the USA. He has described some new species and is now working on several new species that he discovered himself not long ago. Frans has also written numerous articles for fish hobby magazines about his fascination. In addition he maintains a multifaceted web site which is a "must see" for all who love killies from Middle- and South America in particular.

For the past thirty-five years **John Brill** has been collecting, maintaining, propagating, photographing, and writing about killifishes, with a particular focus on North American species. He was associate editor of JAKA during the 1980s, and his writing and photographs have appeared in numerous publications, as well as in exhibits for public aquariums and similar institutions, and on the Web. Since the 1970s he has collected fishes from coast to coast in the continental United States, as well as in Mexico, and has amassed a significant photographic archive of fishes and fish habitats. In 1982, Brill was the first (and probably only) person to report on the idiosyncratic spawning behavior of the Baja killifish, *Fundulus lima*. In 2004 he received a Gerald C. Corcoran Educational Grant from the North American Native Fishes Association to produce and mount a photographic exhibit on the fishes of the northeastern United States. During the past decade, he has been instrumental in bringing the AKA photographic competition into the digital age, and has devoted much effort to revitalizing an interest in killifish photography generally. His ongoing, long-term project is the production of a book or database on the killifishes of North America.

Brill has a Bachelor's degree in physiological psychology from Colgate University, although professionally he is a visual artist working in photography and video, with his main gallery representation in New York City. He has received a number of fellowships in photography, and his work is represented in numerous private as well as major museum collections. His first book, The Photography of John Brill, was published in 2002.

The Killies of Venezuela

Frans Vermeulen, Aruba

Abstract of the presentation at the 2011 AKA Convention in Baltimore.

Collecting and travelling in Venezuela need to be well planned as different areas with different climates, regions and landscapes require different preparations.

This northern South American country has many species generally adapted to the lowland coastal plains that abut the Atlantic Ocean to the north, the open Llanos formed by tributaries of the Orinoco River with their rich clay soils, the high plateau grasslands called "Gran Sabana," and the Amazonas Territories in the south, where densely forested river valleys bisect forested mountain ranges.

The Amazonas Territories are roadless and almost inaccessible, and travel is generally by boat up and down the rivers. This remote, inaccessible region is little known, and we still don't know how many species we can expect to find. A lot of investigations will be needed to fill the blank spots on the Killifish distribution map.

The coastal area is readily accessible, with large cities situated along the coastline, but the roads are in poor condition

Rachovia hummelincki COL 2006–02. Male. The *terra typica* of this species is peninsular Paraguana, northern Venezuela.

from inadequate management. Nevertheless, it is possible to reach all kinds of places. In northwestern Venezuela, the coastal plain is dry and desert–like with cacti and bushes growing in the stony soil. The lowlands disappear in the middle of the coastal zone, replaced by an extension of the mountains that reach all the way to the sea. Farther east the coastal plain habitat resumes as we see the reappearance of marshes and waters of the enormous Orinoco River Delta.

The Llanos are accessible through roads in poor but drivable condition. This open landscape is wide and vast, with many rivers descending from the slopes of the Andes. The rivers are flooded by heavy mountain rainfall that flows powerfully down over beds of gravel lined with tumbled rocks and boulders. If the rain stops, the river beds rapidly dry out, but in the lower coastal plain, water overflows the land and floods huge areas. This is home to many annual species that live in the temporary pools that remain as the rivers dry out. I have seen the land surrounding one river totally flooded and at the same time another area not far away completely dry, making it difficult to plan the best time for collecting these annuals. Whether an area is flooded depends not just on local rain, but on the rains in the far away mountains.

