

modern AQUARIUM



March 2021
volume XXVIII
number 1

Greater City Aquarium Society - New York

長江水族館

專營各國熱帶觀賞魚和全套優質水族器材



131-08 40th Road, Flushing

Skyview Mall 天景豪苑旁

347.732.0373

monsteraquarium@hotmail.com



歡迎參觀 七天營業

Open 7 Days • 10am-8pm



LIKE AND FOLLOW US ON FACEBOOK

WWW.FACEBOOK.COM/MONSTERAQUARIUMINC

modern AQUARIUM

Series III Vol. XXVIII, No. 1 March, 2021

ON THE COVER

The fish in the foreground is a yellow tang, *Zebrasoma flavescens*, family Acanthuridae. It is one of the most popular fish in the marine aquarium hobby. Corals in the photo include (in back) leather green *sinularia*, (at left) pink *Gonipora*, and (at right) *Montipora*.

Photo by Joseph F. Gurrado

GREATER CITY AQUARIUM SOCIETY

BOARD MEMBERS

President.....Horst Gerber
Vice-President.....Edward Vukich
Treasurer.....Jules Birnbaum
Assistant Treasurer.....Ron Wiesenfeld
Corresponding Secretary.....Open

MEMBERS AT LARGE

Pete D'Orio.....Joseph Graffagnino
Al Grusell.....Jason Kerner
Dan Radebaugh.....Marsha Radebaugh
Leonard Ramroop

COMMITTEE CHAIRS

Bowl Show.....Joseph F. Gurrado
Breeder Award.....Joseph Graffagnino
Early Arrivals.....Al Grusell
Membership.....Marsha Radebaugh
N.E.C. Delegate.....Open
Programs.....Dan Radebaugh
Social Media.....Gilberto Soriano
Technical Coordinator.....Jason Kerner

MODERN AQUARIUM

Editor in Chief.....Dan Radebaugh
Copy Editors:
Alexander A. Priest.....Susan Priest
Donna Sosna Sica.....Thomas Warns

Advertising Manager.....Robert Kolsky

In This Issue

From the Editor.....	2
G.C.A.S. 2021 Program Schedule.....	3
President's Message.....	4
Our Generous Sponsors and Advertisers.....	5
Tonight's Speaker: Joseph Ferdenzi.....	6
Lake Tanganyika Cichlids	
<i>Phallichthys tico</i>	7
"The Dwarf Widow" by Joseph Graffagnino	
Fishy Friends' Photos.....	8
Culturing <i>Daphnia</i> in a Small Body of Water.....	9
by Jack McDonnell	
New York Harbor Is Alive!.....	11
by Jules Birnbaum	
Dreaming in the Key of Sea.....	12
Exchange Article by James Bradley	
Experiences in Keeping the Panda Uaru.....	26
by Joseph Ferdenzi	
2020 Modern Aquarium Article Index.....	28
G.C.A.S. Member Discounts.....	32
G.C.A.S. Classifieds.....	33
G.C.A.S. Happenings.....	34
The Undergravel Reporter.....	35
Smooth Swimming	
Fin Fun (Puzzle Page).....	36
The Nasty Ones	

From the Editor

by Dan Radebaugh

In March of last year we met as a club for the first and last time in the year 2020, and produced the only printed issue of **Modern Aquarium** in that year. As I write this, we still do not know when we'll be able to meet again. There are now several approved vaccines theoretically available for Covid-19, though the rollout has thus far been disappointingly limited, so we are still in the dark as to when enough of us will have been vaccinated to resume in-person meetings with in-person speakers, and receive printed copies of **Modern Aquarium**. I'm certain that I'm not the only member who's itching to get back to normal. Meanwhile, we will endeavor to go on with virtual meetings and electronic distribution of **Modern Aquarium**.

I'm pleased that in this first issue of the New Year we have a new article from a new author! See Jack McDonnell's "Culturing Daphnia in a Small Body of Water." An impressive debut! Going on, Joe Graffagnino introduces us to "*Phallichthys tico*, the Dwarf Widow," Joe Ferdenzi joins the party by telling us of his "Experiences in Keeping the Panda Uaru," and Jules Birnbaum describes the current state of New York Harbor in his article, "New York Harbor is Alive!" Sounds positive to me!

Many of you may recall that our September 2016 issue was devoted to the cognitive abilities of our aquarium inhabitants. Well, some weeks ago



I received an email alerting me to a terrific article on that subject by one James Bradley in **Cosmos**, a magazine based in Australia. After reading it, I immediately contacted Gail McCallum at the Royal Institution of Australia, requesting permission for us to reprint the article in **Modern Aquarium**. Somewhat to my surprise, she agreed! Naturally there were some copyright requirements, but these were reasonable and simple to satisfy, so be sure and look for "Dreaming in the Key of Sea" on page 12.

On page 28 you will find our Index of Articles from last year (2020). Our list of member discounts at local fish shops is on pages 32 and 33, and GCAS Happenings is on page 34. We close this issue on a rather medical note, both from The Undergravel Reporter (See "Smooth Swimming" on page 35), and our Fin Fun puzzle, titled "The Nasty Ones," on page 36. Be sure and check these out!



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).

Available in softcover at [Amazon.com](https://www.amazon.com)





GCAS Programs

2021

While because of the Covid19 situation we cannot yet predict when we will be able to resume our normal meeting schedule at the Queens Botanical Garden, we do hope to be able to resume in-person meetings sometime this year. We will post updates to this schedule as we are able to do so. Hope to see you all soon!

March 3	Joseph Ferdenzi <i>Lake Tanganyika Cichlids (via Zoom)</i>
April 7	Dr. Richard Pierce TBA
May 5	Joe Graffagnino <i>Building A Fish Room</i>
June 2	TBA TBA
July 7	TBA TBA
August 4	TBA TBA
September 1	TBA TBA
October 6	TBA TBA
November 3	TBA
December 1	TBA

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 2021 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. 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 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

We are happy to hear from our devoted members about how much they are looking forward to once again receiving our magazine and hoping for our regular meetings to resume. We used to take our meetings for granted, and sometimes may even have thought, "What a pain!" But now we realize how much we miss those monthly get-togethers. Thanks to Dan for continuing to produce the magazine without interruption. I have been told countless times how much our readers have appreciated that!

We are all connected here at GCAS, whether we each always realize that or not. We share a common interest, and have learned (sometimes the hard way) that no one truly gets by on their own. We help one another. That is what our club is all about.

So what else has been going on with everyone? Well, we said goodbye to neckties and hello to sweatpants. We've learned to elbow bump rather than shake hands. Hugs are out of the question—even with your grandkids. We Zoomed! We learned to check out those 6-foot distance points to observe when standing in line. Interestingly, pet sales were up in 2020, including aquariums!

We realized what our most important shopping items are when toilet paper overnight practically disappeared from the store shelves! Meat shelves seemed to have been raided as well. There were also apparently some interesting associations in our minds. While alcohol consumption generally sparked during the lockdown, Corona beer sales plunged 50%. See? We don't just think we're crazy—we are!

I cannot complete these remarks without expressing our deepest sympathy to Jeff Bollbach on the passing of his son Alexander. Jeff, our thoughts are with you during this time of grieving. He was too young for this fate. We hope you will be able to find some peace and comfort.

Difficult times like this seem to deepen our caring and appreciation for spouses, friends and relatives. Please remember that your friends here at Greater City do care about you and yours. You are in our thoughts.



Horst





GCAS Thanks You!

Our Generous Sponsors and Advertisers

The Greater City Aquarium Society extends our heartfelt thanks to the following manufacturers for their generous donations. Thanks also to our advertisers, whose contributions to our success as a Society are deeply appreciated. Please patronize our supporters.

Aquarium Pharmaceuticals

Aquarium Technology Inc.

Aqueon

Brine Shrimp Direct

Carib Sea

Cobalt Aquatics

Coralife

Ecological Laboratories

Florida Aquatic Nurseries

Fritz Aquatics

HBH Pet Products

Hydor USA

Jehmco

Jungle Labs

Kent Marine

Marineland

Microbe Lift

Monster Aquarium, Inc.

NorthFin Premium Fish Food

Ocean Nutrition America

Oceanic

Omega Sea

Penn-Plax

Pet Resources

Pisces Pro

Red Sea

Rena

Rolf C. Hagen

San Francisco Bay Brand

Seachem

Sera

Spectrum Brands

Zilla

Zoo Med Laboratories Inc.

Your Fish Stuff.com

Tonight's Speaker

Joseph Ferdenzi: on Lake Tanganyika Cichlids

A multifaceted aquarist, Joe Ferdenzi has kept tropical fish since the mid 1960s, and during this time has done extensive writing, breeding, showing, speaking, and judging. His skilled and articulate writing has been published locally as well as nationally, and he was awarded the high honor of Author of the Year by the Federation of American Aquarium Societies in 1994 and again in 1996.

Renowned for his breeding expertise, Joe has had numerous successful "first-time-ever" breedings, and is among the top breeders in his home club, the Greater City Aquarium Society. Showing his fish across the region, he has won an abundance of awards, trophies, and ribbons, which include many Best of Show and Reserve of Show. He has also traveled to many states and countries to give presentations on numerous aquarium topics.

An active participant in the organized hobby, Joe is a member of local and national aquarium clubs and organizations. He served an unprecedented 19 years as President of the Greater City Aquarium Society in Queens, NY, is a Life Member of both the American Killifish Association and the American Cichlid Association, a member of the Long Island Killifish Association, and both the ACA CARES and GCAS CARES Programs. For all of these efforts, in 2019 the Northeast Council of Aquarium Societies presented Joe its highest award, the Betty Mueller Memorial Honor for his outstanding dedication and support of the aquarium hobby.



Aside from his many aquariums, Joe has a most impressive collection of literature—his aquatic library being one of the largest in New York. Some of the books date to the mid-1800s, as well as many recently published books. Joe also collects antique aquarium memorabilia and is extremely knowledgeable on the history of the hobby. Having done a tremendous amount of research on the history of his home club, the Greater City Aquarium Society, Joe is well-versed with many accounts of its progression throughout the years.



NEED COMPUTER HELP?

