

ANOTHER SLICE OF MEXICO

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My very first visit to Mexico lasted only a few hours in 1970 as a child crossing into Tijuana from California. My quest at that time was to “smuggle” fireworks across the border. Mission accomplished, but what left a lasting impression on me was the abject poverty. One image that still haunts me today is driving over a dry gulch with hundreds of tiny one-room “homes” constructed of cement blocks. The roofs were draped with tar paper anchored down by more cement blocks. I struggled with this reality and wondered then (and still do now) how could the quality of people’s lives be so starkly different just because a border separates them.

In 2017, I returned to Mexico joining a fish study group visiting many sites from Mexico City to Guadalajara (Schmidt 2019). Our guides were Drs. John Lyons (University of Wisconsin, Madison, and NANFA member) and Norman Mercado-Silva (Universidad Autónoma del Estado de Morelos). This trip focused primarily on endemic goodeids, and no, I did not smuggle any home. We took all we needed in photos and the wonderful experience of collecting these unique fishes in their habitats. However, the trip was somber at times learning the many threats

facing goodeids and other native fishes but also uplifting seeing the conservation efforts underway to maintain many species in captivity and eventually restore wild populations.

In 2018, John and Norman led a second but very different, study group in the state of San Luis Potosi (Figure 1) with one day spent in the neighboring state of Veracruz on the very wide and deep Río Pánuco. We saw only a few goodeids on this trip but a somewhat greater species diversity. However, the big bonus was incredible scenery including rugged mountains, cactus-studded deserts, and, of course, crystal-clear springs and streams.

A BREAK FROM A MINNESOTA WINTER BEGINS

March 4, 2018: My wife (Mary), son (Bryan), and I met Stephan Tanner (NANFA member) at the Minneapolis–St. Paul Airport. I knew Stephan through the Minnesota Aquarium Society but now was looking forward to more fully getting acquainted. Stephan owns Swiss Tropicals and as the name implies, was born and raised in Switzerland. I had only a rudimentary background on the country and the Swiss people from my decades-outdated Junior High geography class. Now, I had my personal tutor for a

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Figure 1. 2018 fish study group sites. The inset shows the Mexican state of San Luis Potosi. Overall, the study group visited ten localities and encountered 37 species in 10 families. This includes 33 natives and four exotics (Appendix 1).



Figure 2. From top: Venado collecting site: Juan Miguel, Bryan, Tim, and Stephen Beaman. Konrad helping Fritz photograph fish (John Olson). Mary shooting Stephen Beaman. John Lyons dip netting.

week to fill in some of the gaps, and I asked many questions to satisfy my curiosity.

We knew we would face a little drama with our connecting flight in Dallas. I had made the flight reservations for my family and forwarded them to Stephan so he could join us. Not being a frequent-flyer, I did not catch there was only a 49-minute layover between flights. Stephan, the international traveler, did and sure enough our departure was delayed. We hustled to the shuttle in Dallas and our anxiety eased somewhat as we glanced at the flight monitors and saw that our next departure time was also delayed. We arrived at the gate and were barely able to catch our breath before the plane started boarding.

John and Norman welcomed the four of us at the San Luis Potosi Airport. John “had to wait” at the airport for Fritz Rohde (NANFA’s fearless leader and last arrival), while Norman shepherded us to a very nice and modern hotel: exactly what these weary travelers needed before beginning our new adventure.

March 5, 2018: The study group assembled for breakfast in the morning. NANFA members dominated the group with Fritz and Tim Aldridge (North Carolina), Stephan Tanner (Minnesota), Bryan, John Olson (Iowa), Stephen Beaman (South Carolina), and me. Jim Herman (California) is an American Livebearer Association member and also another veteran of the 2017 study group. Litzi Hartley and Naomi Sheehan (Illinois), who are mother and daughter and aquarium enthusiasts were also members of the group. And my dear wife, who needed just a little convincing back in December this trip was going to be more than all about fish.

Our mini-bus pulled up in front of the hotel and we met our driver, Israel Chávez Bernal. Throughout the trip, he always had a welcoming smile that beamed ear-to-ear and gently navigated the bus over bad roads and ever-present (and not always marked) speed bumps. Before heading out of the city, we picked up Juan Miguel Artigas Azas, a civil engineer who is also a self-taught expert on this part of Mexico’s flora and fauna. This expertise includes describing the Tamasopo Cichlid *Herichthys tamasopoensis*, which we were going to see later in the trip. Please visit his websites The Cichlid Room Companion at (www.cichlidae.com) and The Freshwater Fishes of Mexico (www.mexfish.info), which will have images and information on many species we encountered during our trip.

Our first site was a park in a high-desert area near the town of Venado (Figure 2). The area was filled with tiny springs that formed streamlets feeding a larger, but shallow, crystal-clear stream. Tim, Stephen Beaman, and Bryan got down to business micro-fishing; Fritz set up his photo-tank; Norman tried cast netting; Mary took pictures of the people doing fishy things and the park’s flora; and I “shadowed” John Lyons who was dip netting vegetated edges along the stream. It only took a few scoops to find two of three species we saw here: Relict Splitfin *Xenoporphorus captivus* and Green Swordtail *Xiphophorus helleri* (Figure 3). The third was suspected to be a Pánuco Gambusia *Gambusia panuco*; however, only a single female was collected, and males are needed for a positive identification. Tim found us and showed off his catch. John remarked, “This is probably the first *captivus* taken by hook-and-line!” We also collected an unknown species of crayfish. I wish I knew them better! Our second site at another park with similar habitats near Moctezuma yielded only Relict Splitfins and Green Swordtails.



