

modern AQUARIUM



October 2023
volume XXX
number 8

Greater City Aquarium Society - New York

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Series III Vol. XXX, No. 8 October, 2023

ON THE COVER

Our cover photo this month is from our Fishy Friends Photos Facebook page, and features a beautiful, serene planted aquarium with several also beautiful fish! The photo is by GCAS member Lonnie Goldman.

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From the Editor

by Dan Radebaugh

The Spy Who Got Away

This photo was taken in Chicago in 1945, soon after the end of WWII. My mother and father are on the right. I was either very recently born or about to be—hard to tell from this photo. My mother's brother Lawson (in dress blues) is at the lower left, and to his left is my father's eldest brother Walter.

Practically everyone had been involved with the war in some capacity. Lawson had been an aerial gunner in the Pacific, and had been shot down a few times, including one that had left him floating around on a rubber raft for about three days.

My mother had been working at Warner Robbins air base (near Atlanta). One morning she came to work, and her boss was nowhere to be seen—nor did she ever see him again! That morning she was summoned to a meeting with General Arnold,



where she learned that her missing boss had in fact been a Nazi spy, who apparently had decided it was time to get out of Dodge. She never heard any more from or about him. Meanwhile, her new boss turned out to be my future dad, who had been assigned the job there at Warner Robbins as a reward for work he had done expediting war materiel deliveries to where they needed to go.

So I can pretty confidently say that if it hadn't been for that Nazi spy I wouldn't be here now, writing this column!





GCAS Programs

2023

March 1	Tom Keegan <i>Fish Biology 101, Part 1</i>
April 6	David Banks <i>Lake Tanganyika Cichlids and Appropriate Tankmates</i>
May 3	Emiliano Spada <i>Antique Aquariums and Equipment</i>
June 7	Karen Randall <i>Sunken Gardens</i>
July 5	Dr. Paul Loiselle <i>The World of Jewel Cichlids</i>
August 2	Night At the Auction
September 6	Sebastian Alvarado <i>Color Changes In Fish</i>
October 4	William Guo <i>Freshwater Shrimp</i>
November 1	Tom Keegan <i>Fish Biology 101, Part 2</i>
December 6	Holiday Party!

Articles submitted for consideration in *Modern Aquarium* (ISSN 2150-0940) must be received no later than the 10th day of the month prior to the month of publication. Please email submissions to gcas@earthlink.net, or fax to (347) 379-4984. Copyright 2023 by the Greater City Aquarium Society Inc., a not-for-profit New York State corporation. All rights reserved. Not-for-profit aquarium societies are hereby granted permission to reproduce articles and illustrations from this publication, **unless the article indicates that the copyrights have been retained by the author**, and provided reprints indicate source, and that two copies of the publication are sent to the Exchange Editor of this magazine (one copy if sent electronically). For online-only publications, copies may be sent via email to gcas@earthlink.net. Any other reproduction or commercial use of the material in this publication is prohibited without prior express written permission.

The Greater City Aquarium Society meets every month except January and February. Members receive notice of meetings in the mail or by email. For more information, contact: Dan Radebaugh at (718) 458-8437, email to gcas@earthlink.net, or fax to (347) 379-4984. For more information about our club or to see previous issues of *Modern Aquarium*, you can also go to our Internet Home Page at <http://www.greatercity.net>, <http://www.greatercity.org>, or <http://www.greatercity.com>.

President's Message

by Horst Gerber

Aquariums have been a part of most of my life. This of course also means that there have been some tribulations along with the triumphs. From floods of sadness, or great unexpected joy and excitement when everything I did seemed to work out well! It would be an interesting program to put together all the joys and disasters of this fishkeeping life. Who knows how long we have left on this earth—five more years, or five more months? What are some of the things still on my bucket list?

Maybe I could go back to Germany and collect daphnia from a bomb crater. I remember in my childhood years when we collected little yellow frog eggs from ponds or swamps and threw them at one another.

These days most of my tanks are empty, what with my age and some nerve problems. In general I love small fish – tetras, killies, and so forth, so the thought had never crossed my mind that I'd end up with Gold Severums! It was during a Norwalk fish show. I saw a magnificent pair of Gold Severums at a member's home, and I knew right then and there that someday I would own fish like that! Luckily my friend bred those fish, and I ended up with six fry, which I raised to adulthood in a forty gallon tank, and eventually successfully spawned and raised them!

So you never know what's going to come of your involvement with this hobby. Joy can come quite unexpectedly!



Horst

Florida
AQUATIC NURSERIES





GCAS Thanks You!

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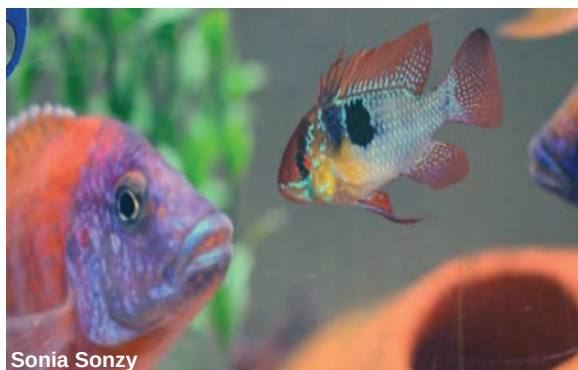
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Fishy Friends' Photos

by Greater City Aquarium Society Fishy Friends

Below are photo submissions to our “Fishy Friends” Facebook group. I’ve left the subjects unnamed, but not the photographer. If you see a shot you like, and want more info, ask the photographer about it! I’m sure he or she will be delighted to tell you!



