AQUATICA

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108 Years of Educating Aquarists

AQUATICA

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The **Brooklyn Aquarium Society Inc.** is a non-profit organization 501(c) (3) for people interested in the aquarium hobby and the study of aquatic life. The Society meets the 2nd Friday of each month except July and August at the Education Hall of the New York Aquarium at Coney Island, Surf Avenue at West 8th St., at 7:30 PM. Meetings are open to visitors. Refreshments are served. Membership is $25 per year family/$20 individual/$15 for students under 14. Send inquiries or membership checks payable to:
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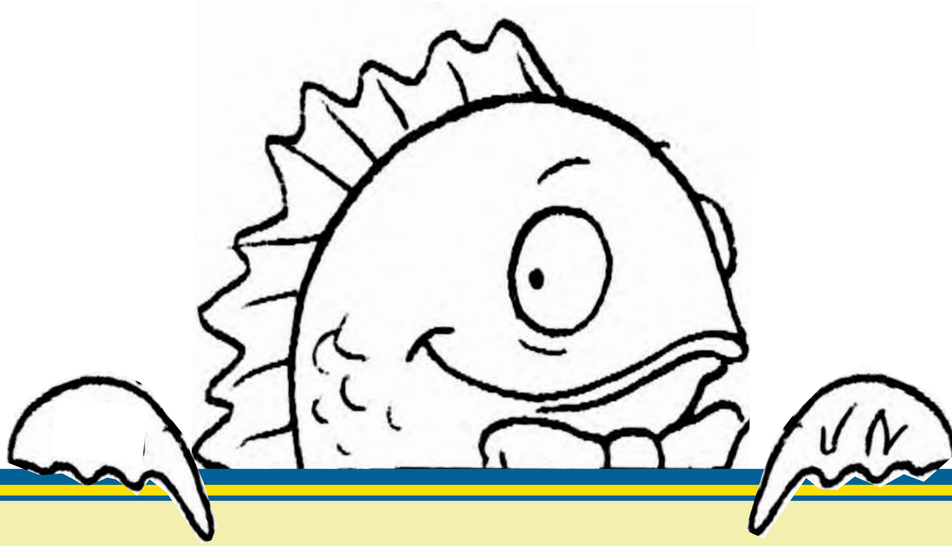
Brooklyn Aquarium Society Board of Directors

Brooklyn Aquarium Society

CALENDAR OF EVENTS ~ 2019



MAY 10 Giant Spring Auction ~ Freshwater fish, plants, marine fish, aqua-cultured corals & dry goods.

JUN 14 Cameron Provost - [House of Fins] - Rare Marine Fish in the Aquarium Hobby ~ BAS OFFICERS ELECTIONS. Followed by an auction of marine fish, aqua-cultured corals, freshwater fish, plants & dry goods.

NO MEETINGS JULY & AUGUST

SEPT 13 Tullio DelAquella ~ The Facts of Light: A scientific approach to comparing light sources for aquarium use ~ Followed by an auction of marine fish, aqua-cultured corals, freshwater fish, plants & dry goods.

OCT 11 Giant Fall Auction ~ Freshwater fish, plants, marine fish, aqua-cultured corals & dry goods.

NOV 8 Lou Ekus [Tropic Marin] - Reef Chemistry Made Easy ~ Followed by an auction of marine fish, aqua-cultured corals, freshwater fish, plants & dry goods.

DEC 13 Holiday Party ~ Members, Their Families & Friends • BAS awards presentations.

2020

JAN 10 Luis Morales - Fish Photography ~ Followed by an auction of marine fish, aqua-cultured corals, freshwater fish, plants & dry goods.

All BAS meetings begin at 7:30pm.
No members, other than those donating their help setting up or items for the auction, will be allowed in before that time.

Staff Writers – *www.pethelpful.com*

Making fish food is easy. If you are what you eat, then your vegetables are what your fish eat, right? Well, while this thinking doesn't hold up for most of life's circumstances, it does apply to Aquaponics! This cutting edge and soil-less gardening practice relies solely on fish byproducts, so it only makes sense to feed aquarium fish with something substantial and natural. In this article, learn how to make your own fish food in order to keep aquarium occupants looking and feeling their best. Aquaponic gardeners and fish keepers unite. Today, we're talking homemade fish food.

Fish Diets - Fish are no different from terrestrial animals when it comes to diet. There are some that are mainly herbivores, many that are omnivores and also a handful that are carnivorous. So if you're wanting to please your fish with homemade food, it helps to first understand what type of eater they are! While the list below won't explain the specific needs of each individual species, it will at least serve as a general guideline as to what your fishes should be eating!