Figure 3. From top: Perhaps the first Relict Splitfin caught on hook-and-line (Tim Aldridge), male adult and juvenile Relict Splitfins (Fritz Rohde), and male Green Swordtail.



Figure 4. Norman photo-bombing Juan Miguel (John Lyons).



Figure 5. From top: Fishing with cows in Río Jesus Maria. (John Olson), Fritz stealing fish from Litzi to photograph (John Lyons), and woman harvesting cactus (Mary Stefansky).



Figure 6. From top: Mexican Tetra, Río Verde subspecies (Fritz Rohde). Male Jeweled Splitfin (Fritz Rohde). Dusky Goodea (first-Fritz Rohde). Second showing dusky appearance.

Time for lunch. Juan Miguel, who from his years of traveling the countryside in search of flora and fauna had also become an expert on fine dining establishments, knew of one along our route (Figure 4). In the restaurant environment, John Lyons and Norman switched hats from guides to translators explaining menu items to us and relaying our meal selections to the waiters. Litzi is fluent in Spanish, but the rest of us scraped by with the bare essentials: *hola* (hello), *buenos dias* (good morning), *gracias* (thank you), and the most vital, *baño* (bathroom).

Our last site for the day was on the Río Jesus María near the town of Jesus Maria (Figures 5 and 6). This was an intermittent stream which, at this time of year, was restricted to isolated and very eutrophic pools above and below a railroad culvert. We also very soon learned this was the communal cattle watering hole

where cowboys brought their small herds to share the site with us. The cows did not quite know what to make of us and many kept a wide berth. Mary met a local resident harvesting cactus. Here we found the Río Verde subspecies of the Mexican Tetra *Astyanax mexicanus rioverde*, Dusky Goodea *Goodea atripinnis gracilis*, Jeweled Splitfin *Xenotoca variata* (Figure 6), and Blue Tilapia *Oreochromis aureus*. In 2017, we saw the Blackfin Goodea *G. a. atripinnis* at four sites, and some exhibited the same full-body, black-velvet color of mollies. I did not see that here but can confirm the term “Dusky” aptly describes this subspecies.

Being this far south in latitude, I was expecting a much greater diversity, but John explained that the area is so geologically active that many small watersheds are isolated by waterfalls or other barriers that make colonization difficult. Quakes and volcanoes have obliterated many areas such that they’re relatively young in geologic time so there haven’t been long periods for major species radiations to occur in many areas. There are a few areas that are quite ancient, and they have higher diversity, whereas others are fairly new in geological terms and have fewer species.

March 6, 2018: Today’s route took us through the scenic Sierra Madre Oriental Mountains and into a fertile, sub-tropical valley to the small city of Río Verde. Our destination sounded mysterious and mystical—Charco Azul—and for a short time turned into something like a quest for a long-lost legendary city. Norman had the coordinates in his smart phone, but he lost service out in the boonies. After some backtracking, we found the sparkling, azure-colored swimming hole (Figure 7). The pretty pool emptied into an enticing stream bordered with cypress trees. The study group disbanded to do their thing. Jim ventured away from the water to do some birding. I have to say he masterfully captured their images up close and personal with his camera. I asked him if he publishes his photos. They were that good! He said he didn’t and usually just files them on his computer. Mary, Litzi, Naomi, and John Olson went snorkeling. The spring here was thermal, and there was a slight odor of sulfur wafting from the pool. However, Mary later remarked the water temperature was just right to take the chill out and yet still felt very refreshing. I followed John Lyons and Norman to survey the stream with a backpack shocker, which didn’t bring in a single fish. They were sweating away in their chest waders, but Norman shed his, and I found the water just right for cut-offs and sneakers when we moved on to seining and better results. Tim and Stephen Beaman wet their lines, but one different looking cichlid species eluded them. Tim had one on but could not land it. He finally resorted to his cast net and I was so envious how he skillfully deployed it. However, all for naught: the mystery cichlids evaded every cast. Stephan Tanner and I later swam across the pool to seine some bulrushes. Again, I saw one of those crafty cichlids in the seine, but as we lifted the net, it went airborne jumping over the float-line. The tally for the team’s efforts racked up a species list of seven fishes, all of them native! This time, male Pánuco Gambusia were collected, which verified the species’ identification. New species thus far included Bicolor Minnow *Tampichthys dichroma*, Bluefin Splitfin *Ataeniobius toweri*, Medina Luna Pupfish *Cualac tessellatus*, Shortfin Molly *Poecilia mexicana*, Medina Luna Cichlid *H. bartoni*, and Black-cheek Cichlid *H. labridens* (Figure 8).

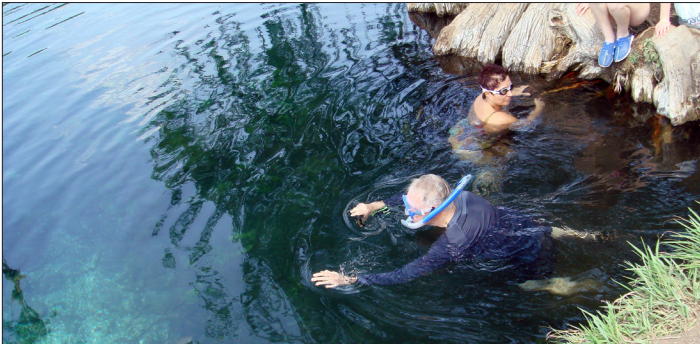


Figure 7. Left column, from top: Charco Azul (John Olson). Litz and John Olson snorkeling. Tim micro-fishing. Right column, from top: Norman, John Lyons, and Konrad working the outlet's stream bank (Fritz Rohde). Fritz on the prowl again, panhandling for fish (Tim Aldridge).