Tonight's Speaker: October 4, 2023

William Guo, Speaking on: Freshwater Shrimp

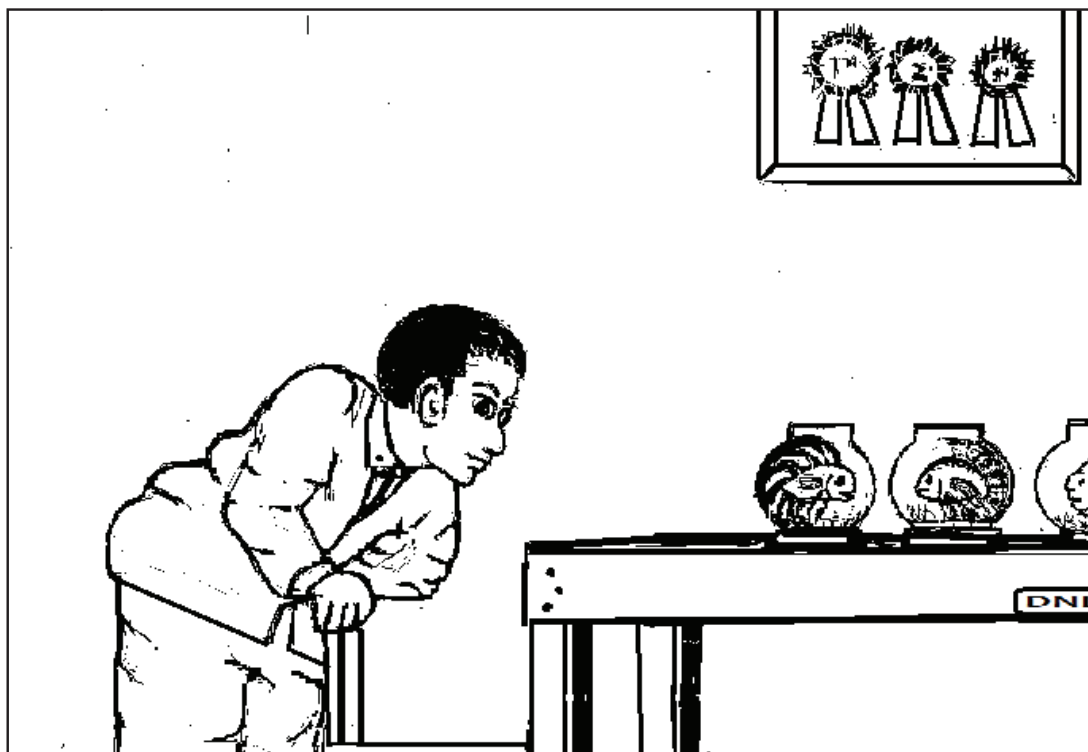
Will Guo has been keeping and breeding fish and shrimp for 10 years. Although that may not seem that long compared to other fish breeders, it is more than one third of his 28 years on this earth.

Will grew up around animals. His mother was a science teacher, and he became interested in fish when he saw how many different colors and fin variations existed in betta fish and guppies. He found that learning how to gradually breed every color out of a previously colorful fish was fascinating! His fishroom consists of 25 tanks, with angelfish, corydoras, plecos, guppies, rams and apistogramma.

He has also consistently kept and bred different types of caridina and neocaridina shrimp. He loves the wide color variations and the peaceful, slow-moving nature of the shrimp. Will is excited to share his knowledge of caridina shrimp with our group. He is also a medical resident in dermatology, and his medical background comes in handy in understanding fish medication. In his free time he goes fishing, plays with his toy poodle Armani, and sings in a local community choir.



September's Caption Winner: Bill Amely

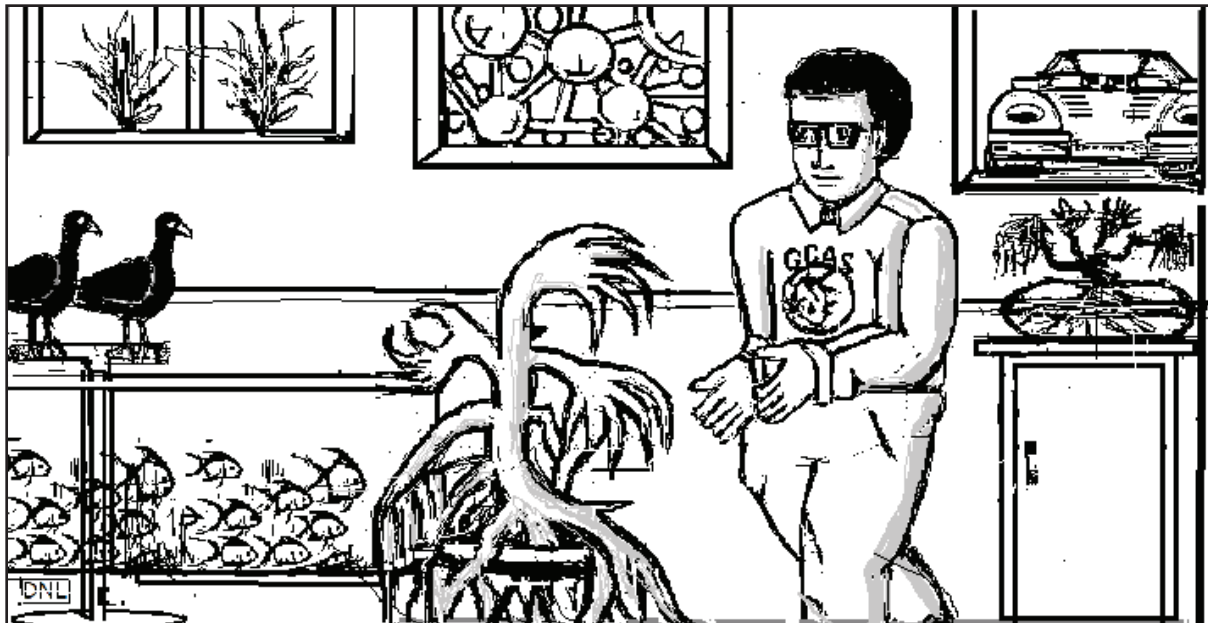


I'd rather be judging Miss Universe, but this'll do.

The Modern Aquarium Cartoon Caption Contest

by Denver Lettman

*Modern Aquarium has featured cartoon contests before, and they're back! You, the members of Greater City get to choose the caption! Just think of a good caption, then mail, email, or phone the Editor with your caption (phone: 347-866-1107, fax: 877-299-0522, email: gcas@earthlink.net). **Your caption needs to reach the Editor by the third Wednesday of this month.** We'll also hand out copies of this page at the meeting, which you may turn in to Marsha or Dan before leaving. Winning captions will earn ten points in our Author Awards program, qualifying you for participation in our special "Authors Only" raffle at our Holiday Party and Banquet. Put on your thinking caps!*



Your Caption:

Your Name:



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Pictures From Our Last Meeting

Photos by Marsha Radebaugh



Our Speaker this evening,
Sebastian Alvarado



John Buzzetti and Tom Keegan
in uniform!



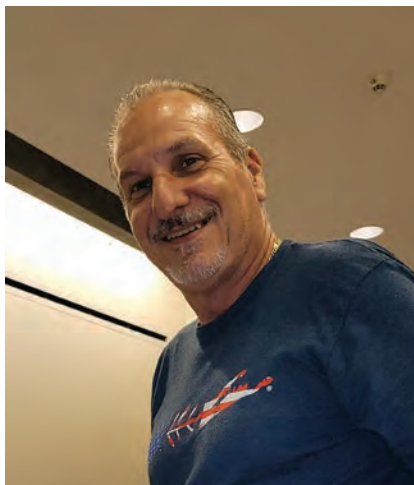
Joshue Modeste listens
intently



Getting some of the auction items ready!



Roger Brewster listens
intently.