Virus/Spyware Removal \$79.00*

Wireless Setup \$49.00**

Optimization Special \$39.00*

Test Hard Drive and Memory
Eliminate Windows build-up
Remove Internet activity and accumulation
Accelerate Windows start-up



All Work Guaranteed
Professional, Friendly Service
On-Site Service in Your Home,
Office or Business

CompTIA® A+ Certified

Repairs & Upgrades • DSL & Cable Modems Installed • Home & Office Networking
Wireless Networks Installed • Computer & Peripherals Set Up • Troubleshooting & Optimization
Virus & Spyware Removal Specialist • Data Recovery • One-on-One Training

* \$15.00 Mobile charge

** Labor only. Equipment additional

Call: 718-469-5444 • jasontech1@verizon.net

Phallichthys tico

“The Dwarf Widow”

by Joseph Graffagnino

This beautiful little livebearer hails from the upper San Juan River/Rio Pizote drainage in Costa Rica. Their coloration is a yellow to orange body with clear pectoral and anal fins, and yellow coloration edging into the tail and dorsal fins. The dorsal fin is yellow close to the body, and then has a black blotch, the edging on the tip of which is a bright blue. The males grow to about 1 inch, and the larger females can grow to 1 ¾ inches. This is a very attractive fish!

Aquarium conditions should be similar to those of most livebearers, with a pH of 7.0 – 7.5, a general hardness (GH) of 3-10 and a water temperature of 73–83 degrees Fahrenheit.



I noticed these beauties at a North Jersey Aquarium Society event. There had to be a dozen fish of various sizes in the bag. I was



able to win the bag at auction, and brought them home.

I had a 10-gallon tank prepared with a thin layer of African cichlid sand to maintain an alkaline pH. I added a lot of floating plastic plants and a corner filter to complete their new home's furnishings.

I needn't have worried about the

floating plants to provide escape paths for newborn fry. Three days after I placed the group in the tank I found a half dozen fry swimming around the bottom of the tank. The parents do not bother them.

These fish will eat anything they can fit in their mouths: crushed flake food, baby brine shrimp, and cut up live blackworms or frozen bloodworms. They are quite prolific, and the tank is filling with fry.

If you want a pretty addition to your home aquarium that is easy to maintain and breed I would strongly suggest this hardy livebearer, and as a bonus it's an easy 5-point Breeder Award species. Give the Dwarf Widow a try—you won't be disappointed!



References:

<https://www.aquariumglaser.de/en/fish-archives/phallichthys-tico-2/>

<https://www.fishbase.de/summary/Phallichthys-tico.html>

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!



Culturing Daphnia in a small body of water

by Jack McDonnell (@barrier_island_aquatics)



In the ten years that I have been keeping freshwater aquarium fish, I have noticed several misconceptions about various aspects of the hobby. The topic I would like to discuss in this article is culturing daphnia. Some hobbyists believe this to be a difficult task for numerous reasons, while others, such as myself, find it to be a fairly simple task to achieve, and with very minimal cost. When culturing smaller daphnia colonies, I have found that as long as you are willing to put in a minimal amount of effort in maintaining the culture this is something that can be easily achieved.

In the early summer of 2020 I decided that I wanted to start culturing live foods, daphnia in particular, to feed my various fish species. I had been experimenting with and researching different foods for quite a while. Since I primarily keep livebearing fish I wanted to find out which live/fresh food would provide the most nutritional benefit.

Throughout my years of keeping fish I had been reluctant to start a live food culture. I was most hesitant because of the possibility of wiping out the cultures. I had also read many articles detailing a long list of troubles hobbyists and breeders had reported on culturing daphnia. Most of these articles dealt with raising live food in large tanks, which in any case does not work well in an apartment. What I found to be very appealing about culturing my own live foods was the fact that you always knew what you were feeding these cultures, and you knew how they were

being raised, which gave me a feeling of security in how I was caring for my fish.

After investigating different methods of culturing daphnia, I finally decided to start my own. The method I chose proved to be very simple and efficient for my current setup of eight aquariums. I had purchased a generic five gallon bucket from a local hardware store and placed it under one of my aquarium cabinets. I filled this bucket with cultured water from one of my well established planted aquariums. I added airline tubing in the bucket with a splitter valve connected to the central diaphragm air pump controlling all of my other aquariums. Any common air pump can be used for this.

So basically, I tapped into the diaphragm pump system I already had in place to provide a slow release of air through the tubing, creating a minimal bubble rate into the bucket, which provided a small amount of surface agitation. I also placed a clip-on shoplight over the bucket so I could see what was going on in the culture. Additionally, I added a small amount of duckweed to help control water quality, since duckweed (and plants in general) provide a great form of natural filtration in any aquarium.

Duckweed absorbs a lot of excess waste and debris from the water column. I use duckweed in every one of my aquariums. You can always remove small amounts if it is becoming a problem when harvesting daphnia. Duckweed is a very hardy and prolific plant, so you will always have more.

I also wanted something in the culture to serve as a “clean-up crew.” In all my aquariums I have blue ramshorn snails and pond snails. These snails will not harm your daphnia. Many aquatic snail species provide a great role in any aquarium as a decomposer. In all of my aquariums I am very focused on providing a balanced and natural ecosystem with a cohesive symbiotic relationship.

When I finally set up the daphnia culture and had the system running, I decided that I would give it about a week’s worth of time to cycle before adding any daphnia. During this time I would check the water conditions every other day to see if there was anything alarming in the water quality. I wanted to provide the safest conditions I could for these microorganisms since they were going to be fed to my fish.

The conditions in which you raise your live food should be just as important as the conditions you keep your fish in. Leading up to this time I searched the internet for a good starter culture. I tried my best to purchase most of my stock from fellow hobbyists and breeders. Typically I look on eBay, Aquabid and Getgills for most of my fish and plants. When I was searching for a possible starter culture for my first daphnia colony I saw many different advertisements for an assortment of different types of daphnia. I also saw various amounts of daphnia being sold, ranging from a three hundred count to about fifteen hundred.

One day I came across an advertisement on eBay that said, “indoor raised red Russian daphnia culture 400 count.” This I found to be a good amount to start my first daphnia culture. It was also a manageable amount to watch the process of their growth reproduction.

Once started, they will reproduce fairly regularly, taking about seven days to multiply. I had also read several articles and had seen videos of breeders that I had admired using this line of daphnia. I found this to be the best fit for me, as I trust the quality of these breeders’ stock and what they used to feed their fish.

When you are planning to culture live foods such as daphnia you should pay special attention to the individual that you are buying or obtaining your initial stock from, and how they are raising them. This can be done indoors or outdoors, but indoors allows you to monitor and control the conditions a bit easier. For example, I was looking for a small starter culture to raise indoors, so I purchased a small indoor-raised culture. This can be a good thing to keep in mind, because it may help start your culture on a good healthy note.

When I received the Red Russian daphnia in the mail, I acclimated them to the water they would be living in by simply floating the bag for about forty five minutes. After releasing them I gave them approximately twenty four hours to adjust to the conditions with no food added. The next morning I gave them their first feeding in their new system. My

food of choice was spirulina flakes. I decided I would break down these flakes into a very fine powder before feeding it to the daphnia since they are microorganisms. This was a very cost effective method, because it gave me an abundance of food to feed a small culture over a long period of time. I personally watched them swim to the surface and eat the powder, which was a very relieving feeling for me.

I fed my daphnia twice per day, once in the morning and once in the evening, using a very small amount of the spirulina powder each feeding. This seemed to work very well, and I maintained this process for about two weeks before ever harvesting any daphnia to feed to my fish. During this two week period I did two water changes on the culture, once a week, about fifty percent each time using water from the aquarium in which I originally started the culture. This worked out well and provided no problems, so I continued doing this even when I was feeding them to my fish.

The first feeding of my bucket-raised daphnia was an exciting event. My fish came to life with vibrant colors and lightning fast energy as they feasted on their new staple. Following this I made an additional (identical) bucket set-up, and had two cultures going at the same time. That way I could feed alternately from both cultures daily, so I wasn’t harvesting too heavily from just one.

In conclusion, this method of raising daphnia is a mix of the various practices that I had learned from my research. I found it to be very inexpensive, easy and productive for my breeding projects. This can be set up indoors or outdoors, and at virtually any scale or size to accommodate your space and budget. I maintain a small fish-room in my apartment on Long Island, New York, and this setup has worked great for me.

Special thanks to Mr. Ferdenzi for asking me to cover this topic!



Editor’s Note:

Mr. McDonell (@barrier_island_aquatics) is the owner of Barrier Island Aquatics.

Email: barrierislandaquatics@gmail.com

Daphnia Photo from Ebay

New York Harbor is Alive!

by Jules Birnbaum

The **New York Times** of January 31, 2021 has an article that I think may be of interest to aquarists. It's about what is in the waters of New York Harbor. I'll try to summarize.

Mud—As a result of making the harbor safe for shipping, the harbor floor is now dominated by a layer of mud.

Underwater traffic—Hundreds of cars have ended up parked at the bottom, forming artificial reefs. In the 1960s old ice cream trucks were deposited just outside the harbor as a refuge for marine life.

Whales—Humpbacks have been seen as well as fin whales, minke whales, dolphins and porpoises.

Oysters—Centuries ago the waters around New York City were blanketed by oyster beds. Those are basically all gone, the result of colonization and pollutants. The Department of Environmental Conservation (DEC) is now working to build oyster reefs.

Humans—Water lovers have begun swimming in the East and Hudson Rivers, mostly in organized races.

Seals—There are more fish to eat because of less pollution, so we are seeing more of these, particularly grey seals and harp seals.

Sea Turtles—Eggs have been laid on local beaches. In 2018 an endangered sea turtle, Kemp's Ridley (the most endangered sea turtle in the world) laid eggs on a Rockaway beach. The Park Service incubated 96 eggs that hatched, and the offspring headed back into the water.



Photo by USEPA Environmental-Protection-Agency - Kemp's Ridley Sea Turtle, Texas Uploaded by mrjohncumings, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=28266684>

Water birds—More and more water birds, such as the Red Breasted Merganser, are migrating north as the winters become milder.

Fish—Sturgeons as long as 14 feet have been spotted, as well as tiny sea horses. The article also mentions striped bass and hogfish, but does not mention yellow perch, bluefish, flounder, and black sea bass.

Sunken Treasure—In 1903 a barge capsized and spilled its cargo of silver and lead bars into the waters off Staten Island. Although most were recovered there are still at least 1,500 bars buried in the muck.

Sharks—There have been great white sharks spotted off Rockaway Beach. There are also many smaller sharks, such as tiny dogfish about 4 feet long, but they are not a danger to humans.