March 7, 2018: We were now base-camped at Hotel Taninul, which is really a spa resort with a sulfur swimming pool fed by hot thermal springs. The resort grounds had a variety of habitats, and during our stay we noticed Jim taking frequent birding walks with camera in hand ready to shoot his elusive subjects (Figure 9).

The plan for this day was to snorkel at Tamasopo Falls, but we woke to rain and chilly temperatures. John Lyons and Norman decided to move up the Río Pánuco trip, and we were soon on our way to the tropical coastal plain in the state of Veracruz. The rain lessened to a steady drizzle, but the wind still felt cold to this Minnesotan. We hiked about a quarter-mile to the river (Figure 10). It was big and the two Johns and Norman soon found out—deep! They had, for the most part, hug the banks. John Olson, always the trooper, pushed a little too far into the dark and muddy frontier and slightly topped his chest waders. Everyone knew he was alright but just a little soggy. John Lyons announced to the group that according to Wisconsin custom, Mr. Olson now owed everyone a round of donuts (ha ha). In the

end, we saw very few fish in numbers but some really interesting species including the coastal Pánuco subspecies of Mexican Tetra *Astyanax mexicanus argentatus*, Atlantic Needlefish *Strogylura marina*, Opossum Pipefish *Microphis brachyurus*, and Bigmouth Sleeper *Gobiomorus dormitor*. There was also a neat looking shrimp and a dead Silver Carp *Hypophthalmichthys molitrix*, which John justified counting because it was “fresh.” Meanwhile, Mary was experiencing a little melodrama, which she recalled in an email to a friend later in the day:

I was wandering all over looking at interesting plants when I heard they caught fish. I thought Konrad had gone over there so I headed over with Naomi who was following me around. She's eleven and here with her mother. Us three girls and ten goofy guys. Anyway, Naomi and I headed over along the river bank on a path through ten-foot-tall grasses that the guys had trampled. It was kind of muddy. First, I fell in a hole. Then, it got so muddy that my foot sunk down and I couldn't get my shoe



Figure 8. Left column, from top: Bicolor Minnow (Fritz Rohde). Bluefin Splitfin (Tim Aldridge). Two images of Medina Luna Pupfish (male, Fritz Rohde, and juvenile). Pánuco Gambusia. Right column, from top: Two images of Medina Luna Cichlid (second - Fritz Rohde), and two images of Blackcheek Cichlid (second - Fritz Rohde).

out. I had to pull my foot out of my shoe and then dig my shoe out. By that time, my other foot had sunk down and was stuck. Great! I could see this going on forever. I got that foot and shoe out and then the other one sunk down. Finally, I got both feet and shoes out of the mud. I somehow put my muddy shoes on over my muddy socks and then tried to turn back. I fell on my butt, twice, before

I could get out of there. It turns out Konrad and Bryan and a few others were sitting up the road in the dry van. I did finally get to see the fish when they brought them back to where we were standing. I was a mess! Mud all over my pants, shoes, shirt, and then we headed to a restaurant.

Everyone but me decided to take an evening dip in the hot springs swimming pool. The sulfur odor (i.e., rotten eggs) was

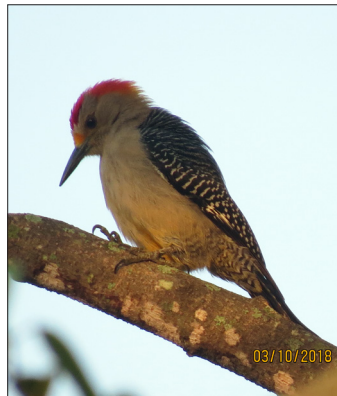


Figure 9. Top left: Hotel Taninul. Norman and Tim waiting for bus and Jim back from birding (Mary Stefansky). Top right: sulfur swimming pool (John Lyons). Bottom: Some of Jim's bird shots taken near the hotel. From left: Hooded Oriole, Golden Cheeked Woodpecker, Red Crowned Parrot, and Boat Billed Heron.

very strong reminding me of almost everywhere you go in Yellowstone National Park, but at least here fresh air was just a short walk away. In the confines of the bus the next day I could still smell sulfur wafting from my compadres and someone did comment, "We smell like a box of matches!" Bryan also found when he got home that his shorts and t-shirt worn in the pool contaminated all of his laundry. Washing his clothes several times has not helped. He also tried a "shake and bake" remedy using baking soda and sealed overnight in a garbage bag; however, this produced a barely marginal improvement. As of April 28th, my nose still detected the lingering fragrance from Bryan's clothes on the drive to the Minnesota Aquarium Society auction where I also ran into Stephan Tanner. He confirmed several washings of his swim trunks worn in the sulfur pool helped very little. His solution was leaving them to air out on the back deck for almost a month, which finally eliminated the stench.

March 8, 2018: John Lyons and Norman scheduled another busy day for us with three sites on the docket. We headed into stunning county with forest covered mountains so steep I wondered how trees and shrubs stayed anchored. However, it was incredible to see that people were growing some type of crop at widely scattered locations midway up and higher on some mountains where there were ledges, terraces or just a patch with a "somewhat" moderate slope. I wondered how often they

needed to tend their fields from planting to harvest. I'm no rock climber, but in my humble opinion, the physical and technical expertise required would rule-out, or perhaps better said, very soon "weed-out" casual climbers.