Ron Webb



Artie Friedman



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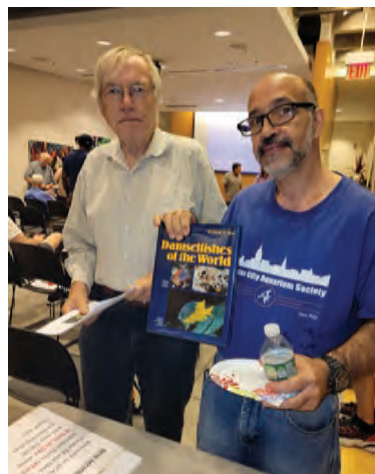
Our Speaker's family



Denver Lettman with his winnings



**Richie Waizman wins 1st &
2nd in the bowl show**



**Jason Irrizarry with his door
prize.**



**And Stephen Sica with *his*
door prize!**



Everybody's ready!



Lenny Ramroop trying to keep up with everything at once.





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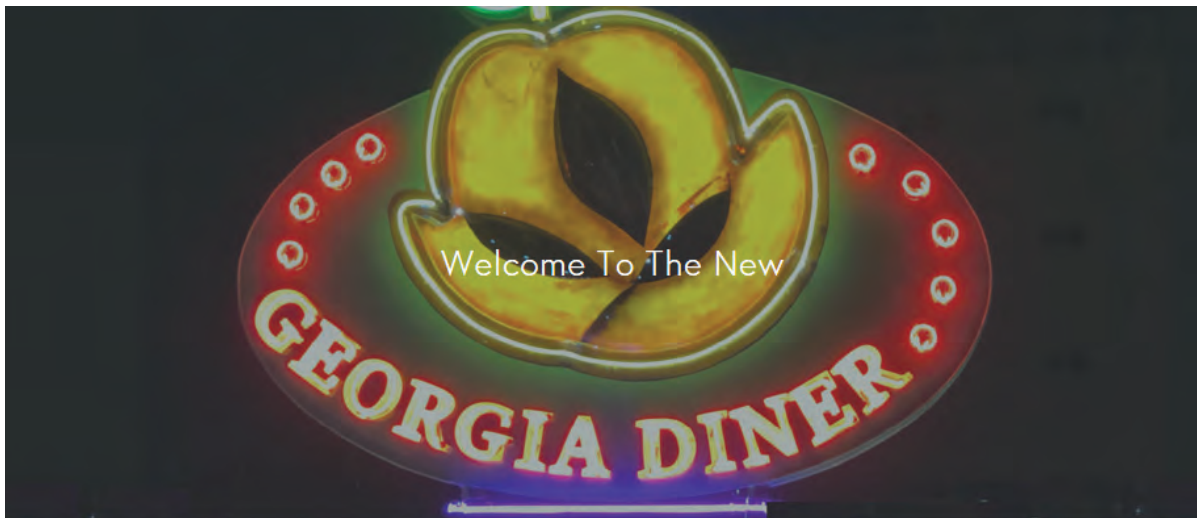
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OBSERVATIONS FROM MY FISHROOM

by Jules Birnbaum

Although I have been involved with the tropical fish hobby for 70+ years, my fish room was built approximately 15 years ago. For all those 15 years I spent many hours enjoying my 30 fish tanks and all the equipment (a heat pump, central air pumps and LED lights). Listed below are some of my observations. I have always said, “whatever works for you,” so I am not saying my way is the only way.

All my plants are low-light. I have found that they will thrive with 6 hours of light. Although growth is slower, algae is minimal. Since my low light plants are attached to wood or rocks they are easier to move around.

For many years my water changes were done every week, but recently I changed to 50% every 2 weeks. It seems to be working, but I still try to keep my sponge and box filters clean. I have two Marineland polishing filters that I use to stir the tank bottom to remove wastes from the substrate. My gravel is never more than an inch thick. I should mention that I use two water pumps with attached hoses going to our laundry room’s slop sink to remove water. I use a third hose to fill all the tanks. I got the idea from JEHMCO, the fish room supply house. The whole process takes about 3 hours. It has worked well for many years.

Fish tank tops are important to avoid fish jumping out, to control humidity and make water changes easier. Fellow GCAS member Ed Vukich was kind enough to cut lightweight plastic tops for all my tanks. The Greater City Aquarium Society has always had members willing to help others.



Fish diet is important, and I prepare brine shrimp daily and feed blackworms about three times a week. I use high quality flake food purchased from Brine Shrimp Direct. Although their shipping charges are high, I feel they are the best fish food source. I have no rules as to the time food must be consumed by my fish. Some, like Rainbows, will take just 15 seconds, going crazy over what is being served, while others, such as Angels, need more time to consume their food. If the bioload is high I avoid overfeeding, since there will be more fish waste, requiring more tank cleaning.

My Brine Shrimp hatchery was purchased from Aquarium Co-op. The hatchery hangs from a tank, thus Modern Aquarium - Greater City A.S (NY)

taking up no additional room. I purchase my eggs from Brine Shrimp Direct, usually purchasing three cans at a time. I freeze two, refrigerate the third, which is opened and kept in the refrigerator. From the opened can I remove, to a squeeze bottle, enough eggs for one week. The hatchery is about a half gallon to hatch a full tablespoon of eggs.



I have found I can maintain a higher bio load for my Lake Tanganyika cichlids such as my *N. similis*. These fish just keep breeding and parenting the fry, as long as conditions do not change. They just do not get sick. Could it be my maintenance, or the hard water with the high pH? I am not a scientist, so I do not have an answer. If I want to minimize aggression of some of the Africans I just keep more fish in their tank or remove the bully.

A number of years ago I switched to plant friendly LED lights for all my tanks. They all have built in timers, but I manually start them and shut them off at night. In this way I personally control the light each tank gets.

Breeding most tropical fish should not be difficult but it does require lots of patience. It has been said, “give them the right conditions and they will do the rest.” I have usually started with 6 or 8 juveniles, letting them pair off. Then I either remove a pair or remove all the others.

My shell dwellers and rock dwellers are left with the fry to form colonies. There are several ways of breeding killifish, but other than annuals I just load the tank with Java Moss or use a mop, which will contain the eggs that are laid on them. I remove the eggs to a hatchery usually floated in the same tank as the breeding pair. I breed my livebearers by also loading the tanks with Java Moss. I have consulted with some of my friends who are expert breeders, such as the famous Rosario LaCorte and Joe Ferdenzi.

Some of you have visited my fish room and given me useful ideas, and I thank you. If you would like to visit, members are welcome. Just give me a call!