Shipwrecks—There are many shipwrecks in the harbor, which is not easy to navigate because of sand bars.

Eels—American eels breed in the mid-Atlantic and migrate to freshwaters which they prefer, living in our streams for about 5 years. When they are ready to spawn they migrate back to the mid-Atlantic.

Tropical Visitors—Storms in the tropics pick up young fish and carry them into New York waters via the Gulf Stream. Climate change is making it easier for them to survive, at least for a time.

Seaweed and Seagrass—For years there was too much pollution for plants to survive, since not enough sunlight could reach them. Groups like the New York Harbor School have been planting eelgrass, which is an important home for young fish as well as shellfish.

Wood Munchers—These are critters that eat into wood—any wood, such as docks, and are called ship worms. They are a form of mollusk (snails, clams, et al). They were not as big a problem during the time of heavy pollution, but with cleaner waters they are making a comeback.

I hope this helps to give you an insight into what is going on in New York Harbor.





FISH COGNITION

AUSCAPE/GETTY IMAGES



Research suggests fish use tools, have complex social lives and are self aware.
JAMES BRADLEY explores what that means for the way we test intelligence, and how we treat this diverse, enigmatic community.

Earlier this year, while on a field trip in the Cocos Islands, I took some time out and went snorkelling. I was in a shallow channel between two islets, and the tide was running, so my only real option was to let the current carry me, which it did, and quickly, sending me shooting over an expanse of broken coral and sand. Although I had seen fish earlier in the day, there weren't that many about in the water I was moving through, but after a few minutes a trevally came angling in towards me. It was a striking animal: its silvery, streamlined body some 70 or 80 centimetres long, with a vivid blue stripe running along its spine and back along its middle, and it approached me quickly, seemingly without fear. At the last moment it arced outward and swooped around me, before turning back to circle me again, and then again, a process it kept up for perhaps another 10 or 12 minutes as the tide carried me further down the channel into the lagoon.

For a time, I was worried it might be thinking of attacking me – certainly there was an edge of aggression to the way it kept circling – but what most struck me about



it was its air of purpose, the sense I was being monitored and observed. There was no question this fish was *there*, a living presence with its own intentions and agenda.

Anybody who spends time in the water will have had similar encounters. But despite them, fish are generally dismissed as creatures of little wit or feeling, and almost never subjects of moral concern. When we do think of them, it is as food, or less commonly, pets of a purely ornamental kind. Pescatarians who regard slaughtering a cow or a pig or a chicken as unutterably cruel happily consume fish as if they are little different to vegetables. Even our everyday language erases their particularity: we speak of one fish or many fish, as if they are so interchangeable it is not worth according them a plural form. Yet these assumptions elide a world of astonishing complexity.

Fish first evolved over half a billion years ago, and have endured because they are supremely well-adapted to their environments. They are also extraordinarily diverse, the 34,000 identified species of fish making up fully 60% of all vertebrate species – more than mammals, birds and reptiles combined. Fish range in size from the minute *Paedocypris progenetica*, which is found in the peat swamps and blackwater streams of Sumatra and Bintan, and measures a mere 7.9 millimetres in length, to the immense whale shark, *Rhincodon typus*, which grows to

13 metres, and can weigh well over 20 tonnes (I once swam with one whose tail was taller than I am). They are found in the icy waters of the polar oceans and the blood-warm waters of the tropics, on the mudflats and intertidal zones of mangroves and more than eight kilometres below the surface in the darkness and bone-liquefying pressure of the Mariana Trench.

But this remarkable diversity is only the tip of the iceberg. Over the past two decades, researchers have amassed an impressive body of evidence that fish not only think and feel, but exhibit complex social behaviours and sophisticated cognitive abilities, are capable of learning, problem solving and tool use, and possess culture and even the sort of self-awareness previously assumed to be restricted to primates, dolphins, elephants and a few species of birds.

These discoveries demand we rethink not just our assumptions about the cognitive capacities of our finned cousins, but challenge our ideas about what intelligence is – and how it can be tested and identified.

One of the leading figures in this emerging space is Macquarie University behavioural ecologist, Culum Brown. Brown's early research was on rainbowfish, small river fish native to Australia, New Guinea and Indonesia. A popular aquarium species, rainbowfish possess

Staying together to avoid predators (above), a mixed school including French grunt (*Haemulon flavolineatum*), bluestriped grunt (*H. sciurus*) and porkfish (*Anisotremus virginicus*) sweep under a coral ledge. Traditionally, fish aren't assigned curiosity, but dive photographers' encounters with individuals – such as the queen angelfish (opposite top; *Holacanthus ciliaris*) and king angelfish (opposite below; *H. passer*) – consistently suggest otherwise.

Previous pages: spellbindingly balletic, a swirling school of bigeye trevally (*Caranx sexfasciatus*) encircle a diver in waters off Tulamben, Bali.

STEPHEN FRINK/GETTY IMAGES

that peculiarly piscine combination of nervousness and glassy regard that tends to lead humans to dismiss the idea they might be intelligent.

Yet Brown's work revealed rainbowfish have complex social lives and hierarchies, are capable of learning to avoid dangers such as predators and traps, and – perhaps most surprisingly – of passing these techniques on to other rainbowfish. Nor are these abilities rudimentary: experiments show rainbowfish learn to associate signals with food three times as fast as rats and twice as fast as dogs.

Brown's early research also added to the growing body of evidence that, contrary to the old joke about goldfish, many fish have excellent long-term memories. Indeed when tested again almost a year later, rainbowfish responded as if no time had passed.

Similar abilities have been observed in many other species of fish: tilapia taught to associate a signal with netting, for instance, remembered the signal and responded accordingly 75 days later, while gobies, which form highly detailed mental maps of the tidal pools in which they live, recall the location of neighbouring pools for at least 40 days after being removed from their original home.

Even more importantly, though, Brown's research demonstrates that not only are fish capable of remembering, they are capable of learning from each other through observation and interaction, meaning information can be passed between individuals and, even more significantly, between generations.

At one level these discoveries should not come as a surprise. As Brown points out, "we've known about social learning and cultural transmission in animals for 60 years. Everybody looked for it in chimps first, because they're so much like us. But since then the search has cascaded through nearly all the animal taxa, to the point where I think it would be fair to say social learning and cultural traditions are present in almost all animals."

Perhaps unsurprisingly, many of the known examples of social learning in fish relate to food acquisition. Archerfish learn their famous ability to shoot insects from the air by firing water from their mouths after observing the hunting techniques of older fish. Similarly tigerfish in Schroda Dam in South Africa have learned to prey on swallows that fly close to the water's surface by leaping out of the water to grab them as they pass, an adaptation unique to this particular population, and one that has spread socially between the fish.

But fish also learn foraging and migration routes from each other. French grunts and bluehead wrasse have both been shown to pass information about migration routes from one generation to the next, the older fish teaching the younger the best paths to take. But as with human culture, this form of cultural

(FROM TOP) KEN KIEFER 2, MARIO/JOEY IMAGES



A large whale shark (Rhincodon typus) is the central focus, swimming horizontally with its mouth open, filter-feeding. It has a greyish-brown body with white spots and stripes. Several smaller, colorful fish, including yellow and blue ones, are swimming around it. The background is a deep blue ocean with some bubbles and a sandy bottom visible at the bottom.

FISH POSSESS INDIVIDUAL PERSONALITIES AND AFFINITIES, AND CAN FORM ATTACHMENTS TO EACH OTHER

Surrounded by smaller oceanic congregants, a whale shark (*Rhincodon typus*) lopes by, mouth open to filter-feed in typical fashion. The world's largest extant fish may surpass 10m in length and a century in years; it's found in all tropical and temperate seas. Despite its size it feeds only on plankton and poses no risk to other mature fish or to humans; juveniles are gentle and have been recorded "playing" with divers. Whale sharks are famously slow movers: about 5–6 km/h suits them fine.

ALEXIS/GETTY IMAGES



FISH COGNITION

transmission is highly vulnerable to disruption, with studies showing this knowledge can be quickly lost if the individuals that possess it are removed from the group.

Like other social animals, fish also possess individual personalities and affinities, and can form attachments to each other. A recent study by Brown's lab discovered that the shy Port Jackson sharks ubiquitous on the eastern Australian coast have well-established social networks and seek out the company of individuals of the same age and sex. In other words, the sharks prefer to socialise with their peers, as we do.

Nor are social behaviours restricted to recognition and attachment. Fish make choices about mate selection on the basis of their observations of relative status within group hierarchies. They also often employ cooperative behaviours, especially when hunting – yellowtail kingfish (known in the US as amberjacks) off the Californian coast have been observed using U-shaped formations to separate out and trap groups of prey fish, behaviour that resembles the hunting techniques of mammals such as wolves and dolphins.

Co-operative behaviour also extends into other aspects of the lives of many fish, in particular species of cichlids that collaborate to protect and raise young. They are also quite capable of punishing fish that do not behave appropriately. When approaching potential predators, sticklebacks use a distinctive stop-start swimming motion to share the risk by taking turns at the front. But if an individual is reluctant to take the lead, or cheats by hanging back, its schoolmates will refuse to cooperate with it in future, meaning the sticklebacks recall the identity of malingerers and remember they are not to be relied upon.

Although these sorts of behaviours have only been observed in a relatively small number of species, it is likely they are widespread – as Brown emphasises, the practical obstacles to detailed study of fish means our understanding of their lives is extremely limited. But these examples make it clear many fish inhabit social worlds at least as rich as those of mammals and birds.

Comparing the intelligence of different species is notoriously difficult, but there is no question managing such social complexity is cognitively demanding, and suggests many fish possess considerably higher levels of cognition than is often assumed. Yet what of other behaviours that are often regarded as markers of high intelligence such as tool use?

The generally accepted definition of tool use requires an animal to grasp something and use it to manipulate another object or organism. For fish, which lack grasping appendages, such behaviour is effectively impossible, a problem compounded by the physics of the underwater environment, which makes it difficult



*“WHEN GOODALL AND
OTHERS CAME UP
WITH A DEFINITION
OF TOOL USE, IT HAD
NOTHING TO DO WITH
APPENDAGES”*

Who's watching whom?
Many species seem to keep
an eye on humans: from
metre-long humphead wrasse
(right; *Cheilinus undulatus*)
in coral waters of the Indo-
Pacific, to (opposite, from top)
tuskfish, Clark's anemonefish
(*Amphiprion clarkii*),
and honeycomb grouper
(*Epinephelus merra*). Anybody
who spends time in the water,
says author James Bradley,
understands that a fish is “a
living presence with its own
intentions and agenda”.