Two of our collection sites were on the Río Huichihuayan near the town of Huichihuayan. The first was the river's source at a beautiful park called El Nacimiento de Huehuetlan; however, the inviting azure water was a little chilly for snorkeling on this cool, cloud-covered day (Figure 11). There also was not much for diversity here with only three species found. The Mexican Tetra was proving to be ubiquitous, but for me, always a welcomed sight! I wondered why this species never became popular in the aquarium hobby. There were two newbies for the trip's list: Blackfin Gambusia *G. atrora* and Pygmy Swordtail *X. pygmaeus*. We did meet a very inquisitive youth who was anything but shy. As I sat on a boulder next to the water, I felt someone poking my back, laughing, and speaking in Spanish. I was wearing a NANFA convention t-shirt with a gar drawing. I turned around and Litz was also laughing and then translated, "He thinks that's a snake on your back!" He later moved on to become Stephan Tanner's "little buddy" peering from a boulder looking for fish.

The next site was about a mile downstream at a park called Baleario El Encinal (Figure 12). This park offered rustic lodging in huts with a bed, bathroom, and shower. The river access was



Figure 10. Left column, from top: Río Pánuco. Fritz “dual purposing” his photo sun filter (Stephen Beaman). Opossum Pipefish (Mary Stefansky). Juvenile Bigmouth Sleeper (John Olson). Shrimp (John Olson).

Figure 11. Right column, from top: El Nacimiento de Huehuetlan. John Olson and Mary at spring. Boy admiring gar print (John Olson). Stephan Tanner and his little buddy (John Olson).



Figure 12. Baleario El Encinal: Rustic lodging (Mary Stefansky). Río Huichihuayan access.



Figure 13. Left column, from top: Pygmy Shiner (Fritz Rohde). Barred Killifish (female - Tim Aldridge/male - Fritz Rohde). Right column, from top: Male Delicate Swordtail (Fritz Rohde). Pygmy Swordtail (female - Tim Aldridge)/male.



Figure 14. Left from top: Río Tanculín: Stephen Beaman and Tim micro-fishing. John Lyons and Stephan Tanner seining. Right from top: Electrofishing and Konrad fetching fish for Fritz (Fritz Rohde). Cowboys herding cattle (John Lyons).

developed more for swimmers in mind with cement ledges but was also amenable to our unruly band of micro-fishers and fish collectors. John Olson donned his chest waders and was one of the first in. However, depth in this clear water was so deceptive and he got baptized again. He was now burdened with a double-donut debt. Just this short distance from the river's source diversity more than doubled to seven species including three new faces: Pygmy Shiner *Notropis tropicus*, Barred Killifish *Heterandria jonesii*, and Delicate Swordtail *X. cortezi* (Figure 13).

The final site for the day was a mid-size stream named Río Tanculín. We stopped on a driveway to Rancho El Danubio where cowboys were herding cattle in a pasture. Ambassador Norman went over to the fence to chat with one them, and very soon our bus headed through the pasture led by a cowboy on horseback to a perfect site on the river with inviting gravel bars, pools, riffles, and crystal-clear water (Figure 14). We found nine species including six with new names not yet seen. I recognized Red Shiners *Cyprinella lutrensis* immediately with males brandishing beautiful nuptial colors; however, these looked different from other Red Shiners I've collected in Minnesota. I have observed and always been fascinated by the variation that so many species exhibit across their ranges. Perhaps the Red Shiner is part of a complex and will someday be split into new species like the Orangethroat

Darter *Etheostoma spectabile* complex, which has swelled to over 20 species and is still growing. The other new finds were: Lantern Minnow *T. ipni*, Mountain Mullet *Agonostomus monticola*, Gulf Gambusia *G. vittata*, Porthole Livebearer *Poeciliopsis gracilis*, and Chairel Cichlid *H. pantostictus* (Figure 15).

Heading back to the hotel, Norman found another fine restaurant from Juan Miguel's recommendations. The building had a thatched roof and the waiters were formally attired. The most wonderful feature was a very friendly kitten, which instantly adopted Naomi and laid in her lap for almost the entire meal (Figure 16). As we headed out to the bus, we noticed two were missing: Naomi and Litzi. Finally, they came running. The kitty had shown no intentions of leaving this new throne and the "influence" it bestowed over Naomi. The waiters encouraged Litzi and Naomi to take the kitty with them, but both understood that would have been a nightmare in red tape getting it home to Illinois.

March 9, 2018: Plan A was to first head for Río Las Crucitas and we got close (Figure 17), but were puzzled why an endless line of trucks hauling oranges and sugarcane had pulled off on the shoulder of this winding mountainous road. Then, rounding a curve the traffic lane abruptly came to a halt. After talking to other drivers, we learned that a truck trailer had jackknifed and



Figure 15. Left column, from top: Male Red Shiner (Fritz Rohde). Male and female Lantern Minnow (Fritz Rohde). Mountain Mullet. Right column, from top: Male Gulf Gambusia. Male Chairrel Cichlid (first- Tim Aldridge/second - Fritz Rohde).

blocked the road leaving only enough space for sub-compacts and motorcycles to pass through. Then someone pointed to the front of our bus and Israel found one of the tires was flat. It got even more complicated when a special tool needed to release the spare was missing. Ninja Norman jumped into action with the flat tire in one arm and flagged down a car heading back the way we came. About an hour later we heard a motorcycle approaching and didn't think much about it until we saw Norman on the back with the repaired tire. Plan B was now in effect. Off to Tamasopo Falls!