BOWL SHOW RULES

There is a Bowl Show at every GCAS meeting, except our Night at the Auction/ fleamarket meeting and our Holiday Party and Awards Banquet meeting. Bowl shows are open to all members of GCAS. Rules are as follows:

- Only current GCAS members may enter fish in the Bowl Show.
- There is a limit of 2 entries per member per meeting.
- Unlike some other clubs, every month is an “open” Bowl Show at the GCAS (i.e., there is no “theme,” such as that one month cichlids are judged, the next livebearers, the next anabantoids, etc.).
- Any fish that wins any prize (1st, 2nd, or 3rd) may not be entered again in the same meeting year.
- B.Y.O.B. (Bring Your Own Bowl!) Entrants are responsible for providing suitable containers and suitable water for their fish. These containers must be clear on at least three sides.
- Only one fish per container (i.e., no “pairs”).
- No plants, ornaments, or equipment (filters, airstones, etc.) are allowed in the judging tank (an external mirror, or opaque cards between containers is acceptable, as is a cover that does not obstruct side viewing).
- Points are awarded: 5 points for 1st Place, 3 for 2nd Place, and 1 for 3rd Place.
- Ribbons are awarded: blue for 1st Place, red for 2nd Place, and green for 3rd Place.
- The person with the most points at the end of the meeting season receives the Walter Hubel Bowl Show Champion trophy at the Awards Banquet.
- The decision of the judge(s) is final.
- A running UNOFFICIAL total of the points awarded is printed in **Modern Aquarium**. Only the tally of points maintained by the Bowl Show Coordinator is official.
- **In case of ties:**
 - 1st Tiebreaker – most 1st Places
 - 2nd Tiebreaker – most 2nd Places
 - 3rd Tiebreaker – most entries

A NURSE and NOT A MAID

Story and Photos by Stephen Sica

The last time that Donna, Cordelia and I had been in Key Largo was in October 2019, just prior to the pandemic. One of our routines is to take both our dog and ourselves for a walk along the wharf that runs along the narrow canal where the various boats dock. We finally returned in May 2023 and recalled that we had encountered a fishing boat operator who gutted fish at a stationary cleaning table next to the canal. He threw the entrails right into the water to a group of small nurse sharks. This activity seems to have begun in 2019. We had never seen it before. Of course we had forgotten about this, but as we were walking late on a Saturday afternoon we came across this unique occurrence again, and refreshed our memories. The small boat had returned from another day of fishing, and the captain or mate was cleaning the day's catch. We peered into the water to find a group of nurse sharks swimming in a tight circle, angling for another free meal.

We found this fascinating, because we never see nurse sharks from a topside view, we observe them underwater. I must say that they appear more detailed on the surface. Their brown skin color is evident and a peek at a blue eye above the water is also interesting. I remember that I authored a brief article for **Modern Aquarium** a few years ago about this very occurrence. Here it is more than three months after our encounter, and I'm thinking to myself that our illustrious editor, Dan Radebaugh, is always in need of articles. Most members of the Greater City Aquarium Society, excluding those who volunteer for other duties, do not author articles for **Modern Aquarium**. Hey out there! You can easily write one story once a year! I'm not an expert aquarist.

I just like fish. I call my works stories, as opposed to articles, because I'm reluctant, but more likely unable, to be expert and scientific unless I look it up. Who wants to always look it up?



The trigger finger on my camera hand couldn't resist photographing a sea bird, in this example a majestic pelican, as we walked Cordelia along the boat canal in search of fish life.



The canal where dive and pleasure boats tie up and traverse to the open ocean about a mile away. At the entrance are pricey private homes and near the end are a few hotels and restaurants.



A local fisherman or boat captain cleans the day's catch and discards entrails into the canal.



Fish entrails from this catch lure the nurse sharks from the open ocean into the boat canal.

It's difficult to write about something different every month—ask Joe Ferdenzi and a few other members! Both my mind and my physical being have lost a step or two during the past few years, so it is more difficult these days to think up new ideas. This is why I'm writing about these same nurse sharks again! I do wonder if all the sharks that I saw in May are the same ones that I saw a few years ago. Do they swim out to sea in the evening, or just hang around the boat canal? Sharks usually feed in the evening as the sun is setting. It is difficult for their prey to see them, and that also goes for humans!

These are the kinds of sharks that keep a low profile. If you watch "Shark Week" type documentaries on cable television, one of their occasional themes or sidebars might be about sharks eating pup and smaller sharks. Although nurse sharks can grow to fourteen feet or so, most adults are in the five to eight foot range. I've seen one or two eight footers. Nurse sharks lie on the bottom in or near a reef that offers protection. Many years ago, during a sunset dive in Key West, Donna and I came across an exceptionally large nurse shark lying in the sand. I cannot recall if I had a camera to film the fish, but I can see it in my mind right now. During night dives, you can't help thinking about what lies out there beyond

your limited vision. Is a big fish behind me? Is it a shark? It can get spooky! They often use these same themes on shark television shows. "Cover my back!" Sometimes it does sound silly to me—but you never know! Look at the poor lady who was bitten at Rockaway Beach a few weeks ago. I do know that many sharks swim to and fro about one hundred yards off the beach. When I was sixteen years old and scuba diving in Reynold's Channel at formerly Beach 8th Street, a medium size shark swam past me heading towards the open sea. The water was fifteen to twenty feet deep and only a few yards off the beach.



For those readers with a scientific bent, let's again review a bit of information about the nurse shark. If you do not want to call a nurse shark a nurse shark, please refer to it as *Ginglymostoma cirratum*. Specimens as long as fourteen feet have been caught, but a decent size nurse shark would usually be between eight to ten feet. Its skin tone is brownish—most of them have a bluish tint to their eyes, and, I believe it is the only shark with obvious barbels used in searching for food. Some other sharks have barbels, but they are not obvious. Its teeth are mostly flat on their surfaces and have developed into grinders. This shark does not tear apart its prey with sharp serrated teeth. This fish is non-aggressive unless provoked. I have not heard of a fatal attack by a nurse shark, but once I did see a video on television of a nurse shark that bit a diver who pulled on its tail. I guess that you can sum up this shark's disposition as "live and let live." If this is the case, don't expect to see any "Shark Week" documentaries about this fish.





ALIENS AMONG US

by John Todaro

Do aliens exist?

Are there other life forms in the universe? Have you ever wanted to meet alien life? Well, you can do that right here on Earth at the water's edge. We know these aliens as fish.

They live in a totally alien world to ours, in which we can not survive without special breathing equipment and "space ships" that allow us to enter the world they live in.

Let's take a look at how they live in their world.

Of the 42,000 different types of vertebrates in the world, about half of them are fish. About 60% live in the oceans and the rest, about 40%, live in freshwater. These aliens range in size from about 6mm long to many feet long.

Breathing under water

How do these aliens survive in this unforgiving water world? How do they breathe? Do they breathe water? No. They need oxygen to live, just like we do. So how do they do it in water? The supply of oxygen is essential to life but it's more difficult to obtain in water than it is in air because water contains only 2% to 3% as much oxygen as air.