The high altitude Gran Sabana has rainy seasons as well but is dry during most of the year. The high plateaus called Tepui's that reach up to 2200 meters above sea level have rain almost every day at their summits, and this water feeds the rivers that meander thru the savannah. The soil is nutrient–poor and is good habitat

Rachovia pyropunctata VGV 2011–10 "Bachaquero". Male. This place is near a river called Rio Misoa that empties into Lake Maracaibo. VGV stands for: Vermeulen–Guerreiro–Venezuela.

for terrestrial orchids and other flowering plants including pitcher plants that get their nutrients by capturing and digesting insects. Huge grass fires can spread over wide areas and much of the vegetation here is fire–dependent, requiring burning of the overgrowth that allows these species of plants to sprout after fires. Nights can be very cold in the savannahs and the top of the plateaus even colder. We believe it is too cold for our killies. However, we do not know that for certain, because no expedition has yet been organized to look for killies or other fish life up there. This would be very costly, as only a helicopter can reach those places. In past years helicopter–borne scientific surveys looked for plants and reptiles and once fishes, and some were seen but not taken.

Now that you have an impression of this country and its landscapes, it must be clear to you that it is not easy to give advice about what time of year is best for collecting, and that it depends on where you want to visit and the species you want to collect.

The desert–like western coast

The killies of the desert–like coast of northwestern Venezuela are *Rachovia pyropunctata*, *Rachovia hummelincki*, *Austrofundulus leoni* , *Austrofundulus leohoignei*, *Terranatos dolichopterus*, *Cyprinodon dearborni* and *Kryptolebias ocellatus*. Some are found in freshwater pools near rivers that empty at the shores of the marine lake Maracaibo. They can survive in very hot

Austrofundulus leohoignei, Sanare, Venezuela. Male. Lives in temporary murky waters along the coastal plains near rivers.

Above: *Kryptolebias marmoratus*. Hermaphrodite. Below: *Kryptolebias marmoratus*. Primary male. *Kryptolebias marmoratus* is normally found in marine waters but sometimes is also found in brackish water. They live in crab holes, which give them shelter against predators.

Rivulus hartii Rio Copei, Isla Margarita. Male. It lives together with millions of guppies and preys on these and on flying insects. This species is distributed along the coastline of Venezuela.

water and cope with wide daily temperature fluctuations. Their habitats are small open pools with stagnant water and, in contrast to most other annuals from the Llanos, also occur in clear water with water lilies and other aquatic plants. The peninsula Paraguana, the *terra typica* of *Rachovia hummelincki*, is dry and after rainfalls, the water gathers in deeper places. People who live there build dams at the lower sides to force more water to be stored and use this water for their land and homes. These pools are murky in most cases and very hot. I found at the end of the season hundreds of *R. hummelincki* dying from the heat and lack of dissolved oxygen.

The middle section and offshore Islands

This area is not rich in killies, but *Rivulus* species find niches here. *Rivulus hartii* occurs on Margarita Island and on the mainland in small creeks together with guppies and small cichlids. *Kryptolebias* is the other killifish from this region. It is a marine species that lives in crab holes among the mangroves.

JAKA needs translators of French, German, Dutch, Spanish, Portuguese, and the Scandinavian languages to provide English versions for the AKA's Journal. Please contact the editor at rjga@aol.com if you can take on an occasional translation from the hobby or technical literature.

Rivulus deltaphilus. Male. This is a member of the *Rivulus urophthalmus* complex that has many members. As the name indicates it can be found in a delta, the huge delta of the Orinoco.

The delta of the Rio Orinoco

Only a few *Rivulus* are described from this delta. Reported is *Rivulus deltaphilus* Seegers 1983, *Rivulus*. cf. *hartii*, (Boulenger 1890) and *Kryptolebias ocellatus* (Hensel 1868). *Rivulus deltaphilus* belongs to the group of *Rivulus urophthalmus*–like fishes. In addition to the Orinoco Delta, this species is found to the south in tributaries of the Rio Cuyuni, itself a tributary of the Rio Essequibo in neighboring Guyana.