Tamasopo Falls on the Río Tamasopo was, by far, the most scenic stop on the trip (Figure 18). Three spectacular waterfalls tumble over an escarpment 66 feet high into pools divided by travertine ledges and shelves (Wikipedia 2017). It was so worth postponing our visit for a bright sunny, warm day! I couldn't get in the water soon enough to snorkel with the fishes. I headed for the deepest habitats at the base of the falls, which was roped off, but I disregarded the rules. It was void of fishes and when I surfaced got whistled at by a lifeguard to leave the area. Much to my delight, the shallows were full of fishes! Again, the ever-present Mexican



Figure 16. Naomi smitten with her dinner kitten (Litzi Hartley)

Tetra, but here some of them were trophies reaching six inches, and the sunlight highlighted a bright yellow semi-circle on the upper rim of their eyes. We had collected Porthole Livebearers at the Río Tanculín, but here the females were enormous. I thought they were a different species, but asking John about them later, I learned they were the same species. Cichlids were also very common in the pools, but I did not have a clue what they were. When I got home, I emailed all my mystery cichlid images to Juan Miguel, and he was able to identify all of them, including my one and only, albeit fuzzy, shot of the Tamasopo Cichlid. This species and four more were new additions to our trip's still expanding species list: Pánuco Minnow *T. catostomops*, Moctezuma Swordtail *X. montezumae*, "Pame" Cichlid *H. pame* (Figure 19), and Slender Cichlid *H. steindachneri*.

March 10, 2018: Taninul Spring is the source of the Río Choy (Figure 20). Access to the site is by a two-mile road only open on weekends. The surrounding habitat is tropical forest, and the river is again the blue-azure color I have so much appreciated this trip. What is the most intriguing is the grotto spring pool. Again, roped off, but no lifeguard this time and I just could not resist. I have no idea what the depth was swimming into the cave entrance but I could not see the bottom in the dim light. I reached the cascade forming the spring pool, but the force of the water coming through the chutes was like water shooting out of fire hydrants. I could not keep my feet anchored in these velocities. However, there was a strapping lad at the top of cascade



Figure 17. From top: The end of our road to Río Las Crucitas. Norman thanking motorcyclist for ride (Tim Aldridge).

who gave this old timer a hand. I expressed my gratitude with a very wholehearted, "Gracias!" The grotto was beautiful! Lofty cathedral ceilings with one skylight opening partially illuminating the cavern. Unfortunately, not enough light to take pictures. I turned around to leave and realized my "savior" had left. I decided to sit down and crawl through the cascade feet-first. It sounded like a good idea anyway. About halfway down the cascade the water lifted me up and turned me sideways, slamming my hip into a boulder before dumping me in the very deep water. I laid there floating on my back slowly moving my leg. The pain was intense and I really thought I broke something. Everything still worked and I could walk on it. However, when I got home the next evening there was a huge black and red bruise extending from the top of my hip to my knee. Dang, I've got to learn to finally act my age! It's been a very long time since I was 18 and invincible (i.e., at least thought I was).

After the grotto mishap, I decided to mellow out snorkeling in the shallows. Again, so many fishes to enjoy! I came up on the largest cichlid I had seen so far guarding about a hundred fry. I then ran into Stephan Tanner trying to catch swordtails with a tiny dip net. I have to say he had incredible patience and

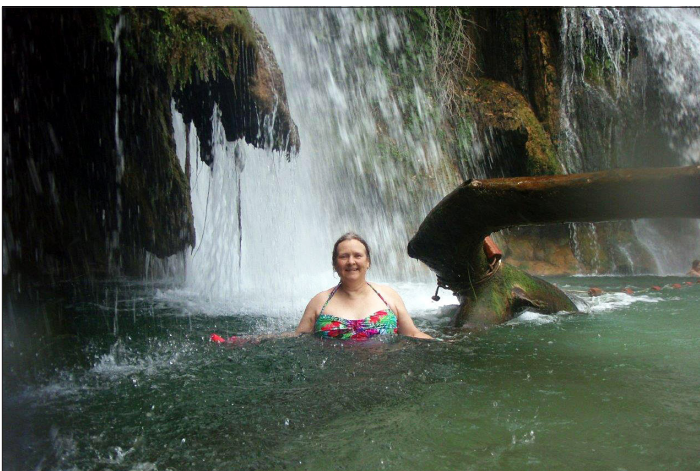


Figure 18. Left column, from top: Two views of Tamasopo Falls. Mary in the spray. Right column, from top: Travertine pools. Fritz snorkeling (Tim Aldridge). Lizard (Jim Herman).

did net some for Fritz to photograph. I got out to watch Tim micro-fish. He caught a Bigmouth Sleeper. They do look like a giant, predatory darter. Our final site did not disappoint us adding three new species: Chubsucker Minnow *T. erimyzonops*, Pánuco Swordtail *X. nigrensis* (Figure 21), and Lowland Cichlid *H. carpintis*.

For our last evening, we shopped downtown San Luis Potosi. Juan Miguel meet us in the town square and we headed for another excellent restaurant he had selected for us. Lots of laughs and stories along with tequila going around the table. At the end, John Olson grabbed the bill from the waiter saying with a smile it was time to pay off his donut debt. Once again, I say, "Thank you John!"



Figure 19. Left column, from top: Pánuco Minnow (Fritz Rohde). Mexican Tetra - coastal Pánuco subspecies (Tim Aldridge). Male Shortfin Molly (John Olson). Female Moctezuma Swordtail (Fritz Rohde). “Pame” Cichlid. Right column, from top: “Pame” Cichlid (Fritz Rohde). Slender and Tamasopo Cichlid (©Juan Miguel Artigas Azas).