Water is 800 times more dense than air and much harder to move through their breathing system. Fish don't have lungs, except for anabantids. More about them later. All fish have gills, and to stay alive in their world they must pass large volumes of water through the

This article is reprinted from the May-June, 2019 issue of the Brooklyn Aquarium Society's Aquatica.

gills to extract oxygen through the gills pumping action. When fish begin to run out of oxygen, the very best they can do is to increase the oxygen supply 2 to 3 times by pumping their gills faster. We humans can increase our supply 20 times or even more by deeper and faster breathing.

Now to anabantids in this alien world. You may know them as labyrinth fish or gouramis or bettas. These fish have developed a labyrinth organ, a defining characteristic of fish in the sub-order *Anabantoidei*. It is a much-folded suprabranchial accessory breathing organ, formed by vascularized expansion of the epibranchial bone of the first gill arch and used for breathing in air.

This special organ allows labyrinth fish to take in oxygen directly from the surface of the water, instead of taking it from the water they live in. The labyrinth organ helps the inhaled oxygen to be absorbed into the bloodstream. So labyrinth fish can survive for short periods of time out of water because they can inhale the air in our world, provided the fish stay wet and the air is moist.

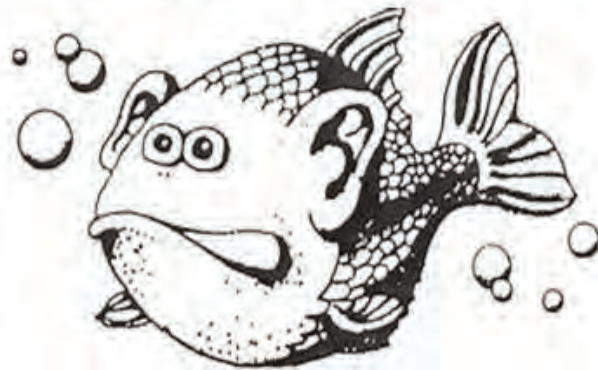
Labyrinth fish are not born with functional labyrinth organs. The development of the organ is gradual, and most young

labyrinth fish breathe entirely with their gills, developing the labyrinth organs as they grow older.

The reason these fish developed this organ is that they generally live in waters stagnant and low in oxygen, and this organ enables them to gulp a bubble of air from the water surface.

Species living in low-oxygenated waters are more likely to have larger and more complex labyrinth organs than species found in fast-flowing, oxygen-rich waters.

Hearing and Sound



Our ears are not very well adapted to detecting sounds in this alien world of water, and until the invention of hydrophones we assumed that the oceans were silent. Scientists were surprised to find that the waters of the world are very noisy—even more so than the world we live in. This high noise level is caused by water's greater density, and it can transmit sound

much further. Much of the noise in the water comes from fish. They make sounds to frighten an enemy or to attract a mate. They make sounds by grinding their teeth or vibrating some part of their anatomical systems such as the swim bladder.

Some fish make noise when eating; for example, parrotfish do when they scrape sections of coral, and rays when they crunch mollus shells. Some small toadfish can make a sound with an intensity of 90 decibels! Even water turbulence created by a school of fish produces noise. It can be heard by us and has given rise to such fish names as grunts, drum, and croakers.

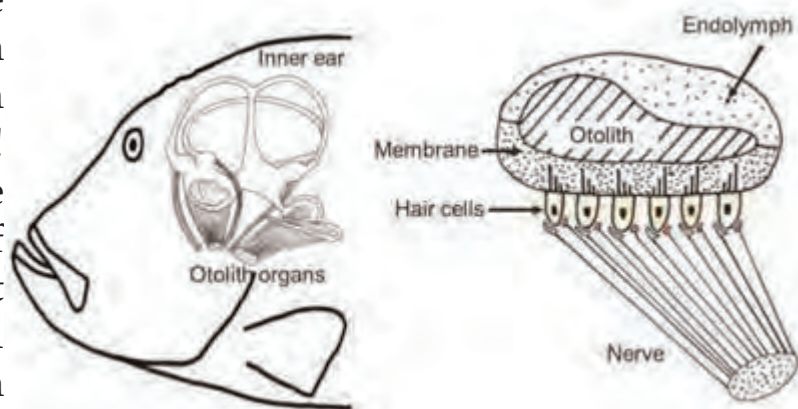
Most sounds are in the form of grunts, whoops, clicks, thumps, growls and barks, and most of them are within the range of human hearing when transmitted through hydrophones.

Physical Hearing Adaptations

Sound perception organs in fishes include cilia (nerve hairs), bladders, ossicles, otoliths, accelerometers and mechanoreceptors in various configurations. Some fish have all of these features; some have only one.

But regardless of the complexity of adaptations, all fish in the alien world of water that we know of seem to respond to sound.

The lateral line along the side of some fishes is an interesting adaptation to their world of water. Lateral lines are comprised of cilia that are akin to the cilia that line the cochlea of the inner ears of terrestrial vertebrates. Some



fish don't have lateral lines, but do have cilia that serve as mechanoreceptors, translating acoustically induced particle motion and pressure gradients into the sensory system of the fish.

By way of these two acoustical energy perceptions, they sense sound and the proximity of other moving bodies, and thus help fish to hold together in their tightly synchronized schools and not bump into each other.

Many fish also have gas-filled swim bladders that are

used to mediate buoyancy. These bladders also represent an acoustical impedance differential in the body and can serve as a pressure gradient sensor. In some fishes, the swim bladder ties into the inner 'ears' of the fish by way of a set of bones similar to those in our own middle ear.

Another hearing organ of fish is an Accelerometer, set up by dense bones in the skull called otoliths, which sense particle motion.

How Fish See

Fishes' eyes are very much like those of humans, and in many species of fish they're well developed, but there are major differences. Fish eyes function independently of each other and can be rotated to take in a wide area on each side of the body. Since the furthest that can be seen underwater with clarity is about 82 feet, there's little provision for focal adjustment, and because fishes' eyes are being constantly kept wet with water, fish generally don't have eyelids.

Not all creatures in our terrestrial world with eyes see in color; of all the mammals, only humans and primates are able to see color. Your dog and cat do not see color. In the alien world of water however, most fish see

color, judging from the existence of color receptor cells in their eyes.

Deep water fish that live in the "twilight zone" where there is little light, have very few color receptor cells and may not see in the full spectrum of color. On the other hand, fish living in or about coral reefs and in shallow sun-drenched waters are well equipped with color receptors, and see in living color.

Fish and other aquatic animals live in a different light environment from terrestrial species. Water absorbs the light spectrum, so that with increasing depth the amount of light available to see with decreases quickly. The optical properties of water also lead to different wave-lengths of light being absorbed to different degrees.