The Llanos

Here we find the most colorful killies such as *Gnatholebias hoignei*, *Gnatholebias zonatus*, *Austrofundulus limneus*, *Austrofundulus transilis*, *Llanolebias stellifer*, *Terranatos dolichopterus*, and *Rachovia maculipinnis*. The pools are mostly shaded and cooled by riparian trees but the landscape is otherwise mostly open and barren of trees. The eggs of these fishes have long incubation periods that last a half year or longer. Their eggs must be stored at high temperatures of about 26 to 30°C in order to accelerate development. At cooler temperatures, you must allow a few months longer before the eggs are eyed up. *Gnatholebias* are big fishes that need a huge amount of food to reach adulthood in a short time. They are able to reach maturity and spawn in just six weeks, an adaptation to their continuing existence under unpredictable environmental conditions. Many other species live in the same habitat. I could collect *G. hoignei* together with *L. stellifer* and *R. maculipinnis*. In other locations I found *G. hoignei* with *R. maculipinnis* and *Austrofundulus*

Above: *Rachovia maculipinnis* VGV 2010–03. Near Guanarito. Two fighting males.This species lived together with *Gnatholebias hoignei* and *Llanolebias stellifer* in a shallow pool under the cover of some trees. Below: *Rachovia* aff. *maculipinnis* from near "Pijiguaos". A new species to science and to the hobby of which the description is in progress.

Above: *Rachovia* aff. *maculipinnis* from "Puerto Paez". A new species to science and to the hobby of which the description is in progress. Below: *Gnatholebias zonatus* El Baul–Cojedes. Male. This is a beautiful species to have in your tanks and to breed. Eggs need higher temperatures and development time of about 5 months.

Gnatholebias hoignei VGV 2010–03. Displaying males.

Llanolebias stellifer VGV 2010–03. Male above, female below. This is a remarkable species. Just look at www.itrainsfishes.net to find out more about this fish and its re-discovery.

Austrofundulus transilis VGV 2011–06. Male. Temporary pool at "Papelon" near the cemetery. This image is made by Fernando Guerreiro, Valencia, Venezuela. Note the red in this variety This is a very colorful species.

transilis. In earlier days there were reports from pools that had both *G. hoignei* and *G. zonatus* together. To find places where *Terranatos* lives is not easy, even for Venezuelan ichthyologists. One of these specialists went collecting with me twice. His name is Ing. Oscar Leon Mata, collection manager of the museum Guanare. This is one of the museums in Venezuela with probably the largest collection of fish samples in the world with an average of 55,000 items. I was pleased to have the help of Prof. Otto Castillo, Oscar Leon Mata and my Venezuelan friend Fernando Guerreiro in finding the collection sites. The most important person responsible for building this collection is Prof. Donald Taphorn, well known to ichthyologists worldwide and to the AKA, a colleague of Dr. Jamie Thomerson. Dr. Taphorn now lives in the United States.

The Gran Sabana

The killifishes known from the Gran Sabana with its tepui's are *Rivulus lyricauda*, *Rivulus gransabanae*, *Rivulus* cf. *stagnatus*, and *Rivulus* aff. *gransabanae*. This is not an area where we find annuals. The nights are cold and the days extremely hot. The *Rivulus* here live in streams and do not have any predators. For that reason, the collector can see *Rivulus* swimming in the open. Normally collecting *Rivulus* requires scooping up leaves and other debris and checking for fish inside the net. Collectors

Above: *Rivulus gransabanae* THV 2010–10. Male. San Rafael de Kamoirán in the "Gran Sabana" area. There it lives in high altitude of 1100 meter above sea level and in streams of the open savannah. THV stands for: Tomas-Helker-Vermeulen.
Below: *Rivulus* aff. *gransabanae* THV 2010–11. Male. Gran Sabana area, more to the southern border with Brazil. This species turns out to produce other colors as the *R. gransabana*e from the description.

Above: *Rivulus lyricauda.* Male. "Creeks near Angel Falls". Strongly related to *R. breviceps*, *R. torrenticola*, *R. gransabanae* and *Rivulus* sp. Paryag. This member of the "breviceps group" is a typical inhabitant of the geological formation called the Guyana Plateau.
Below: *Rivulus* aff. *immaculatus.* Male. "Creeks near Kamarang" in neighboring Guyana. This variety shows more colors than the fishes from the type locality "La Escalara" at the Venezuelan side of the border with Guyana where the Kamarang river springs.