PETE ATKINSON/GETTY IMAGES

to strike objects together or engage in fine control, both actions basic to many forms of tool use on land.

Yet despite this, many fish engage in behaviours that seem to closely resemble tool use. A number of species of wrasse and tuskfish have been observed using rocks as anvils to crush sea urchins or break open shellfish. Likewise, a group of Atlantic cod in an aquaculture facility in Norway recently took to stealing food from an automatic dispenser after they realised tags attached to their bodies could be used to activate it.

To Brown, the refusal to treat such innovations as tool use says more about our definitions than it does about the behaviour. Instead, he argues, the emphasis upon grasping is fundamentally misconceived, and a reflection of the emphasis upon behaviours observed in apes and monkeys.

"What's interesting is that when [primatologist] Jane Goodall and others came up with a definition of tool use it had nothing to do with appendages; instead it was all about using an object to achieve a goal. But then the whole concept got hijacked by the primatologists, who substituted a primatecentric definition."

Brown contends Goodall's original definition was correct, and the most important element in tool use is the intention of the animal, its desire to achieve a goal that might elude it without the tool.

This emphasis upon intentionality and the manipulation of the environment opens up a broader approach to our understanding of the evolutionary origins of such abilities. "There's obviously a lot of overlap between building nests and using tools," Brown says. "Both of them are clearly about manipulating the environment in a way that enhances your fitness, so you're either more reproductively successful, you're getting more food, or you're safer from predators and other environmental stresses."

This shift in approach is particularly relevant to fish, at least 9000 species of which build nests. Sometimes these structures are relatively simple: certain species of wrasse, for instance, create mucous cocoons in which to shelter while they sleep, and some eels, gourami and bettas, such as the Siamese fighting fish, use oral secretions to create raft-like bubble nests in which they secrete their eggs. But many species also build structures to protect eggs and young or to provide shelter while they sleep. Sometimes, as with the mounds of coral that triggerfish create to hide within, these structures can seem primitive or haphazard. But as Brown observes, appearances can be deceptive.

"It isn't simple or boring behaviour. It's often seriously sophisticated. If you're building an igloo out of coral rubble that's going to protect you it has to be structurally complex enough that it won't fall down around your ears."



(FROM TOP) ALEX VAIL, LITTLE DINOSAUR, STEVEN TRAINOFF/GETTY IMAGES

VAIL'S WORK
SHOWED THE
FISH DON'T
JUST LOOK
LIKE THEY'RE
POINTING,
THEY ARE
POINTING.



Schooling, swimming or (apparently) snarling, piscine "otherness", including their habitation of a medium in which humans can't survive, might be the greatest barrier between them and us. But our fascination with species such as the great white shark (above; *Carcharodon carcharias*) and short-nosed unicornfish (opposite below; *Naso brevirostris*) is undiminished.

In 2006, scientist Redouan Bshary noticed groupers in the Red Sea approaching moray eels and performing a distinctive head-shake, or shimmying motion, to attract a moray's attention. That done, the tropical odd couple of grouper and moray would head off together in search of prey.

Fast-moving predators, groupers excel at catching fish in open water, but often lose prey when it takes shelter in holes or under rocks. The long, sinuous bodies of morays, on the other hand, are perfectly adapted to catching fish in crevices, but often lose them if they flee into open water. Working together, the groupers and morays in combination were able to cut off all routes of escape for their prey, making them far more effective than either in isolation. Bshary later observed groupers teaming up with humphead wrasse as well, using the much-larger humpheads' ability to suck prey from crevices with their powerful jaws to complement the groupers' open-water skills.

Interspecies cooperation of this sort is incredibly rare, and has only been observed in a handful of species of mammals and birds. Yet Bshary quickly realised the groupers also seemed to be engaging in another, even more surprising behaviour: in cases where they trapped prey somewhere inaccessible, the groupers would stop and perform an unusual

headstand over its location, seemingly pointing in an effort to attract the attention of morays.

As anybody who has tried to direct the attention of a dog or a cat by pointing at an object knows, referential gestures that seem natural to humans are nothing of the sort. Indeed, while there is some evidence Australian magpies can understand them, and some dogs are able to learn to respond correctly, the only non-human species known for certain to understand referential gestures are chimpanzees and ravens. Even human children only become capable of using and understanding referential gestures around their first birthday.

As the roll call of creatures capable of using them suggests, referential gestures seem to be associated with high intelligence. As a result, biologists have developed a five-fold test to determine whether behaviours are genuinely referential. The gesture must be directed towards an object; it must be communicative rather than mechanically effective; it must be directed at a recipient or potential recipient, whose response must be voluntary; and – perhaps most importantly – it must exhibit the hallmarks of intentionality.

With this in mind, Australian scientist Alex Vail set out to establish whether coral trout – close relatives of the groupers that live on the Great Barrier

KEN KIEFER 2/GETTY IMAGES



(FROM TOP) ALEX VAIL, FEDERICA GRASSI/GETTY IMAGES

Reef and engage in similar behaviour – met all five criteria. And as quickly became clear, they do. In other words, the groupers and the trout don't just look like they're pointing, they are pointing.

Vail, who now works as a cameraman on major natural history projects such as *Blue Planet 2* and Netflix's *Our Planet*, admits he was not hugely surprised by the results: having grown up at the Lizard Island Research Station on the Great Barrier Reef, he has been diving with coral trout all his life and has no doubt they are highly intelligent.

Yet he's also cautious about overstating the scientific implications of the referential behaviour, emphasising that, like tool use (which it resembles in many ways), it is possible to understand it as an evolved response to ecological need rather than a sign of generalised intelligence. "Animals know what they need to do to succeed in their environment," he says. "But that can be because they're responding to environmental stimuli, or they can be doing it with a bit more understanding of their actions. In the end we went with the more cautious interpretation because it was more defensible, but even interpreting that way we had a hard time getting the paper published, because most of the people reviewing it were primatologists who aren't keen on the idea fish might be able to do the same things as their beloved primates."

The tension between primatologists and researchers studying the behaviour of fish has come to a head over a study of cleaner wrasse. Small, highly social fish native to coral reefs from the Red Sea to the Pacific, cleaner wrasse maintain "cleaning stations", which other fish visit in order to have the wrasse remove dead skin and parasites. These stations are extremely popular, attracting large numbers of regular clients as well as more casual visitors.

Yet while the wrasse are skilled at their job, they are not entirely trustworthy, and will sometimes seek to supplement their diet with a mouthful of live skin and mucus.

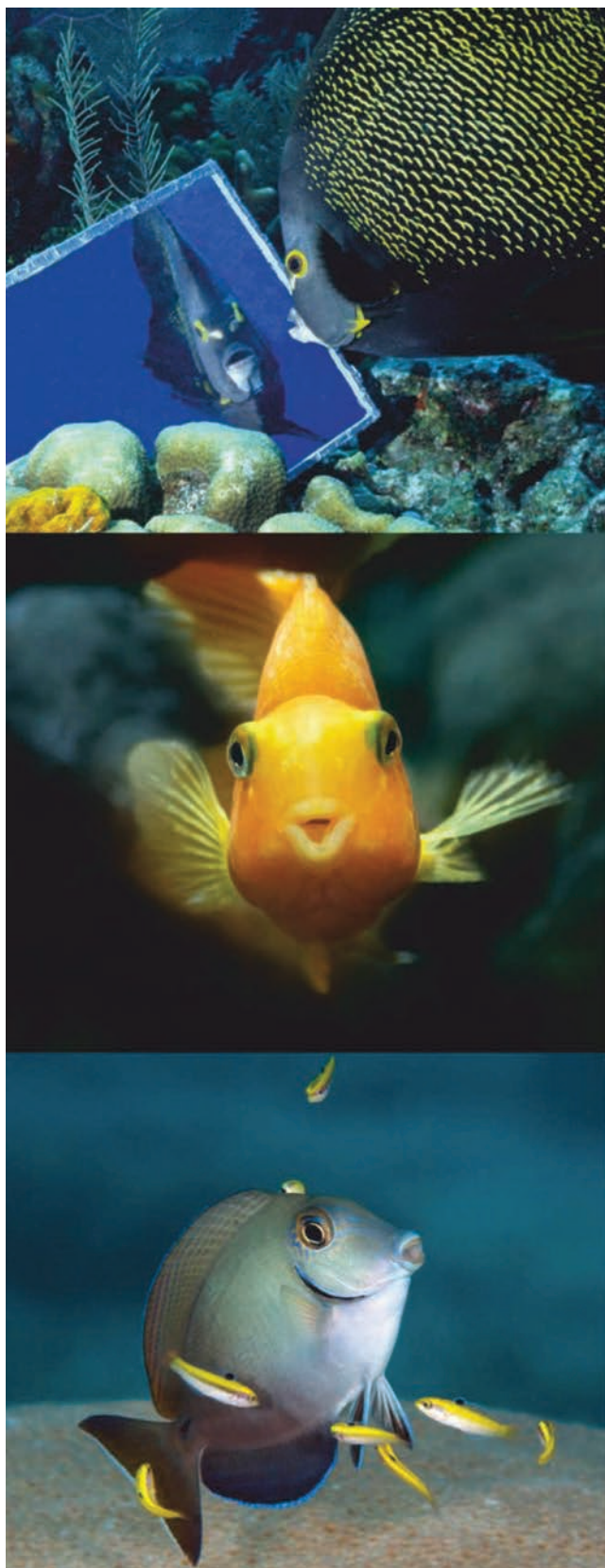
Unsurprisingly the wrasses' clients often respond badly. So the wrasse choose their victims carefully, only ever biting non-predatory species that are unlikely to retaliate by attacking or eating them. They also distinguish between regular clients and new clients, giving priority to newcomers and rarely nipping them, presumably to avoid scaring off a fish which might have the potential to become a regular client.

But the sneakiness of the wrasse doesn't stop there. Not only are they less likely to bite clients if they know other fish are watching, they often attempt to manipulate fish that respond badly to being nipped, chasing after them and rubbing their backs and pelvic fins to mollify them. They even seem to understand the relationships between different client species, and if pursued by an irritated client will swim toward a predator of that species to prevent them chasing them further.