For example, visible light of long wavelengths (e.g., red, orange) is absorbed in less water than light of shorter wavelengths (green, blue). Ultraviolet light (even shorter wavelength than violet) can penetrate deeper than visual spectrum.

Besides the universal qualities of water, different bodies of water may absorb light of different wavelengths differently, due to varying salt and/or chemical presence in the water.

Structure and Function

Fish eyes are broadly similar to those of other vertebrates—notably the tetrapods (amphibians, reptiles, birds and mammals—all of which evolved from a fish ancestor). Light enters the eye via the cornea, passing through the pupil to reach the lens. Most fish species seem to have a fixed pupil size, but elasmobranchs (like sharks and rays) have a muscular iris which allows pupil diameter to be adjusted. Pupil shape varies, and may be either circular or slit-like.

Lenses are normally spherical, but can be slightly elliptical in some species. Compared to terrestrial vertebrates, fish lenses are generally more dense and spherical. In water there's not a major difference in the refractive index of the cornea and the surrounding water (compared to air or land), so the lens has to do the majority of the refraction. The spherical lenses of fish are able to form sharp images free from spherical aberration.

Once light passes through the lens it's transmitted through a transparent liquid medium until it reaches the retina, which contains the photoreceptors. As in other vertebrates, the photoreceptors are on the inside layer, so light must pass through

layers of other neurons before it reaches the retina which contains rod cells and cone cells.

The ratio of rods to cones depends on the ecology of the fish species concerned, e.g., those mainly active during the day in clear waters will have more cones than those living in low light environments. Color vision is most useful near the surface in clear waters, rather than in deeper water where only a narrow band of wavelengths persist.

The distribution of photoreceptors across the retina is not uniform. Some areas have higher densities of cone cells, for example. Fish may have two or three areas specialized for high acuity (e.g., for prey capture) or sensitivity (e.g., from dim light coming from below). The distribution of photoreceptors may also change in the case when the species typically moves between different light environments during its life cycle (e.g., shallow to deep waters, or fresh water to ocean) or when food spectrum changes accompany the growth of a fish, as seen with the Antarctic icefish *Chamsocephalus gunnari*.

Some species have a tapetum, a reflective layer which bounces light that passes through the retina back through it again.

This enhances sensitivity in low light conditions, such as deep sea species, by giving photons a second chance to be captured by photoreceptors.

However, this comes at a cost of reduced resolution. Some species of fish are able to turn their tapetum off in bright conditions, with a dark pigment layer covering it as needed.

The retina uses a lot of oxygen compared to most other tissues, and is supplied with plentiful oxygenated blood to ensure optimal performance.

Humans have a vestibulo-ocular reflex, which is a reflex eye movement that stabilizes images on the retina during head movement by producing an eye movement in the direction opposite to head movement, thus preserving the image on the center of the visual field. In a similar manner, fish have a vestibulo-ocular reflex which stabilizes visual images on the retina when it moves its tail to swim.

From Skin to Scales

Scales are semi-transparent, like our fingernails, and grow from the fish's skin. The number and arrangement of the scales are established genetically and don't change with age; they merely enlarge with growth.

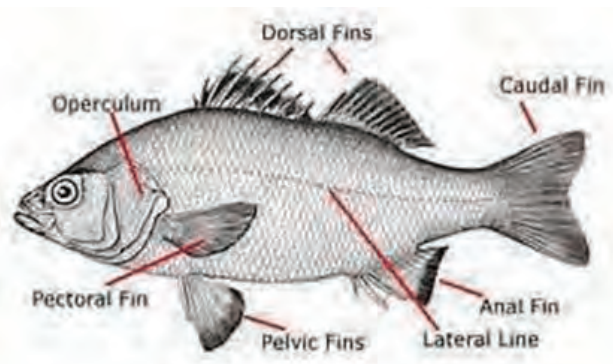
Overlaying the scales is a thin layer of slimy mucus familiar to anyone who has ever handled a fish; this mucus serves as a barrier to bacterial and fungal infections. The mucus also reduces the friction of water on fishes and it allows them to swim more efficiently in their watery world.

Modification of Scales



Different groups of fishes have evolved a number of modified scales to serve various functions. Almost all fishes have a lateral line, a system of mechanoreceptors that detect movements in water.

In bony fishes, the scales along the lateral line have central pores that allow water to contact the sensory cells.



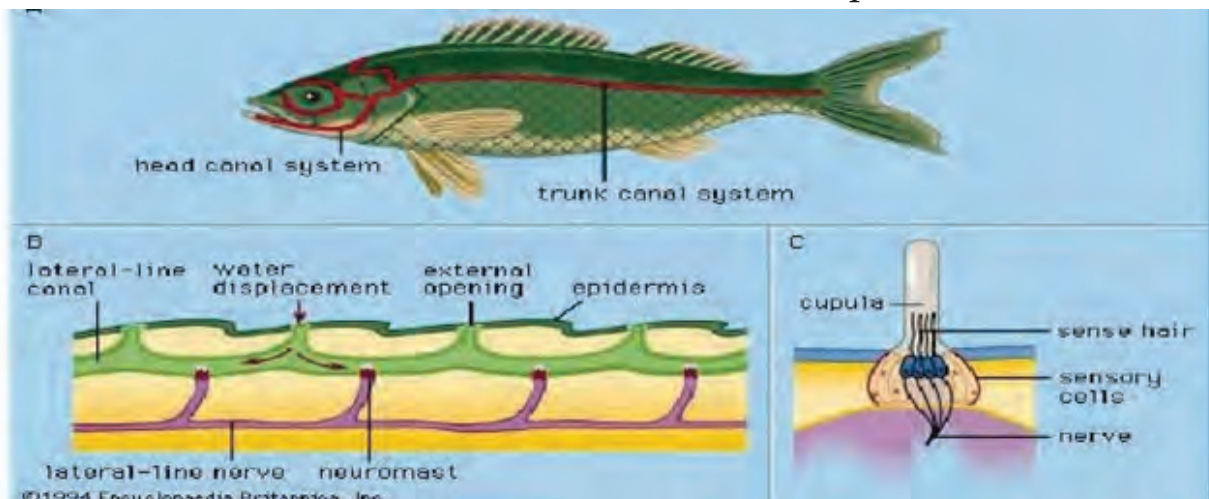
- The dorsal fin spines of dogfish sharks and chimaeras, the stinging tail spines of stingrays, and the "saw" teeth of sawfishes and sawsharks are fused and modified placoid scales.
- Porcupine fishes have scales modified into spines.
- Surgeonfishes have sharp, blade-like spines on either side of the caudal peduncle.
- Some herrings, anchovies, and halfbeaks have deciduous scales, which are easily shed and aid in escaping predators.
- Male Percina darters have a row of enlarged caducous scales between the pelvic fins and the anus.