Above: *Renova oscari.* Male. This fish was collected on the river island " Isla Raton" in the Orinoco near Puerto Ayacucho. It is named after Ing. Oscar Leon Mata, conservator of the museum in Guanare.
Below: *Micromoema xiphophora* VSV 2009–04. Near Puerto Paez. Juvenile male.The fish in this-photo is similar to the fish from the original description but has a different pattern on the fins and body. VSV stands for: Vermeulen–Sladkowski–Venezuela.

Micromoema aff. *xiphophora* Isla Raton. Male. This species was collected at the river island "Isla Raton" for the first time by Dr. Roger Brousseau and Ing. Oscar Leon Mata. The "Isla Raton" population has been considered to be the real *Micromoema xiphophora* because specimens from the type locality had never been seen alive in the hobby. In my opinion the "Isla Raton" population is different enough from the original description of *M. xiphophora* that further investigation is needed to clarify its status.

do not see them as they are masters in hiding. These highland fishes, all belonging to the ancient *Rivulus breviceps* group, are the only species in the habitat, which is always in midstream at low water level and among streamside grasses if water is high.

The landscape seems to be out of a fairy tale, with huge tepui's on the horizon rising up very high with inaccessibly steep 90 degree walls, while the area around the tepui's is open and broad far as the eye can see. The grassland is filled with flowering orchids able to survive in the poor soil.

I did visit this site more than once. The last time was in May 2011 to collect a *Rivulus* new to science that had been reported earlier. Due to incorrect data about its whereabouts provided to me, we made that trip without collecting this species. In total I traveled 5000 km in seven days on that trip.

The Amazonas Territories

It is still the most undiscovered area in this huge country because of its inaccessibility. The species are diverse and abundant. Known killies in the small area around Puerto Ayacucho are *Renova oscari*, *Micromoema xiphophora*, *Rachovia* species "Puerto Paez", *Rachovia* species "Pijiguaos", *Rivulus tecminae*, *Rivulus nicoi*, *Rivulus* species Tobogán and *Rivulus* species "Maroa".

Rivulus live in the dense forest in creeks and streams, and the annuals live in

Rivulus tecminae. "Tecmina Mine", Atabapo. Male Above, Female below. A robust species with long ventral fins. Eggs need longer incubation time than other species and diapauses are reported (Thomerson) but it is not needed to store them on peat moss. I am finding out in this moment how long they need in water to develop. It is a member of the subgenus Owiyeye.

Rivulus species Tobogán "Tobogán de la Selva"–Amazonas Territory, Venezuela. Pair. The fish on the image is close related to the members of the Subgenus Owiyeye . This subgenus currently contains eleven species (*Rivulus altivelis*, *Rivulus amanapira*, *Rivulus kirovskyi*, *Rivulus mahdiaensis*, *Rivulus nicoi*, *Rivulus rectocaudatus*, *Rivulus romeri*, *Rivulus staecki*, *Rivulus tecminae*, *Rivulus uakti* and *Rivulus uatuman*). Note that *Rivulus staecki* has only been recently described: Schindler, I. & Valdesalici, S. (2011). *Rivulus staecki*, a new killifish (Teleostei: Cyprinodontiformes: Rivulidae) from the upper Rio Negro drainage in southern Venezuela. Vertebrate Zoology 61(1): 109–114.

pools near rivers and in swamps and marshes. Many species and probably several new genera remain to be discovered. I intend to start a collecting trip that will bring me over 500 km up the Rio Ventuari, as far as we can reach in the mountains of the Guyana Plateau. Millions of biting and stinging insects will be the biggest challenge to do this and only with the help of the Museum UNELLEZ, local Amerindian people and permission of the authorities, may we enter this new land for this survey. I am sure we will discover new species of all kind as this area was never subject to such an in–depth search before.

Venezuela is a country rich in killies and among the most colorful and most interesting shapes and habits. It was a pleasure to tell about it during the banquet in Baltimore. This was written for those of you who could not attend. I hope you like the information and if more specific information is needed you can visit my website www.itrainsfishes.net.

Frans Vermeulen, Aruba 2011