And I can't forget to say, “*Muchas gracias!*” to John Lyons and Norman for a delightful trip to wonderful country!

Postscript: John and Norman may host another trip to Mexico in 2021. Anyone interested in learning more, please contact John at johnlyons1957@gmail.com.

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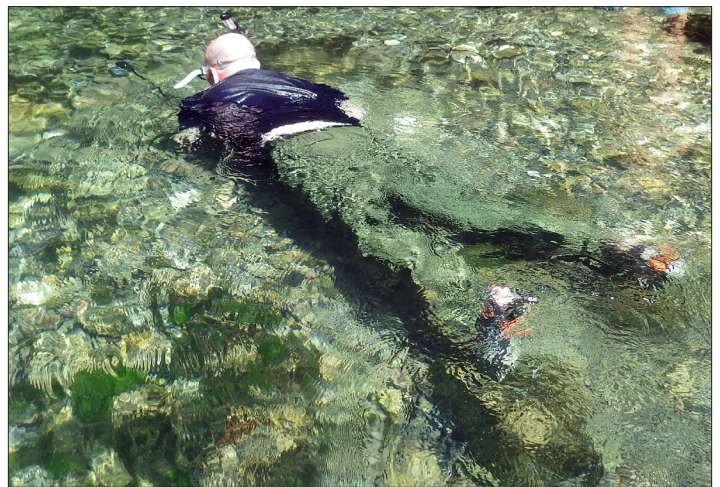


Figure 20. Taninul Spring. Left column, from top: John Olson snorkeling (John Lyons). Spring grotto (Mary Stefansky). Study group photo (Israel Chávez Bernal). Right column, from top: Two views of Stephan Tanner netting Pánuco Swordtails (underwater shot by John Lyons). Stephen Beaman using his GoPro camera (John Olson).



Figure 20, continued. Israel, bus driver excelente! (John Olson).

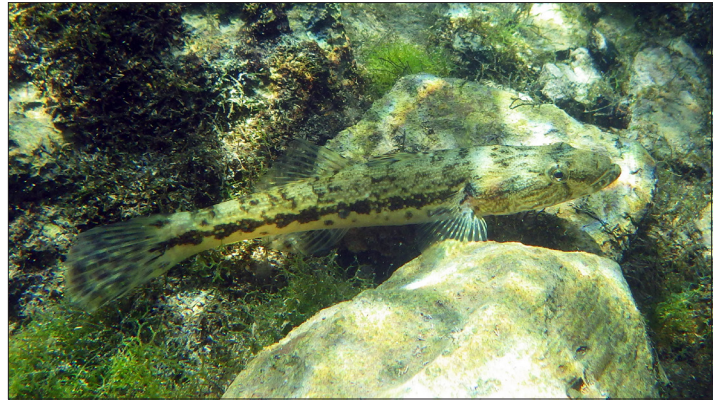


Figure 21. Left column, from top: Chubsucker Minnow (Fritz Rohde). Male Pánuco Swordtail (Fritz Rohde). Right column, from top: Male Pánuco Swordtail (John Olson). Bigmouth Sleeper (second by John Olson). Lowland Cichlid (©Juan Miguel Artigas Azas).

APPENDIX 1. FISHES CAPTURED, 5–10 MARCH
2018, MEXICO FISH TOUR OF SAN LUIS POTOSÍ
Identified and compiled by John Lyons, Curator of
Fishes, UW Zoological Museum, Madison, Wisconsin

Combined species list for entire trip. Listed in taxonomic order by family and within family alphabetically by scientific name. Taxonomic order and scientific and common names follow the latest (7th; 2013) edition of American Fisheries Society/American Society of Ichthyologists and Herpetologists list of scientific and common names of North American fishes. Alternative names in recent usage are given in parentheses. All species are native unless indicated otherwise.

FAMILY Cyprinidae—Minnows

Hypophthalmichthys molitrix—Silver Carp (**non-native**)—(Río Pánuco)
Cyprinella lutrensis—Red Shiner—(Río Tancuilín)
Notropis tropicus—Pygmy (Tropical) Shiner—(Río Huichihuayán)
Tampichthys (Dionda) catostomops—Pánuco Minnow—(Río Tamasopo)
Tampichthys (Dionda) dichroma—Bicolor Minnow—(Charco Azul)
Tampichthys (Dionda) erimyzonops—Chubsucker Minnow—(Río Choy)
Tampichthys (Dionda) ipni—Lantern Minnow—(Río Tancuilín)

FAMILY Characidae—Tetras

Astyanax mexicanus argentatus—Mexican Tetra (coastal Pánuco species)—(Río Pánuco, Río Tamasopo, Río Choy)
Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species)—(Río Jesus María, Charco Azul, Río Huchihuayán, Río Tancuilín)

FAMILY Mugilidae—Mulletts

Agonostomus monticola—Mountain Mullet—(Río Tancuilín)

FAMILY Belontiidae—Needlefish

Strongylura marina—Atlantic Needlefish—(Río Pánuco)

FAMILY Goodeidae—Splitfins

Ataeniobius toweri—Bluetail Splitfin—(Charco Azul)
Goodea atripinnis gracilis—Dusky Goodea—(Río Jesus María)
Xenotoca variata—Jeweled Splitfin—(Río Jesus María)
Xenophorus captivus—Relict Splitfin—(Arroyo Venado, Arroyo Moctezuma)

FAMILY Cyprinodontidae—Pupfishes

Cualac tessellatus—Media Luna Pupfish—(Charco Azul)