Many groups of bony fishes, including pipefishes and seahorses, several families

of catfishes, sticklebacks, and poachers, have developed external bony plates, structurally resembling placoid scales, as protective armor. In the boxfishes, the plates are all fused together to form a rigid shell enclosing the entire body. These bony plates are not modified scales, but skin that has been ossified.

Lateral Lines

A lateral line is a sense organ fish use to detect movement and vibration in the surrounding water. Fishes use it to detect depth and water pressure, prey, predators, sense current movement and orientation in the current, as well as to avoid collisions. The lateral line is a unique organ that is a combination of eyes, ears and sensory feelings combined into one. All fish have some form of a lateral line; some have a more developed one than others.



The Lateral line is a sensitive receptor which enables fish to detect currents and vibrations in the water.

Lateral lines are usually visible as faint lines running lengthwise down each side of the fish, from the vicinity of the gill covers to the base of the tail. Sometimes parts of the lateral organ are modified into electroreceptors, which are organs used to detect electrical impulses. It's possible that vertebrates, such as sharks, use the lateral organs to detect magnetic fields, as amphibians also have a lateral organ.

The development of the lateral-line system depends on the fish's mode of life. For instance, fish that are active swimmers tend to have more neuromasts in canals than they have on their surface, and the line will be farther away from the pectoral fins, which probably reduces the amount of "noise" that is generated by fin motion.

The lateral-line system helps fish to avoid collisions, orient itself in relation to water currents, and to locate prey. For instance, blind cavefish have rows of neuromasts on their heads, which appear to be used to precisely locate food without the use of sight; killifish are able to use their lateral line to sense the ripples made by insects struggling on the water's surface. Experiments have shown that lateral lines in schooling fish are

used to avoid collisions with other schooling fish.

Do Fish Drink?

Yes and no. Fish do drink water, but how they consume it depends on what sort of water they live in.

Water gets into a fish's body through osmosis, the process in which water diffuses from a higher to a lower concentration.

Freshwater Fish

Here's how it works. If there is more water outside of a cell than inside, water will try to flow into the cell until there is the same concentration of water on either side of the cell's membrane.

The body of a fish acts the same way, either absorbing or losing water depending on its surroundings.

Whether a fish absorbs or loses water is based on the fact that all fish must maintain a certain amount of salt in their bodies to stay healthy. Fish that live in freshwater have a higher concentration of salt in their bodies than does the surrounding water. So freshwater fish absorb water through their skin and gills. Consequently, water continuously flows into the fish's body to attempt to dilute the amount of salt in the fish until it is equal to the amount of salt in the surrounding water.

Since fish cannot allow their salt content to be diminished, their kidneys work overtime to expel excess water in the form of urine. So freshwater fish do not drink, their cells do!

Saltwater Fish

Fish that live in the ocean have the opposite problem. Surrounded by saltwater, their bodies contain a relatively lower concentration of salt than ocean water. In this case, osmosis causes the fish to constantly *lose* water in order to equalize salt concentration inside and outside the fish.

To partially compensate for the water loss, ocean fish actually drink water through their mouths. To get rid of the excess salt they take in by drinking seawater, they excrete some salt through cells in their gills.

In other words, saltwater fish have to drink because their body's concentration of salt is lower than the surrounding water. Therefore salt water fish must drink huge amounts of water to stay hydrated.

Temperature

In this alien world of water, we have always thought of fish as being cold-blooded, but some species of fish actually maintain a body temperature slightly

higher than the water they are swimming in.

Fishes are surprisingly sensitive to temperature changes; some react to a change of as little as **one tenth** of a degree F. They have developed to live in a variety of environments in their alien world. There are fish that live in nearly freezing water, and others that live in water as hot as 104°F. Most fish are likely to die if the temperature they are accustomed to changes more than 15°F, and many cannot tolerate even that change.

Temperature at the time of spawning is especially critical to many species, and may be a reason why some fish migrate to special spawning areas at a particular time of the year.

Since most fish are cold-blooded, which means they do not and cannot control their internal body warmth, their metabolism is strongly influenced by the temperature of the water in which they live.

A few species, bluefin tuna as an example, are somewhat warm-blooded, in that they can control the temperature of some organs by using muscle movement to generate heat. But as far as is known, most fish are cold-blooded.

Given their cold-blooded nature, fish need to move to stay within their temperature comfort zone. Generally they do not need to move too quickly, because water has a high heat capacity, so generally change in temperature happens slowly. Fish are rarely trapped outside their comfort zone unless exceptional changes happen, such as a fish being trapped in a small landlocked pool on a very hot day, or when there is a large draw-down of a reservoir.

Fish generally try to find their thermal optimum, (their Goldilocks zone) the temperature which is not too cold or not too hot. This thermal optimum varies for different fish species.

Many feel that larger fish have better cold tolerance, and

this may be a factor why larger fish generally live in deeper, colder water than smaller fish.

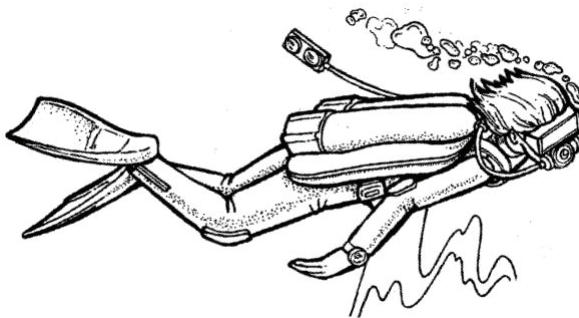
We get to watch creatures living in this alien world behind a glass panel, while sitting comfortably in an easy chair.

No rockets to outer space, no space suits. As an aquarist for my whole life, I find this world of fish and other creatures that live in this watery world exciting!



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A St. Louis Urban Legend

The Alligator Gar and Lock and Dam 26 - Alton, IL



Alton Telegraph (15 June 1942): "Photo of J. J. Carver, a guard at Lock and Dam 26 during World War II, with a 7'2", 112 lb. Alligator Gar that he shot with a 45-caliber revolver and a shotgun, lassoed it with a rope and pulled it out of the Mississippi with the help of three men."

by Thomas M. Keevin

URBAN LEGENDS HAVE been around for a long time and are always evolving, and changing with the times. They are usually fictional stories associated with the macabre, superstitions, ghosts, demons, dangerous creatures and other fear generating narratives. Such legends often come to life and are shared around the campfire or on Halloween to scare young kids.

Growing up in St. Louis during the 1950's I heard stories about commercial divers on the Mississippi River not wanting to work at the locks and dams because of the huge fish they encountered while making underwater inspections and repairs. There seemed to be a general fear by the commercial divers that monster catfish and Alligator Gar were lying in wait to attack them while they worked.