This Machiavellian behaviour suggests cleaner wrasse possess the capacity to attribute mental states to other fish and respond accordingly, a concept known as "theory of mind", which implies self-awareness previously only observed in a handful of primates, dolphins, elephants and a few species of bird.

With this in mind a team led by Japanese scientist Masanori Kohda decided to test whether wrasse were capable of passing the mirror test – long regarded as proof an animal is self-aware – by recognising their reflection. Placed in a tank with a mirror, the wrasse initially reacted with the sort of aggression they would usually direct at a rival, but subsequently abandoned these behaviours in favour of unusual activities such as swimming toward the mirror upside-down, before finally settling down into non-aggressive postures to gaze at their reflections. Interestingly this sequence of behaviours is almost exactly the same as that observed in other species that have passed the mirror test, although spaced over several days rather than a few minutes or hours.

Kohda's team then removed the wrasse from the tank, anaesthetised them and placed a mark on their



faces or necks before returning them to the water. Once again the wrasse responded similarly to other animals that have passed the test, first assuming postures that allow them to examine the mark, and then attempting to remove it by scraping the affected area against the side of the tank or a rock.

Many scientists have been highly critical of the study, chief among them the mirror test's inventor, evolutionary psychologist Gordon Gallup, who argues the behaviour of the wrasse is ambiguous, and cannot be taken as evidence the fish recognise themselves or possess the self-awareness that implies. Barbara Reiss, whose work with dolphins showed they were capable of passing the test is similarly sceptical, suggesting the fact the mark resembled a parasite, which the wrasse are hyper-evolved to detect, may have skewed the results.

Culum Brown is not impressed. "The mirror test has been the gold standard for individual recognition for 50 years. When primates passed people said, 'Oh yes, of course'. Then when a dolphin passed they said, 'I guess that makes sense'. And when some corvids passed they said, 'Okay, maybe; corvids are pretty smart'. But when a *fish* passes, suddenly the test must be broken. It's kind of mind-boggling, but it just goes to show that even scientists have these massive biases."

Alex Jordan, an evolutionary biologist and leader of the Comparative Evolution of Social Behaviour Research Group at the Max Planck Institute of Animal Behaviour in Konstanz, Germany, and senior author of the Kohda paper, is even less diplomatic. "If passing the mirror test is evidence of self-awareness in chimps and elephants and dolphins and all the other animals you pay \$10 to see in the zoo, then if a fish passes you either have to accept it's self aware or – pardon my French – your test is f**ked."

So are the wrasse self-aware? Culum Brown laughs and says that he has no doubt. "The social complexity of the cleaner and client relationship clearly illustrates the wrasse are extremely sophisticated, so is it really surprising that they're capable of self-recognition as well as recognising all those other different species? Probably not. Probably it's part of a generalised social intelligence thing that includes self-recognition."

Jordan is more circumspect, arguing scientists who see self-recognition as clear evidence of self-awareness are over-interpreting the results of a flawed test. "The mark test isn't unequivocally telling us that an animal has theory of mind." Instead he says it is possible the wrasse learn by a process of association that the mirror reflects their world and thus how to use it as a tool. "That would be a very interesting and amazing finding, and extremely cognitively complex. But it wouldn't involve self-awareness, and all the other behaviours we observed could flow from that."

FROM TOP: HAL BERAL, BALHASH, WILD HORIZON/GETTY IMAGES



What would it mean for a fish to be self-aware? What might it be like to be a fish? A century ago the German biologist Jakob von Uexküll coined the term *umwelt* – literally “surrounding world” – as a way of capturing the way different organisms inhabit different realities, each defined by their particular sensory world.

The world of a fish, its *umwelt*, is radically different from our own. Fish inhabit a liquid environment, a weightless world of currents and eddies, and like birds in the air, float in three dimensions rather than the two-dimensional world ground-based animals like ourselves take for granted (although their awareness of depth is extremely acute, presumably because of the potentially fatal consequences of misjudging pressure).

Their sensory worlds are also far richer than ours. Although the basic physiology of fish and human eyes is similar, many fish possess extra receptors granting them tetrachromatic vision, and allowing them to see wavelengths we cannot. In some – especially freshwater fish – this allows them to see into the infrared, making it easier for them to see in the muddy, red-shifted waters of rivers and lakes. Others are able to see ultraviolet light and some can detect polarised light. Some even have visual worlds that change across the course of their lives: the eyes of salmon, for instance, are calibrated to see blues better when they are in the ocean and reds better when in freshwater.

Most fish also have excellent hearing: the American shad is able to hear sounds up to 180,000 Hz, nine times the range of human hearing, presumably so they can detect the ultrasonic vocalisations of the dolphins that predate them, while other fish use infrasound to assist with migration, allowing them to hear the subterranean rumble of the tides and the movement of water as it breaks and flows against underwater terrain and the shore.

Alongside hearing and vision, fish also use chemoreception to smell chemical traces in the water around them. In most cases this is done using cells in the nostrils, although some species, like catfish, have receptors spread across their entire bodies, allowing them to taste anything they touch.

These chemoreceptors are often extraordinarily acute. Sometimes they are used for hunting. Sharks, for instance, can detect blood in amounts as low as one part in a million, allowing them to scent prey over long distances; an indication of the importance of this ability can be found in the fact that in great whites an astonishing 14% of their total brain mass is devoted to olfaction. Chemoreceptors also play an important part in migration: salmon learn the smell of stream in which they are born; later they follow the threads of that scent back to the same stretch of river.

Some fish also inhabit sensory dimensions entirely alien to our human experience of the world, possessing magnetoreceptors that allow them to follow the lines of force generated by Earth’s magnetic fields or

Are fish self-aware? Yes, say many researchers, who are satisfied that cleaner wrasse – juvenile bluehead wrasses (opposite bottom; *Thalassoma bifasciatum*) shown here with an ocean surgeonfish (*Acanthurus bahianus*) – have passed the “mirror test”: “the gold standard for individual recognition for 50 years”, according to Macquarie University biologist Culum Brown. French angelfish (opposite top; *Pomacanthus paru*) tend cleaning stations as juveniles. There’s also evidence of cross-species co-operation: roving coral groupers (*Plectropomus pessuliferus*) and giant moray eels (above; *Lycodontis javanicus*) have been observed hunting together in the Red Sea. The groupers are fast in open water; the eels excel if prey hides in rocky crevices – a formidable combination.

REINHARD DIRSCHER/GETTY IMAGES

the ability to sense minute electrical currents. Even more significantly fish are able to sense changes in pressure and water movement using specialised cells along their lateral lines. Known as neuromasts, these cells resemble tiny hairs encased in gel, and assist with schooling behaviours, allowing fish to respond almost instantaneously to the movements of other fish, even in the dark.

Can we even start to comprehend such a radically different way of being? After all, many of us struggle to imagine our way across lines of gender or culture. What must it be like to exist in a world where magnetic fields have dimension? To be able to see the direction of light, or extend the boundaries of your body's perception by registering changes in pressure, or tiny movements of water? Or to be part of a school, moving in unison, one body amongst many?

Faced with the problem of such radical subjectivity, many philosophers have argued our minds simply cannot comprehend such fundamentally different ways of being in the world. Ludwig Wittgenstein suggested that "if a lion could talk we could not understand him"; likewise Thomas Nagel argued consciousness was essentially subjective, meaning that not only is it impossible to reduce the experience of consciousness to a purely material explanation, but – in an echo of Uexhüll – that there is no such thing as objective experience.

Yet even if we accept we can never truly know, perhaps there are ways of at least beginning to intuit these other ways of being. Fish fall for many of the same visual illusions as humans, suggesting similarities in our visual processing, and open-source software now exists that allows ecologists to simulate the visual experience of other organisms. Similarly, we share behaviours: sociality, curiosity, memory, even culture. Perhaps it could be as simple as actually beginning to look, to try to see them for themselves.

But perhaps the real question is not whether we can imagine their worlds, but what it might mean for us to try. How might that change the way we see them? How might that change us?

The philosopher Donna Haraway writes of the importance of making kin with other species, of recognising our connectedness with the non-human world. Making kin is not necessarily about recognising similarity, but about acknowledging difference, strangeness: kin are, in Haraway's words, "unfamiliar ... uncanny, haunting", and making kin demands we reimagine our *selves* and our place in the world.

As Culum Brown suggests, mightn't consciousness be better understood as something multi-variate, a multi-dimensional space shaped by the sensory and cognitive abilities of different species? A function, in other words, of its *umwelt*? As Alex Jordan puts it,

"there are many, many paths to many, many different places. To argue there's just one developmental scale of cognition and that's the way a fish or a bacterium or a plant or any other thing interacts with the world is just narcissism."

Recognising fish for what they are might shift our perspective in other ways as well. Trapped in our humanocentric viewpoint, we tend to conceive of intelligence and culture as relatively recent developments, ways of being in the world that only appeared with the advent of hominids like ourselves. Yet the jawed fish that exist today first appeared in the Silurian period: their existence stretches back hundreds of millions of years. Imagining intelligence spread across such oceans of time cannot help but alter our understanding of our own significance and relationship to other species.

It also demands we think again about our attitudes to fish, why it is so difficult for us to think of them as creatures with their own minds and ways of being in the world. There is no question that it is at least partly because of their otherness and unfamiliarity. But might it not also be because thinking of them as conscious is just too confronting?

In the absence of detailed records, we cannot know for certain how many fish humans kill a year, but studies suggest they number in the trillions. Most

"Can we even start to comprehend such a radically different way of being?" asks author James Bradley. Whatever the answer, many of us are in thrall to the ocean's citizens. Divers travel from all over the world for the experience (above) of swimming with massed bigeye trevally (or jackfish, *Caranx sexfasciatus*) at Balicasag Island, in the Philippines. The dazzling mandarin fish (opposite top); *Syngnatus splendens* is one of only two known vertebrate animals with blue colour because of cellular pigment; the other is its relative, the psychedelic mandarin (*S. picturatus*).



STEVE DE NEEF/GETTY IMAGES



*“TO ARGUE
THERE’S
JUST ONE
DEVELOPMENTAL
SCALE OF
COGNITION
IS JUST
NARCISSISM.”*

of these fish die slow and agonising deaths, suffocating over several hours after they are hauled aboard. Fish that are live-gutted tend not to suffer as long – only 25 to 65 minutes on average – although as the term “live-gutted” suggests, the relative brevity of their distress comes at a price.