FAMILY Poeciliidae—Livebearers

Gambusia atrora—Blackfin Gambusia—(Río Huchihuayán)
Gambusia panuco—Pánuco Gambusia—(Charco Azul, Río Pánuco)
Gambusia vittata—Gulf Gambusia—(Río Tancuilín, Río Tamasopo)
Heterandria (Pseudoxiphophorus) jonesii—Barred Killifish—(Río Huchihuayán)
Poecilia mexicana—Shortfin Molly—(Charco Azul, Río Tancuilín, Río Tamasopo)
Poeciliopsis gracilis—Porthole Livebearer (**non-native**)—(Río Tancuilín, Río Tamasopo)
Xiphophorus cortezi—Delicate Swordtail—(Río Huchihuayán, Río Tancuilín)
Xiphophorus helleri—Green Swordtail (**non-native**)—(Arroyo Venado, Arroyo Moctezuma)
Xiphophorus montezumae—Moctezuma Swordtail—(Río Tamasopo)
Xiphophorus nigrensis—Pánuco Swordtail—(Río Choy)
Xiphophorus pygmaeus—Pygmy Swordtail—(Río Huchihuayán)

FAMILY Syngnathidae—Pipefishes and Seahorses

Microphis brachyurus—Opossum Pipefish—(Río Pánuco)

FAMILY Cichlidae—Cichlids and Tilapias

Herichthys (Nosferatu) bartoni—Media Luna Cichlid—(Charco Azul)
Herichthys carpintis (carpinte)—Lowland Cichlid—(Río Choy)
Herichthys (Nosferatu) labridens—Blackcheek Cichlid—(Charco Azul)

Herichthys (Nosferatu) pame—“Pame” Cichlid (no common name yet officially assigned)—(Río Tamasopo)
Herichthys (Nosferatu) pantostictus—Chairel Cichlid—(Río Tancuilín, Río Choy)
Herichthys tamasopoensis—Tamasopo Cichlid—(Río Tamasopo)
Herichthys (Nosferatu) steindachneri—Slender Cichlid—(Río Tamasopo)
Oreochromis aureus—Blue Tilapia (**non-native**)—(Río Jesus María)

FAMILY Eleotridae—Sleepers

Gobiomorus dormitor—Bigmouth Sleeper—(Río Pánuco, Río Choy)

TOTALS: 10 families, 37 species (33 native, 4 non-native)

Catch per site (combined across all sampling techniques: netting, electroshocking, hook and line, visual observations while snorkeling). Sites are listed in the order they were sampled. All field GPS coordinates have been converted to decimal degrees. Numbers of fish caught are given in parentheses after the species name. Numbers equal to or less than 25 are actual counts; numbers greater than 25 are approximations (“>” indicates “greater than” and represents a minimum estimate for abundant species).

Site 1: Arroyo Venado, San Luis Potosí State, México, at park on the edge of the town of Venado; 22.93482 N, -101.10562 W. 5 March 2018. Dip net, hook and line.

Xenophorus captivus—Relict Splitfin (12 fish)

Gambusia panuco?—Pánuco? Gambusia (1 female; can’t definitively ID females; introduced here)

Xiphophorus helleri—Green Swordtail (60; **non-native**)

Site 2: Arroyo Moctezuma, San Luis Potosí State, México, at park on the edge of the town of Moctezuma; 22.74460 N, -101.09695 W. 5 March 2018. Dip net, hook and line.

Xenophorus captivus—Relict Splitfin (15 fish)

Xiphophorus helleri—Green Swordtail (20; **non-native**)

Site 3: Río Jesus María, San Luis Potosí State, México, below railroad bridge about 0.25 km NE of town of Jesus María; 21.92563 N, -100.91096 W. 5 March 2018. Backpack electroshocker, dip net, cast net, hook and line.

Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species) (15 fish)

Goodea atripinnis gracilis—Dusky Goodea (30)

Xenotoca variata—Jeweled Splitfin (30)

Oreochromis aureus—Blue Tilapia (**non-native**) (3)

Site 4: Charco Azul spring and outlet, San Luis Potosí State, México, about 8 km E of city of Río Verde; 21.87703 N, -99.82567 W. 6 March 2018. Backpack electroshocker, seine, dip net, cast net, hook and line, snorkeling.

Tampichthys (Dionda) dichroma—Bicolor Minnow (15 fish)

Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species) (6)

Ataeniobius toweri—Bluetail Splitfin (>100)

Cualac tessellatus—Media Luna Pupfish (12)

Gambusia panuco—Pánuco Gambusia (>100)

Poecilia mexicana—Shortfin Molly (8)

Herichthys (Nosferatu) bartoni—Media Luna Cichlid (>100)

Herichthys (Nosferatu) labridens—Blackcheek Cichlid (>100)

Site 5: Río Pánuco, Veracruz State, México; about 8 km ENE of city of Pánuco; 22.01415 N, -98.11093 W. 7 March 2018. Seine, cast net.