- **Herbivores** - Many aquarium algae eaters (*ottocinclus* & *plecostomus*), as well as some tropical species and African cichlids, fall into the herbivorous category. While these fish may occasionally eat meat proteins, the majority of their diet consists of plant matter.
- **Omnivores** - The majority of aquarium fish for sale will be listed as having an omnivorous diet. These fish will readily take both animal and plant matter, and should be fed both regularly for continued health. Generally speaking, omnivores normally take in more plant matter, so animal proteins are usually limited to around 20-40% of their diet.
- **Carnivores** - Like herbivores, there are few aquarium fish that are actually labeled true carnivores. The reason for this is that even carnivorous species tend to eat plant matter in the wild. So, for vitality and longevity in the aquarium, these fish should be typically fed with 60-70% animal matter and 30-40% plant matter.

Ingredients:

(Plant Matter) - For vegetables and plant matter, I prefer to use produce that was organically grown. As pesticide residues can adversely affect aquatic and microbial life, it's best just to leave conventionally grown produce out of the picture.

- **Dark Leafy Greens** - Spinach, Romaine Lettuce, Kale, Sushi Seaweed and Chard provide a rich and nutritious plant base for any diet. Chocked full of vitamins and minerals, these greens simulate the natural aquatic flora consumed by fish species.

• **Garlic** - It turns out that garlic is somewhat of a "super food" when it comes to fish. Beside its ability to simulate the appetite of even the most finicky eaters, garlic also maintains fish health by providing antibacterial properties.

• **Miscellaneous Fruits/Vegetables** - On top of your leafy green base, it's a good idea to add a few additional fruits/veggies to your food. Doing so will ensure that nutrition is derived from a variety of sources instead of just a few. This variety in nutrients will keep fish looking and feeling their best. Broccoli, zucchini, carrots, apples, pears, peas and oranges all make for great additions to homemade fish food

• **Spirulina Powder** - This food additive is a favorite among those who make their own fish food. Composed of cyanobacteria, spirulina powder is rich in minerals, vitamins, and amino acids. Natural pigments within also help captive fish show their best colors.

• **Potato or Corn Starch** - A tablespoon or so of either will be added to the mixture for binding purposes. The starch holds the mixture together so that it creates flakes when dried.

Ingredients:

(Animal Matter) - When choosing animal proteins, try to seek out wild caught or organically produced options. Conventionally farmed fish and other aquatic life are typically fed a poor diet, and can lack nutritional value compared to their wild, free range counterparts.

• **Fish** - Other fish are generally acceptable for use in making your own fish food. Wild caught specimens contain a variety of nutrients and proteins, providing a hearty base for any omnivorous or carnivorous diet. To minimize disease and pathogen contamination, always use a species of fish that is different from the ones you're planning to feed it to.

• **Earthworms** - Earthworms are an excellent source of proteins and are a fairly inexpensive option for fish food. If you don't want to blend up live worms, just rinse them off and pop them in the freezer beforehand.

• **Miscellaneous Animal Matter** - Brine shrimp, blood worms (mosquito larvae), and other bulk frozen foods offer variety to the fish food. Buy from only trusted sources to reduce contaminates and pathogens.

Process:

The process outlines how to make fish food flakes. If you're interested in making frozen food, you'll want to follow the procedure outlined in another guide.

• **Prep your ingredients**. Leafy greens should be rinsed and harder veggies (aka broccoli, carrots, etc.) parboiled. Any frozen ingredients should be thawed. Fish should be descaled, but with bones in.

• **Blend it.** That pretty much says it all. Place all of the ingredients into a blender or food processor and pulse until the mixture has reached an even consistency.

• **Strain the mixture**. Using a spatula, squeeze the mixture through a medium-fine mesh. This process is the most labor intensive, but will remove any large pieces of bone/veggie that are too big for fish consumption.

• **Dry it out**. Dedicate three to four hours for drying your fish food into flakes. This process begins by covering large baking trays with wax or parchment paper. The paper will prevent the dried food from sticking to the pan. Next pour the refined mixture onto the sheets and spread into a very thin layer (1/8 - 1/4" thick). Place in an oven set to 150°F and allow to dry for 3-4 hours, or until the mixture is thoroughly crumbly.

• **Break it Apart.** The sheets will come off in large chunks. Break them down with your hands until they reach the desired size. Store in dark and cool environment. In an airtight container, the fish food will remain good for over a year.