While reviewing historical newspaper articles as basis for scientific papers on the historical distribution of the Alligator Gar and the cultural history of the species, I found two articles in the **Alton Telegraph** that indicated one of the urban legends of my youth may have had some truth behind it.

The 15 June 1942 issue of the Alton Telegraph had an article that reported that J. J. Carver had caught a 7'2", 112 pound Alligator Gar at old Lock and Dam 26. He had shot it in the neck with a .45-caliber revolver and then hit it with a shotgun blast. The fish was lassoed with a rope and pulled out of the Mississippi by four men.

My first thought was why did Mr. Carver have a .45 revolver and a shotgun at Lock and Dam 26 and why did they let him use them to kill a fish?

An Alton Telegraph article published six years later, on 30 June 1948 answered at least one of the gun questions, and also shed some light on why commercial divers might not have been happy about diving at Lock and Dam 26.

The 1948 article stated:

"Giant alligator garfish have been visiting the Alton Lock and Dam during the past week for the first time in five years*. The fish, from six to seven feet in length and weighing about 200 pounds, appeared on the downstream side of the locks when the Missouri River began to rise. Today, the numbers of fish were decreasing, but several of the huge fellows could be seen below the locks, dwarfing any other fish in sight. In 1943*, the last year that the gars visited the Alton locks, one of them was killed by a guard who was posted on the dam during the war.

This fish measured more than seven feet in length." *Author: Actually 5 years after the 1942 article.

This article also cleared up one of my questions by indicating that the armed guard was there to guard Lock and Dam 26 during World War II. Of course it still didn't answer the question - Why he could blast away at fish from the lock and dam.

The large aggregation of monster Alligator Gar could certainly put the fear of God into commercial divers and start an urban legend that was in reality true.

Temperature and flood stages experienced at the time of the articles are the factors that initiate Alligator Gar spawning behaviors, as they normally form aggregations and move to the floodplain to spawn during flooding. They generally spawn in June in our part of the Mississippi River - the month of publication for both articles.

The Alligator Gar no longer occurs in the Mississippi River within the St. Louis District of the Corps of Engineers, although stocking efforts by both Illinois and Missouri are in progress.

This article is reprinted from the Missouri Aquarium Society's March/April 2022 issue of the *The Darter*.



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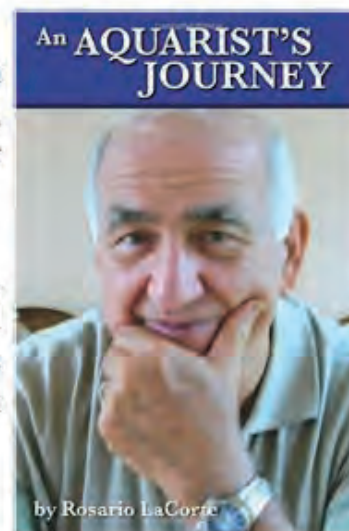


An Aquarist's Journey

Rosario La Corte is one of the world's leading authorities on breeding fish and he has written numerous articles and books, contributing greatly to our understanding of fish and their habits.

Now, for the first time, here is a compilation of his travels, adventures, successes (and, very occasional failures) all relating to collecting, keeping, and breeding fish, and in his own words (and edited by Modern Aquarium's Editor, Dan Radebaugh).

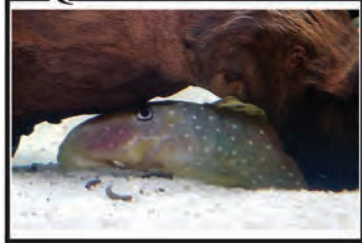
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Parancistrus nudiventris

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Community Tank

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Haemulon sciurus

by Stephen Sica

July 2017

Corydoras knaacki

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August 2017

Epiplatys roloffi

by Ruben Lugo

September 2017

Moenkhausia sanctaefilomenae

by Susan Priest

October 2017

Ambastaia sidhimunki

by Nipun Marwaha

November 2017

Pomacanthus arcuatus

by Stephen Sica

December 2017

Joe Gurrado Discus Tank

by Larry D. Whitfield



THE BIG ONE

(That *Didn't* Get Away!)

A series by the Undergravel Reporter

In spite of popular demand to the contrary, this humor and information column continues. As usual, it does NOT necessarily represent the opinions of the Editor, or of the Greater City Aquarium Society.

Back in June of 2022, a group of fishermen in the Mekong Delta of Cambodia caught a freshwater stingray. While this fish belongs to a species aptly named the Giant Stingray, the men probably did not realize the sheer enormity of their haul at first. Fishing in the hot afternoon sun, the men probably knew immediately that they had caught something large, but only when it took twelve of them to haul the fish to shore did they likely begin to realize the (literal) enormity of their catch.

Once the fishermen got the fish to shore and realized it was no ordinary stingray, but rather a rare and extremely large giant stingray, they fortunately decided to call a group of local scientists, who hurried to the shore. That is because the fishermen cooperate with a conversation alliance between Wonders of the Mekong and the Cambodian Fisheries Administration, which urges fisherman to alert researchers if and when they capture giant or rare fish.

The group weighed the fish, and found it clocked in at a 661 pounds (300 kg), smashing the previous world record for the largest freshwater fish ever caught, a 293 kg catfish in Thailand. The fish wasn't just heavy—it measured in at 3.98m long and

2.2m wide. While every fisherman has a tale about “the big one,” these fisherman have the pictures and international news stories to prove it!

The scientists quickly arranged to purchase the giant stingray from the fishermen at the market price for the meat, approximately \$600. A surgeon used a novel surgery to implant an acoustic tracking chip into the stingray (the first time one was used with this species), and it was released back into the Mekong Delta. Given that by this time a full moon had risen in the now-dark sky, and given the female stingray's bulbous shape, the group decided to name her “*Boramy*,” the local Khmer word for “full moon.”

Boramy is back in the news this year, as the scientists tracking her movements were shocked to report that she has not traveled much during the past year, instead preferring to stay within a relatively limited range (hopefully the

fisherman pick a different spot, or those scientists will be out \$600 at least once a week).

Dr. Zeb Hogan, a researcher with the Wonders of the Mekong group, stated that he was encouraged by the catch, because it indicates that the Mekong Delta has become healthier after years of overfishing and pollution had substantially reduced the population of fish in the river. Surely everyone is hoping that those fisherman continue to catch more rare and endangered fish in the future!

<https://www.smithsonianmag.com/smart-news/stingray-found-in-cambodia-sets-record-for-worlds-largest-freshwater-fish-180980288/#:~:text=The%20giant%20freshwater%20stingray%20%28Urogymnus%20polylepis%29%20was%20caught,project%2C%20a%20joint%20Cambodian-U.S.%20research%20and%20outreach%20initiative>



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