In this context, studies arguing fish cannot feel pain seem not just misguided and anachronistic, but self-serving. Studies make it clear we routinely downplay the mental abilities and capacity for suffering of land-based animals we eat; is it so unlikely the same psychological strategy is at work with fish? Perhaps the time has come to reconsider our tendency to emphasise intelligence rather than the capacity for suffering as the basis of moral concern.

We need to recognise the urgency of this challenge. Alex Vail chose to work on coral trout on the Great Barrier Reef instead of the groupers in which the pointing behaviour was first observed because in the six years between Redouan Bshary’s initial observations and Vail’s study the grouper population in the Red Sea almost entirely disappeared.

This collapse is only a footnote to a catastrophe of planetary proportions: a 2015 report by the WWF estimated that between 1970 and 2010 the global fish population dropped by a half, with populations of fish species utilised for food falling by almost three-quarters. Warming waters are radically reshaping habitats and migration patterns, while ocean acidification is

disrupting food chains, and affecting the bodies and brains of many species.

Overfishing is even destroying the capacity of some species to feed and migrate, as the removal of the largest – and therefore oldest – individuals leads to the loss of knowledge passed down over thousands of generations.

“Effectively you’re destroying animal cultures which are unlikely to be ever the same again,” says Brown, who describes this process as “cultural genocide” and believes its consequences have probably been underestimated. Yet studies also suggest that fish populations can be restored through the creation of marine reserves, and better regulation of fishing, and there is still a narrow window within which to save at least some of the world’s coral reefs.

Perhaps we will never truly understand the lives of fish; maybe they are too different, too strange, too *fishy*. But maybe by recognising their particularity, their individuality, their capacity to think and feel and learn, we might begin to see not just them, but ourselves, differently. Perhaps we might, as Haraway says, begin to make kin with them. Maybe by saving them we might save ourselves. ☺

JAMES BRADLEY is a novelist and essayist and the Copyright Agency’s 2020 Non-Fiction Fellow. His most recent novel, *Ghost Species*, is published by Hamish Hamilton.

REINHARD DIRSCHNER/GETTY IMAGES



Experiences In Keeping The Panda Uaru

by Joseph Ferdenzi



The Panda Uaru (*Uaru fernandezypezi*) is a South American cichlid that has been known to hobbyists for quite some time, having been described in 1989. The first time I saw photos of this fish, it immediately caught my eye. I thought it was more attractive than the Uaru that has been in the hobby for a much longer time (that being *Uaru amphiacanthoides*). Indeed, for the longest period, the *amphiacanthoides* species was commonly referred to as “the Uaru,” as though there was only one.

My first actual sighting of the Panda Uaru did not occur until at least two decades later. It happened when I was making one of my periodic visits to Monster Aquarium in Flushing (New York). There, to my astonishment, was a tank full of very healthy-looking Panda Uarus. They appeared to be adult-sized. While I am normally resistant to impulse purchases, this was a fish that had been on my “bucket list” for decades. I had to purchase a group. Now mind you, this is not an inexpensive fish. However, John, the owner of Monster, always gives a generous discount to members of Greater City, so the total cost for the five of them was affordable.

Once they were home, I acclimated them for placement in an empty 40-gallon breeder. The water was in the alkaline range, and the temperature was 76° F. Despite the fact that they were wild fish, they ate standard aquarium food, such as flakes and pellets. These fish averaged about six inches long (full-grown Panda Uarus reach about nine inches), and they showed no aggression toward one another.

Despite this good start, over time I began to suspect that something was not quite right. They began to develop some lesions and other signs of stress. I made sure they received ample water changes and a varied diet, but one by one they would become weak and die. When I was down to two, I moved them to a larger (65 gallon) aquarium that also housed some medium-sized swordtails (about 3 inches in body length). Eventually however, even those two succumbed.

Having been in the fish hobby for some 50 years, I have experienced many failures in fishkeeping. While this one was certainly disappointing, it did not convince me that this was not a fish worth trying again if the opportunity arose.

That opportunity arose in January of 2020. This time the Panda Uarus were more juvenile-sized, averaging about four inches. The price was therefore much lower, and I purchased nine of them. Once again, I placed them in a 40-gallon breeder, but this time I acquired a crucial piece of information: the Panda Uaru likes to be kept at about 82° F. So I placed a heater in the aquarium and set the heater to keep the water at 82° rather than the 76° I had used with the first group. Another thing I learned from watching them being fed in the dealer’s tank was that they liked Tetra-Min Tropical Crisps, and it happened that I had this food on hand.

The only other fish in the 40-gallon breeder was a small school of *Corydoras panda* (Hah! I then

realized that, without planning it, I now had a “Panda Tank”!)

At first the Panda Uarus did well, but within a month one of them began to develop a loss of pigmentation on one side. This ‘blotch’ symptom was accompanied by a loss of appetite, and it died within a week. A couple of the other fish began showing signs of some disease (head lesions, fin disintegration). Alarmed by this development, I sought the advice of several fish dealers with a great deal of experience. Ultimately, one of them provided a cure—formalin. This is a powerful medication, and must be used in carefully administered doses. But it worked! The symptoms began to reverse themselves. Nevertheless, I lost a few more before the treatment fully took hold.

I also decided that the remaining six needed a larger aquarium. So in due course I moved them and the Panda Corys to a well-planted 55 gallon tank. Also, after reading another article about Panda Uarus, I decided to raise the temperature of the water to the 82—84 (F) degree range. Now, almost a year later, I have to say that they are doing very well.

When I moved them to the 55-gallon tank, the tank contained two plants: *Anubias barteri* and a *Najas* species. The *Najas* is a very delicate, light-green floating plant. The *Anubias*, by contrast, has very thick leaves and stems that are dark green. Within a few days of their having occupied the tank, every piece of *Najas* was gone! The *Anubias* was (and is to this day) untouched. As it turns out, Panda Uarus love to eat soft plants. This was a great discovery because I have dense accumulations of *Najas* (also commonly referred to as guppy grass) in many of my aquariums. Previously, the *Najas* would become so abundant that I would have to throw some of it into the garbage (which goes against my desire to never throw away any extra plants—but there was often so much that even other hobbyists would decline my offers of free plants). Now I had a fish that seemed to relish it, and the *Najas* has become a welcome supplement to their diet of wafers and flakes. I also discovered

that another herbivorous cichlid in my collection, *Coptodon snyderae*, also loves to eat *Najas*!

Wild fish are usually a challenge; they come in with all kinds of parasites and are not used to aquarium living. But I would not trade the excitement that comes from having these wild creatures simply because they can be a challenge. Such is the case with my Panda Uarus.

Before ending this story, I will give you all the pertinent details of my “Panda Tank.” It is 55 gallons, has a one-inch layer of natural brown gravel, contains numerous *Anubias barteri* and many pieces of Malaysian driftwood. The water is alkaline (about 7.4). The filtration consists of a large hang-on power filter at one end, and there is an airstone at the other end.

Their only tankmates are six *Corydoras panda*. The Panda Uarus are fed crisps, spirulina flakes, and fresh guppy grass (*Najas*). They are never fed live worms, though I do occasionally give them live adult brine shrimp (so I’m sure frozen brine shrimp will be taken). Most importantly, I keep their water temperature at 84° F using a 300 watt titanium heater, which I make sure to turn off before doing my monthly 30% water changes!



2020 Modern Aquarium Article Index

Month/Pg

AQUARISTICS

“Aquarium Filtration Revisited” by Jules Birnbaum	03/07
“The Balanced Aquarium Experiment” by Joseph Ferdenzi	05/09
“Water Quality and Water Conditioners” by Timothy A. Hovanec, Ph.D.....	05/11
“Aquascaping Without Plants” by Joseph Ferdenzi	06/09
“Back In Black (Water)” by Chance Peragine.....	07/15
“The Natural Aquarium: Does It Exist?” by Dan Radebaugh.....	08/19
“Using Rocks Effectively” by Dan and Mary Carson.....	08/22
“Tiny Bubbles” by Gary Lange.....	12/17

ART

<i>Petrochromis</i> – drawing by Denver Lettman	04/06
“The Amusing Aquarium” by Bernard Harrigan.....	09/17
Artists’ Showcase	11/15

CARTOON CAPTION CONTEST

March Cartoon, by Elliot Oshins.....	03/05
May Cartoon, by Elliot Oshins.....	05/05
June Cartoon, by Elliot Oshins.....	06/07

CARTOON CAPTION WINNERS

March Winner: Ron Webb	04/05
May Winner: Peter Goldfien.....	06/05
June Winner: Ron Webb	07/05

CATFISH

“ <i>Corydoras zygatus</i> ” by Joseph Graffagnino	10/07
--	-------

CICHLIDS

“Wild Angels” by Jules Birnbaum.....	05/07
“ <i>Astatotilapia latifasciata</i> ” by Joseph Graffagnino.....	05/15
“ <i>Teleogramma brichardi</i> ” by Joseph Graffagnino.....	06/13
“ <i>Andinoacara latifrons</i> ” by Joseph Graffagnino	07/09
“ <i>Coptodon kottae</i> ” by Joseph Graffagnino	08/11
“My Shell Dwellers From Lake Tanganyika” by Jules Birnbaum	09/07
“ <i>Apistogramma rubrolineata</i> ” by Don Kinyon.....	09/13
“Angelfish” by Al DiSpigna.....	10/15
“ <i>Sarotherodon knauerae</i> ” by Joseph Graffagnino.....	11/07
“The Uaru(s)” by Dan Radebaugh.....	11/18
“ <i>Danakilia</i> sp. <i>Shukoray</i> ” by Joseph Graffagnino.....	12/13

COVER PHOTOGRAPHS

GCAS Cake – photo by Marsha Radebaugh	03/C1
<i>Betta splendens</i> – photo by Stephen Sica	04/C1
<i>Symphysodon aequifasciatus</i> – photo by Thomas Warns	05/C1
<i>Neolamprologus brichardi</i> – photo by Joseph Ferdenzi.....	06/C1
Gray Angelfish, <i>Pomacanthus arcuatus</i> – photo by Stephen Sica	07/C1
Toadstool Mushroom Leather Coral, <i>Sarcophyton</i> Sp. – photo by Joseph Gurrado	08/C1
<i>Neolamprologus similis</i> – photo by Jules Birnbaum	09/C1