John Todaro - BAS

First pubished in *Aquatica* January/February 2009 Vol. 22 No. 3

ARTICLES FROM THE FILES WORTH READING AGAIN

An Old Favorite Revisited: The Paradise Fish

The Paradise fish is the granddaddy of all tropical fish. It was first introduced into the hobby in Paris in 1869 by **Carbonnier**. It wasn't until 1876 that it was introduced into America by **Adolphus Busch** (from "this Bud's for you" fame). No kidding!

The Paradise Fish was regarded as an aquarium novelty back then and the breeders of long-tail Goldfish feared the presence of this "menacing stranger" among their highly developed but defenseless long finned beauties. Of course, they should never have put Paradise Fish in with their Goldfish in the first place.

Paradise fish can withstand water down to 50˚F, but should be kept between 70˚F to 75˚F. They're not particular about water quality. They can be very aggressive among themselves, particularly at spawning time, so it's best to keep them in a species tank that's densely planted, with a small amount of floating plants for the male to anchor his bubble-nest.

The species breeds like Bettas and the eggs will hatch out in about 24 hours. After three to five days in the nest, the fry become free-swimming and can be fed on infusoria, then brine shrimp nauplii. They're easy to raise.

Breeders have developed an albino strain and a black strain and these strains can be easily found in most shops. The Paradise Fish is well suited to pond culture, as it can handle moderate chilly spells.

This is a beautiful fish and worth another look for a small desktop tank or first fish for a beginner or, as Adolphus Busch might put it... "Hey bud, this fish is for you!"

FAMILY: *Anabantidae*
SCIENTIFIC NAME: *Macropodus opercularis*
COMMON NAME: Paradise Fish.
REGION: Shallow waters of eastern Asia.
SIZE: up to 4 inches.
TEMPERATURE: Between 59˚F-75˚F.
WATER QUALITY: pH 6.0 to 8.0 and dGH 30˚
HABITS: Quarrelsome, not a good community fish. Best kept in a species tank.
FOOD REQUIREMENTS: Omnivorous; live, frozen & flake foods.
SEX: Male is more colorful and has substantially longer fins.
BREEDING: Easy to breed. Young fish and females can be kept together, but adult males will fight if kept together in a small tank.

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Anthony P. Kroeger – BAS

IS MY FISH SICK – FISH DISEASE TIPS

Part 1 can be read in *Aquatica*, Sept/Oct 2017
Part 2 can be read in *Aquatica*, May/Jun 2018
Part 3 can be read in *Aquatica*, Jan/Feb 2019
Part 4 can be read in *Aquatica*, May/June 2019

IS MY FISH SICK PART 5

FISH DISEASE TIPS

Organic Disease Treatments

I close this series of tip columns with ways to help your fish that are not drugs.

CONSIDER THESE AS PREVENTIVE AND SUPPLEMENTAL MEASURES TO HELP YOUR FISH FIGHT OFF DISEASES AND RECOVER FROM THEM!

#1 Salt

Salt is my general tonic. I use it on all sick fish at the rate of 1 Tsp of Kosher salt per gallon of water, with the exception of catfish, loaches and cory species. This is my normal healing dose. However, I also make a more intense "salt dip" for my fish. I find this works especially well on velvet and ick. For the "salt dip," I start with a 5-gallon bucket of water and use a hydrometer to bring the salinity of the water to 1.018. I also add an airstone with a heavy air flow. Put the infected fish into this treatment for about 1 to 3 minutes. The extreme change in salinity permeates the fishes' skin and affects even imbedded parasites to some extent. The osmotic imbalance kills the parasites.

Fish in such a solution will rapidly fall to the bottom, breathing hard. That's okay. When the fish falls over on its side breathing hard, remove it immediately and place it in fresh salt-free water. I use a 2nd 5-gallon bucket for this. Once the fish is recovered and swimming normally, only then can you place it back in its treatment tank that contains 1 tsp of salt per gallon of water.

Any fish which responds to this treatment with sharp twitching or jerky movements should be removed and placed in freshwater immediately... it's going into shock!

As a rule of thumb, the smaller the fish, the less time it can spend in the saltwater dip. Likewise, I do not recommend a saltwater dip for small blackwater species, ex: cardinal tetras, licorice gouramis, etc.

Saltwater dips work best for goldfish,danios, barbs, cichlids, livebearers, gobies and puffers.

#2 Temperature

Elevating the temperature helps all fish fight off diseases. A raised temperature boosts a fish's immune system, 86˚F is fatal to ick. At 90˚F many diseases start to have a problem. I always raise my temperatures to at least 86˚F. 90-92˚F is even better. I once had a heater stuck at 104˚F in a tank of pictus cats covered in ick. All the ick died. Every pictus survived.