Hypophthalmichthys molitrix—Silver Carp (**non-native**) (1 large adult; found freshly dead on shore)

Astyanax mexicanus argentatus—Mexican Tetra (coastal Pánuco species) (9)

Strongylura marina—Atlantic Needlefish (1; very small juvenile)
Gambusia panuco?—Pánuco? *Gambusia* (1 female; can't definitively ID females)
Microphis brachyurus—Opossum Pipefish (2)
Gobiomorus dormitor—Bigmouth Sleeper (2; small juveniles)

Gambusia vittata—Gulf *Gambusia* (12)
Poecilia mexicana—Shortfin Molly (100)
Poeciliopsis gracilis—Porthole Livebearer (**non-native**) (2)
Xiphophorus cortezi—Delicate Swordtail (3)
Herichthys (Nosferatu) pantostictus—Chairel Cichlid (30; 2 adults, rest juveniles)

Site 6: Río Huchihuayán, San Luis Potosí State, México; at source, Huchiyuayán Springs, 3 km NW of town of Huchiyuayán; 21.4555 N, -98.9725 W. 8 March 2018. Dip net, hook and line.
Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species) (2 fish)
Gambusia atrora—Blackfin *Gambusia* (2)
Xiphophorus pygmaeus—Pygmy Swordtail (8)

Site 9: Río Tamasopo (aka Río Otates or Río Agua Buena), San Luis Potosí State, México; at Tamasopo Cascades in park 1 km N of town of Tamasopo; 21.93997 N, -99.39628 W. 9 March 2018. Seine, dip net, hook and line, snorkeling.
Tampichthys (Dionda) catostomops—Pánuco Minnow (15 fish)
Astyanax mexicanus argentatus—Mexican Tetra (coastal Pánuco species) (>1,500)
Gambusia vittata—Gulf *Gambusia* (5; introduced here?)
Poecilia mexicana—Shortfin Molly (130)
Poeciliopsis gracilis—Porthole Livebearer (**non-native**) (250)
Xiphophorus montezumae—Moctezuma Swordtail (26)
Herichthys (Nosferatu) pame—“Pame” Cichlid (>200)
Herichthys tamasopoensis—Tamasopo Cichlid (>400)
Herichthys (Nosferatu) steindachneri—Slender Cichlid (3)

Site 7: Río Huchihuayán, San Luis Potosí State, México; at Baleario El Encinal, about 1.5 km downstream of source, 2 km NW of town of Huchiyuayán; 21.47088 N, -98.97673 W. 8 March 2018; Backpack electroshocker, seine, dip net, hook and line.
Notropis tropicus—Pygmy (Tropical) Shiner (1 fish)
Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species) (10)
Gambusia atrora—Blackfin *Gambusia* (15)
Heterandria (Pseudoxiphophorus) jonesii—Barred Killifish (30)
Xiphophorus cortezi—Delicate Swordtail (5)
Xiphophorus pygmaeus—Pygmy Swordtail (10)

Site 10: Río Choy, San Luis Potosí State, México, at source, Tanunil Springs, 6 km N of Hotel Tanunil; 21.98815 N, -98.88403 W. 10 March 2018. Dip net, hook and line, snorkeling.
Tampichthys (Dionda) erimyzonops—Chubsucker Minnow (15 fish)
Astyanax mexicanus argentatus—Mexican Tetra (coastal Pánuco species) (>1,000)
Gambusia vittata—Gulf *Gambusia* (100)
Xiphophorus nigrensis—Pánuco Swordtail (75)
Herichthys (Nosferatu) pantostictus—Chairel Cichlid (200)
Herichthys carpintis (carpinte)—Lowland Cichlid (25)
Gobiomorus dormitor—Bigmouth Sleeper (10)

Site 8: Río Tancuilín, San Luis Potosí State, México; at Rancho El Danubio, downstream of first bridge upstream of confluence with Río Axtla; 21.41780 N, -98.89528 W. 8 March 2018. Backpack electroshocker, seine, dip net, hook and line.
Cyprinella lutrensis—Red Shiner (9 fish; breeding, colorful)
Tampichthys (Dionda) ipni—Lantern Minnow (18; breeding)
Astyanax mexicanus rioverde—Mexican Tetra (Río Verde species) (100)
Agonostomus monticola—Mountain Mullet (25; juveniles)

FishMap.org

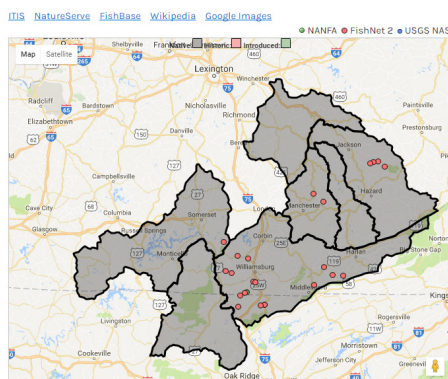
NORTH AMERICAN NATIVE FISHES ASSOCIATION

FishMap.org is for anglers, aquarium hobbyists, scientific researchers, or anyone else with a passion for fishes who wants to visually explore species' ranges or learn what species are in their local waters. The site is dedicated to spreading knowledge and respect for all fish species.

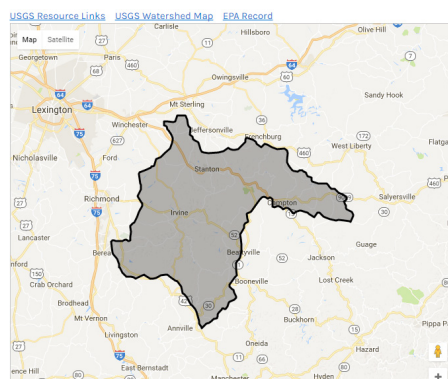
FishMap.org combines numerous data sources to provide a better view and more complete understanding of fish species distribution. It uses data from NatureServe, the National Atlas, the USGS water resources and Nonindigenous Aquatic Species programs, FishNet2, iNaturalist.org, GBIF, and iDigBio.

FishMap.org is sponsored by NANFA. Users can submit their own data to the portal to help map species distribution, so FishMap.org has been working with NANFA members to create an additional database of fish sightings and collections (currently nearly 30,000 records and growing).

Range and Collection Data



Explore Watersheds



Compare Ranges