Saltwater Tank – photo by Joseph Gurrado.....	10/C1
<i>Sarotherodon knauerae</i> – photo by Joseph Graffagnino	11/C1
Angelfish Group – photo by Lonnie Goldman	12/C1

EXCHANGE ARTICLES

“The Horseface Loach” by Mike Hellweg, CFN	03/09
“Follow The Worms” by Brian Cush.....	04/15
“The Black Trigger” by Kevin Thurston	04/18
“Water Quality and Water Conditioners” by Timothy A. Hovanec, Ph.D.....	05/11
“Growth Studies Focused on <i>Lepomis cyanellis</i> ” by Dalton Stoner	05/23
“The Story of <i>F. spoorensbergi</i> ” by Karen Murray.....	06/15
“Back In Black (Water)” by Chance Peragine.....	07/15
“Fish Happen!” by Brian Candib	08/10
“Breeding the <i>Candidia</i> Goby” by Larry Feltz	08/17
“ <i>Apistogramma rubrolineata</i> ” by Don Kinyon.....	09/13
“Angelfish” by Al DiSpigna.....	10/15
“Snails: Don’t Be Quick to Judge” by Matthew Penney.....	11/13
“Tiny Bubbles” by Gary Lang.....	12/17

FAREWELLS

“RIP ‘Juice!’	06/08
“Ken Lazara: A Personal Remembrance” by Joseph Ferdenzi.....	10/11
“Seth Kolker” by Joseph Graffagnino	12/08

GCAS Facebook Fishy Friends

Fishy Friends’ Photos	03/20
Fishy Friends’ Photos	04/17
Fishy Friends’ Photos	05/14
Fishy Friends’ Photos	06/12
Fishy Friends’ Photos	07/12
Fishy Friends’ Photos	08/07
Fishy Friends’ Photos	09/12
Fishy Friends’ Photos	10/10
Fishy Friends’ Photos	11/09
Fishy Friends’ Photos	12/11

GCAS Society Issues

GCAS 2020 Award Winners.....	12/19
GCAS Past Award Winners	12/20
GCAS 2020 Author Award Program	12/21
GCAS 2020 Breeder Awards	12/25
GCAS 2020 Breeder Award Totals.....	12/26

GENERAL INTEREST and MISCELLANEOUS

2019 MODERN AQUARIUM INDEX OF ARTICLES	03/21
“Aquarium Filtration Revisited” by Jules Birnbaum	03/07
“25 Things I Didn’t Always Know About Taking Care of Tropical Fish” by Susan Priest	03/16
GCAS Prohibited Species List	03/26
“The Common Denominator of Success in Fishkeeping” by Jules Birnbaum.....	04/09
“Table Food For Tropicals” by Chuck Davis.....	04/10
“Standing Tall” by Stephen Sica	04/13
“Fish Named After Former GCAS Member”.....	05/13
“What I Learned From the Aquarium Hobby” by Pat Piccione	05/17
“Can A Hamburger Save The Planet?” by Stephen Sica.....	06/17
“Aggression In Tropical Fish” by Jules Birnbaum.....	06/19
“The Lazy Person’s Guide To Award-Winning Articles” by The Undergravel Reporter	07/20

“What’s On Your Mind?” by Susan Priest.....	07/24
“Aquariums In The Movies” by Joseph Ferdenzi	08/08
“Fish Happen!” by Brian Candib	08/10
“Beer, Guppies, and Social Distancing” by Horst Gerber.....	10/13
“A Do-It-Yourself Fish Trap” by Joseph Ferdenzi.....	12/09
“Swap Meet!” by Harry Faustmann.....	12/12
“16 Tentacles and 16 Seconds of Passion” by Joseph Ferdenzi.....	12/28

GOBIES

“Breeding the <i>Candidia</i> Goby” by Larry Feltz	08/17
--	-------

KILLIFISH

“The Story of <i>F. spoorensbergi</i> ” by Karen Murray.....	06/15
“ <i>Hypsolebias mediopapillatus</i> ” by Joseph Graffagnino.....	09/11

LIVE FOOD

“Follow The Worms” by Brian Cush.....	04/15
“No BS — Brine Shrimp!” by Jules Birnbaum.....	10/14

LIVEBEARERS

“ <i>Xenotoca lyonsi</i> ” by Joseph Graffagnino.....	11/11
---	-------

LOACHES

“The Horseface Loach” by Mike Hellweg, CFN	03/09
“I Love My Loach!” by Stephen Sica.....	12/15

MA CLASSICS

“25 Things I Didn't Always Know About Taking Care of Tropical Fish” by Susan Priest	03/16
“Table Food For Tropicals” by Chuck Davis	04/10
“What I Learned From the Aquarium Hobby” by Pat Piccione	05/17
“The Editor’s Apprenticw” by Alexander A. Priest.....	06/22
“The Lazy Person’s Guide To Award-Winning Articles” by The Undergravel Reporter	07/20
“Using Rocks Effectively” by Dan and Mary Carson.....	08/22
“The Dragon Murder Case Revisited” by Joseph Ferdenzi.....	09/15
“The Amusing Aquarium” by Bernard Harrigan.....	09/17
“Blame It On Wanda” by Warren Feuer.....	10/12
Artists’ Showcase.....	11/15
“16 Tentacles and 16 Seconds of Passion” by Joseph Ferdenzi.....	12/28

MARINE FISH & FISHKEEPING

“The Black Trigger” by Kevin Thurston.....	04/18
“My Damsel Distress” by Stephen Sica.....	09/09
“A Puffer and a Porcupine” by Stephen Sica.....	10/20
“The Ocean Triggerfish” by Stephen Sica.....	11/10

MEMBER PHOTOS

“Pictures from Our Last Meeting” by Joseph Gurrado & Marsha Radebaugh	03/18
“Pictures from Our Last Meeting” by Joseph Gurrado	04/21

NEC NEWS/EVENTS

“NEC Articles Competition Results”	07/08
--	-------

PLANTS

“Done With Duckweed?” by Stephen Sica.....	03/13
“Anubias: The Plant That Anyone Can Grow” by Joseph Ferdenzi.....	07/13

PUZZLES

“FIN FUN”

“Under The Rainbow”	03/32
“Collecting We Will Go”	04/26
“Angelic Maze”	05/28
“Quarantine, Inoculate, Wait and Hope”	06/28
“Find the Earth Eaters”	07/30
“Who Is That Masked Fish?”	08/30
“The Aquatic Gardener”	09/24
“Trick or Treat”	10/22
“Inside Out”	11/24
“In This Issue . . .”	12/34

REVIEWS

“Mysteries of the Deep” by Dan Radebaugh	09/18
--	-------

SPEAKER PROFILES

Tonight’s Speaker: Lawrence Kent: “Two West African Stories”	05/10
Tonight’s Speaker: Pam Chin, on “Swimming With Cichlids - Zambia”	06/21
Tonight’s Speaker: Larry Flynt, on Reef Aquarium Sytems in Schools.....	07/07
Tonight’s Speaker: Joshua Wiegert, on Loricarids for the Planted Aquarium.....	09/08
Tonight’s Speaker: Larry Johnson, on “Swimming With Cichlids - Lake Malawi”	10/06
Tonight’s Speaker: Neil Frank, on Angelfish Breeding.....	11/12
Tonight’s Speaker: Charlie Grimes, on Native Fishes.....	12/25

TETRAS

“My Three Tetras” by Susan Priest	04/11
---	-------

THE TRAVELING AQUARIST

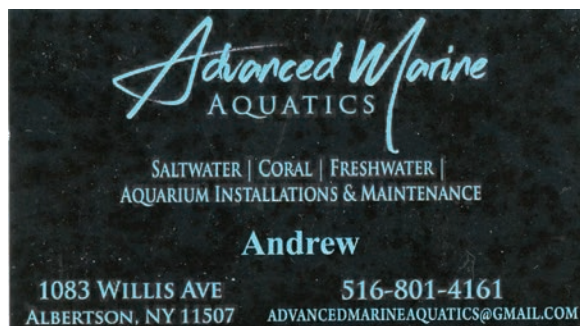
“Bahamas Cruising” by Stephen Sica.....	05/19
“Key Largo: Just Another Dive!” by Stephen Sica	07/21
“A Nurse In Time” by Stephen Sica.....	08/15

THE UNDERGRAVEL REPORTER - a column by *The Undergravel Reporter*

“Three-D, or not Three-D?”	03/31
“GloFish® Are No Fish”	04/25
“Incest is Best”	05/27
“Socializing With Eels”	06/27
“Shrimp to Share”.....	07/29
“Siamese Fighting Genes”.....	08/29
“UltraBlack Fish Matters”.....	09/23
“Meeting the Neighbors”.....	10/21
“World Algae Day”.....	11/23
“Grumpy Grouper”	12/33



GCAS Member Discounts at Local Fish Shops



10% Discount on everything.



20% Discount on fish. 15% on all else.



10% Discount on everything.



10% Discount on everything.



10% Discount on everything.



10% Discount on fish.



10% Discount on everything.



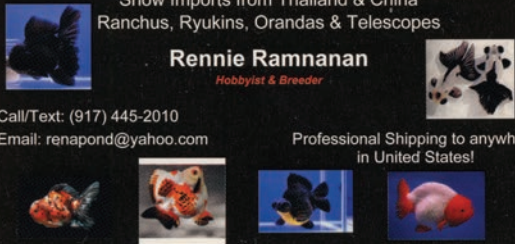
10% Discount on everything except 'on sale' items.

High Quality Exotic Goldfish
 Show Imports from Thailand & China
 Ranchus, Ryukins, Orandas & Telescopes

Rennie Ramnanan
Hobbyist & Breeder

Call/Text: (917) 445-2010
 Email: renapond@yahoo.com

Professional Shipping to anywhere
 in United States!



10% Discount on everything.



**152-69 10TH AVENUE
 WHITESTONE, NY 11357
 TEL: 718 902-6117
 WWW.FISHWORLD1.COM**

STORE HOURS
 MON - FRI 11AM - 8PM
 SATURDAY 10AM - 7PM
 SUNDAY 10AM - 6PM

10% Discount on everything.

JUNGLE BOB ENTERPRISES, INC.



4130 Sunrise Hwy
 Oakdale, NY 11769
 ph: 631-319-6592
www.JungleBobAquatics.com



Manufacturer of Quality Reptile & Aquarium Supplies

15% Discount on everything in store, or online at:
<http://www.junglebobaquatics.com> Use coupon code gcas15.