Obviously, I do not recommend such extreme heat, but for some fish like rams, discus and some catfish, heat definitely does help a lot. Raise the temperature and keep it high for 2 weeks minimum. When you do start to decrease the temperature, do so very gradually, no more than a 2˚F per day decrease. You do not want to chill your fish and have them catch ick again.

#3 Garlic

I'm not sure exactly what property of garlic helps fish, but I do know when I mince the garlic fine and mix both it and the resultant oil with fish food, my fish seem to recover faster. I think it is an immune system booster; as near as I can tell. It also seems to help prevent fish from falling ill with disease in the first place. I use garlic with all sick fish, just as I do with salt and elevated temperatures.

#4 Massive water changes

In my quarantine tanks, I make a minimum of twice daily 50% water change. Twice a week I make a 75% water change, if the species of fish likes water changes.

Juvenile parasites move in the water column to find new hosts; changing the water decreases the number of parasites to infect new hosts while keeping water quality top notch.

Add these 4 "organic"treatments to your regular treatments and you'll save a lot more sick fish.

Happy fishkeeping!

Tony

John Todaro – BAS

ALIENS AMONG US

Do aliens exist?

Is 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 from us, in which we can not survive in 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 the 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 anabantid. More about them later. All fish have gills and to stay alive in their world they must pass large volumes of water through the gills' to extract oxygen through the gills pumping action. When fish begins 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. As humans we can increase our supply 20 times or even more by deep and faster breathing.

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

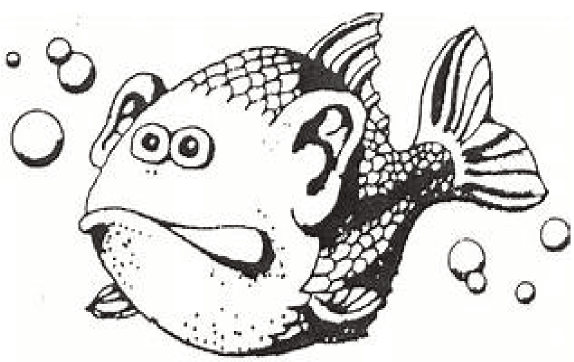
This special organ allows labyrinth fish to take in oxygen directly from the surface of the water, instead of taking it from the water they live in. The labyrinth organ helps the inhaled oxygen to be absorbed into the bloodstream.

Because of this, 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 and develop 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 helps them 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 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 mollusk shells. Some small toad fish 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.

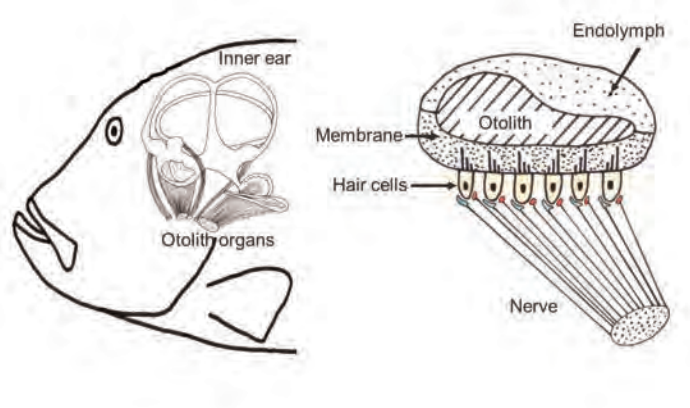
Most sounds are in the form of grunts whoops, clicks, thumps, growls and barks and most of them are within the range of human ears when transmitted through hydrophones.

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 adoption 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 bones.

Another hearing organ of fish is an accelerometer set up by dense bones in the skull called *otolith*s 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 fish's 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, most fish, however, see color judging from the existence of color receptors cells in their eyes.

Deep water fish that live 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 wavelengths 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 at 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 on 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. Like 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 *Champsocephalus 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.

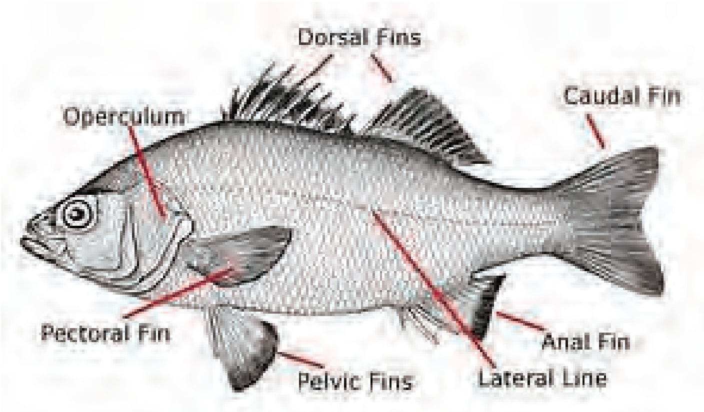
The retina uses a lot of oxygen compared to most other tissues, and is supplied with plentiful oxygenated blood to ensure optimal performance.