☎ 917-300-2293

📍 124-11 Jamaica Ave
 Richmond Hill, NY 11418

🌐 naturesreefandreptile.com

🕒 Mon-Sun
 10 am - 8 pm

📷 [natureefandreprs](#)

📷 [nature_reef_reptile](#)

10% Discount on everything.



GCAS Classifieds

FOR SALE: African cichlids -- all sizes, as well as tanks and accessories.
 Call Derek (917) 854-4405



GCAS Happenings

March

December's Bowl Show Winners:

No meeting or bowl show in December

OFFICIAL 2020 BOWL SHOW TOTALS:

HARRY FAUSTMANN 5 WILLIAM AMELY 1 JOHN BUZZETTI 3

Meeting times and locations of many of the aquarium societies in the Metropolitan New York City area. COVID-19 could cause cancellations! Check before you go!



GREATER CITY AQUARIUM SOCIETY

Next Meeting: 2021

Speaker: TBA

Event:

Meets: The first Wednesday of each month

(except January & February) at 7:30pm:

Queens Botanical Garden

43-50 Main Street - Flushing, NY

Contact: Horst Gerber (718) 885-3071

Email: pilotcove43@gmail.com

Website: <http://www.greatercity.net>

BIG APPLE GUPPY CLUB

Meets: Last Tuesday each month (except Jan, Feb, July, and August) at 7:30-10:00pm.

Alley Pond Environmental Ctr.: 228-06 Northern Blvd.

Contact: Donald Curtin (718) 631-0538

BROOKLYN AQUARIUM SOCIETY



Next Meeting: TBA

Speaker: TBA

Topic: TBA

Meets: 2nd Friday of the month (except July and August) at 7:30pm:

NY Aquarium - Education Hall, Brooklyn, NY

Call: BAS Events Hotline: (718) 837-4455

Website: <http://www.brooklynaquariumsociety.org>

LONG ISLAND AQUARIUM SOCIETY



Next Meeting: TBA

Speaker: TBA

Topic: TBA

Meets: 3rd Friday of each month (except July and August) at 8:00 PM.

LIAS Meetings are held at SUNY Stony Brook's Maritime Science area. Room 120 in

Endeavor Hall on the State University at Stony Brook

Campus, Stony Brook, NY 11790

Email: president@liasonline.org

Website: <http://liasonline.org/>



EAST COAST GUPPY ASSOCIATION

Meets: 2nd Tuesday of each month at 8:00 pm at Alley Pond

Environmental Ctr.: 228-06 Northern Blvd.

Contact: Gene Baudier (631) 345-6399



NASSAU COUNTY AQUARIUM SOCIETY

Next Meeting: TBA

Event: TBA

Topic: TBA

Meets: 2nd Tuesday of the month (except

July and August) at 7:30 PM. Molloy College, at 1000 Hempstead Avenue, Rockville Centre, NY, in the Hagan Center for Nursing building, in the lower level, classroom #H006. See website for directions.

Contact: Harry W. Faustmann, (516) 804-4752.

Website: <http://www.ncasweb.org>



NORTH JERSEY AQUARIUM SOCIETY

Next Meeting: TBA

Speaker: TBA

Topic: TBA

Meets: 12:30 PM - 3rd Saturday of the month,

Clark Public Library in Union County, just off the Parkway at exit 135

Contact: NJAS Hotline at (732) 332-1392

Email: tcoletti@obius.jnj.com

Website: <http://www.njas.net/>



NORWALK AQUARIUM SOCIETY

Next Meeting: TBA

Speaker: TBA

Topic: TBA

Meets: 8:00 P.M. - 3rd Thursday of each month except for July & December at: Earthplace - the Nature Discovery Center - Westport, CT

Contact: Sal Silvestri

Call our toll free number (866) 219-4NAS

Email: salsilv44@yahoo.com

Website: <http://norwalkas.org/>

Smooth Swimming

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.

When a fish can't swim normally, that usually means it isn't able to fend for itself and even finding food is a problem. Here are two different reports of how an aquatic mobility problem was solved.

When Einstein the goldfish contracted a bladder disease which caused it to swim upside down, Leighton Naylor, its owner, made him a "lifejacket" from airline tubing. Einstein can now swim normally.

Naylor says, "He wriggled a bit at first and he wasn't too keen on the idea. He kept catching on to plants and getting stuck but since I've rearranged the tank to make it disability friendly he's been absolutely fine."

Then there's Louie, a seahorse owned by Carol Bengé of Chiefland, Florida. After a few months, Louie seemed to have trouble swimming. He moved horizontally and appeared listless. Even more troubling were the small, pearl-like bubbles clustered on his tail.

References:

<https://thefreaky.net/goldfish-given-life-jacket-to-help-it-swim/>

<https://www.clickondetroit.com/news/weird-news/2020/11/30/florida-vet-school-uses-novel-approach-to-save-seahorse/>

<http://www.jacobi-hyperbaric.com/html/hyperbaric-chamber.html>

Bengé had done a lot of research on seahorses and suspected he had gas bubble disease, similar to a human scuba diver getting the bends from surfacing too quickly. Gas bubble disease is common in aquariums, and seahorses are particularly vulnerable to the illness, although experts are not sure why.

After her local veterinarian's office said they could not help Louie, Carol put him in a temporary tank and drove him to the University of Florida College of Veterinary Medicine. There, Carol agreed to an experiment, at no cost to her, of putting Louie in a hyperbaric chamber, just like a human diver suffering from the bends. (The hyperbaric oxygen chamber at the school is normally used for wound care in mammals.)

Louie was gently transferred into a Pyrex® glass container along with water and

an aquatic plant from his home tank. This was the first time the school had treated a fish in the chamber, and it was a gamble. The veterinary team used a treatment protocol devised by the U.S. Navy. They put Louie and the glass container inside the hyperbaric chamber and shut it tight. Pressure and time are used to shrink the volume and diameter of gas bubbles in the tissue and allow them to reabsorb into the animal.

Immediately after taking him out, he was swimming around. With just one treatment, Louie was cured!

(PS, Jacobi Medical Center in the Bronx has a "walk-in hyperbaric chamber," but I don't know if they will treat a fish.)



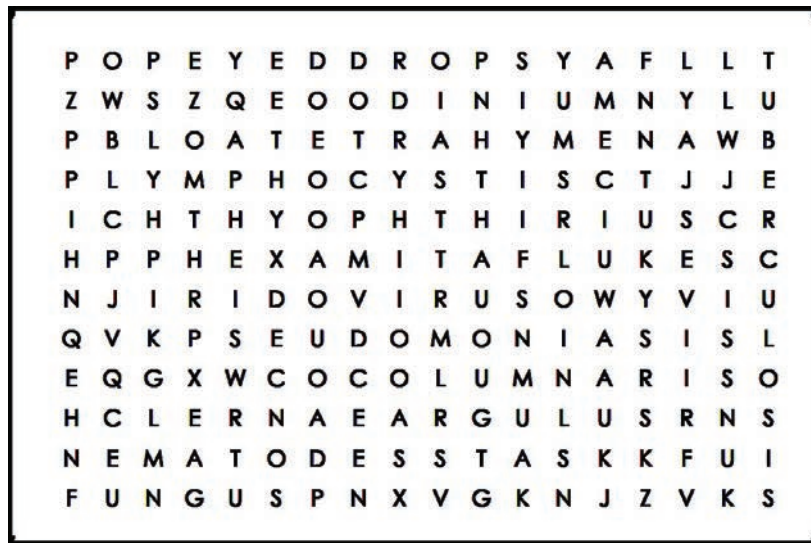


Fin Fun



The **Nasty** Ones

We don't like to see (or even think about) the diseases and maladies that can happen to our aquatic friends. Nonetheless, see how many diseases, conditions, bacteria, etc., you can find in the word search puzzle below.



ARGULUS
BLOAT
COLUMNARIS
DROPSY
FLUKES
FUNGUS
HEXAMITA
ICHTHYOPHTHIRIUS
IRIDOVIRUS
LERNAEA
LYMPHOCYSTIS
NEMATODES
OODINIUM
POPEYE
PSEUDOMONIASIS
TETRAHYMENA
TUBERCULOSIS
VIBRIOSIS

Solution to our last puzzle: **In This Issue ...**

AQUARIUM
BROOKLYN
BUBBLES
ERITREA
ETHIOPIA
FINLAND
GROUPE
HELSINKI
INCUBATOR
KILLIFISH
LAPLAND
LINGONBERRIES
LIONFISH
SANTA
SHUKORAY
SOCIETY



Enjoy the 2021 American Cichlid Association Convention in St Louis, MO, July 23-25!



Cichlid enthusiasts of all ages and experience will be there for all things Cichlid, fishy talk and fellowship and have access to world class speakers, manufacturer & vendor booths, an ACA hospitality suite and fish being sold throughout the event.

Everyone is bringing their newest acquisitions, spawned and ready to distribute! Party with your Buddies and go home with new fish!

This event features a slate of 5 special speakers, an extra special vendor room, a tank rental room and a hopping hospitality room. Attendee room sales, found throughout the venue, will be intense. The ACA will not have a Show but the Convention will finish with a large Cichlid only auction!

In 2021 make up for staying at home in 2020!

<https://convention.cichlid.org/>

Use the convention website for Convention & Vendor registration, additional details and offers.



- **Rusty Wessel** - Rusty speaks about the Central American Fishes he successfully collected in Belize, Costa Rica, Cuba, Guatemala, Honduras, Panama, Mexico and Uruguay.
- **Pam Chin** - Shares stories and videos about Cichlid Safaris to both Lake Malawi and Lake Tanganyika. She is a founding member of "Babes In The Cichlid Hobby" whose goal is to make a difference in cichlid keeping.
- **Steve Edie** - Banquet Keynote Speaker, believes that attending conventions all over the US is one of the best means of finding friends, information, and rare species and plans to make Conventions fun for all with "The Talk".
- **Dave Schumacher** - Speaking nationally about basic cichlid genetics and nomenclature, in 2006 Dave bought a fish store and turned it into the Dave's Rare Aquarium Fish specialty store, currently, selling more than 200 cichlid species.
- **Don Danko** - Don has collected extensively throughout Mexico on more than a dozen visits. An accomplished photographer, he has gathered an extensive collection of award winning cichlid photos.



Within easy driving distance for most and good flight connections for everyone.