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

Most terrestrial animals have skin. Fish on the other hand have developed scales which are more suited for their environment. Scales can vary in size from very large to microscopic ones such as those on eels.

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 fish 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.

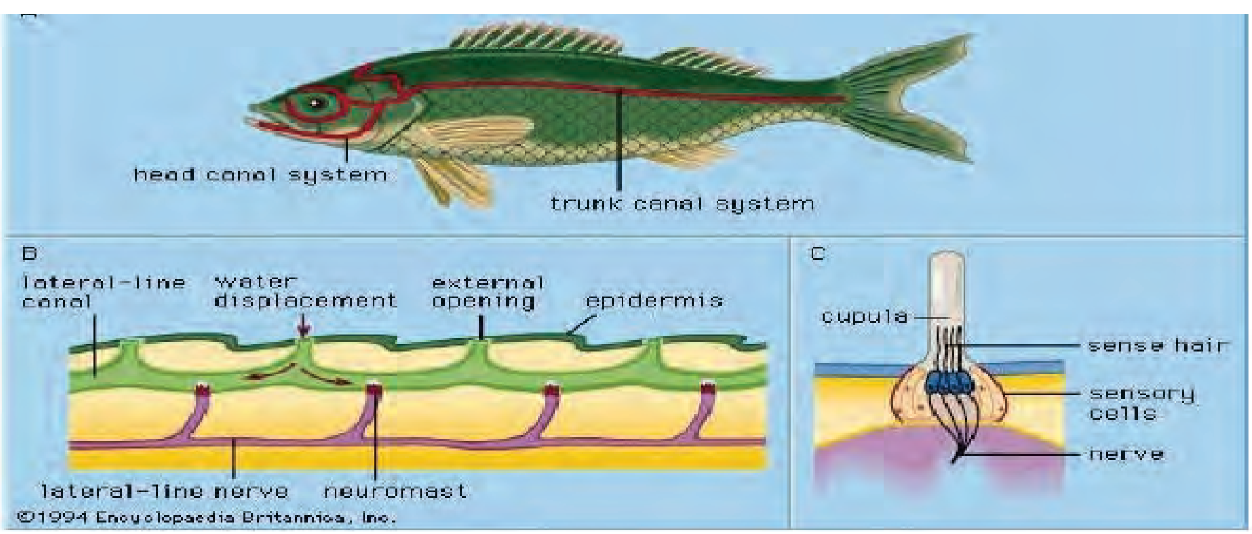
In bony fishes, the scales along the lateral line have central pores that allow water to contact the sensory cells.

• 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 a 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 armour. 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. They 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. Lateral lines are usually visible as



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

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 avoid collisions, to 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 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!

Salt water 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 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 10th of a degree F.

Fish have developed to live in a variety of environments in this alien world. There are fish that live in nearly freezing water and other fish 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 can not 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.

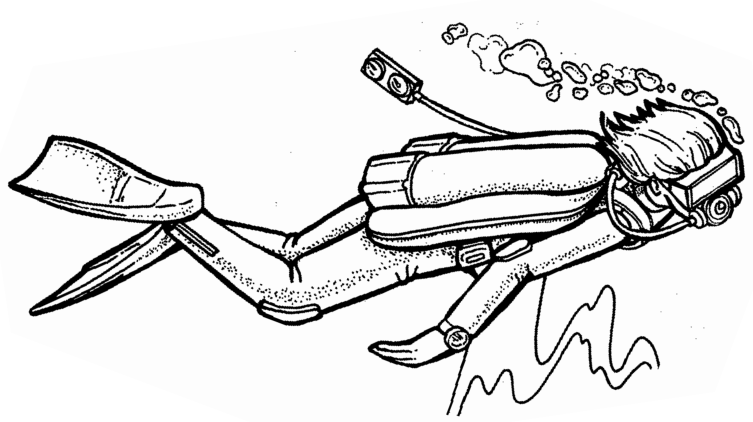
Fish generally try to find their thermal optimum, (their Goldilocks zone) the temperature which is not too cold or not too hot. This thermal optimum varies for different fish species.

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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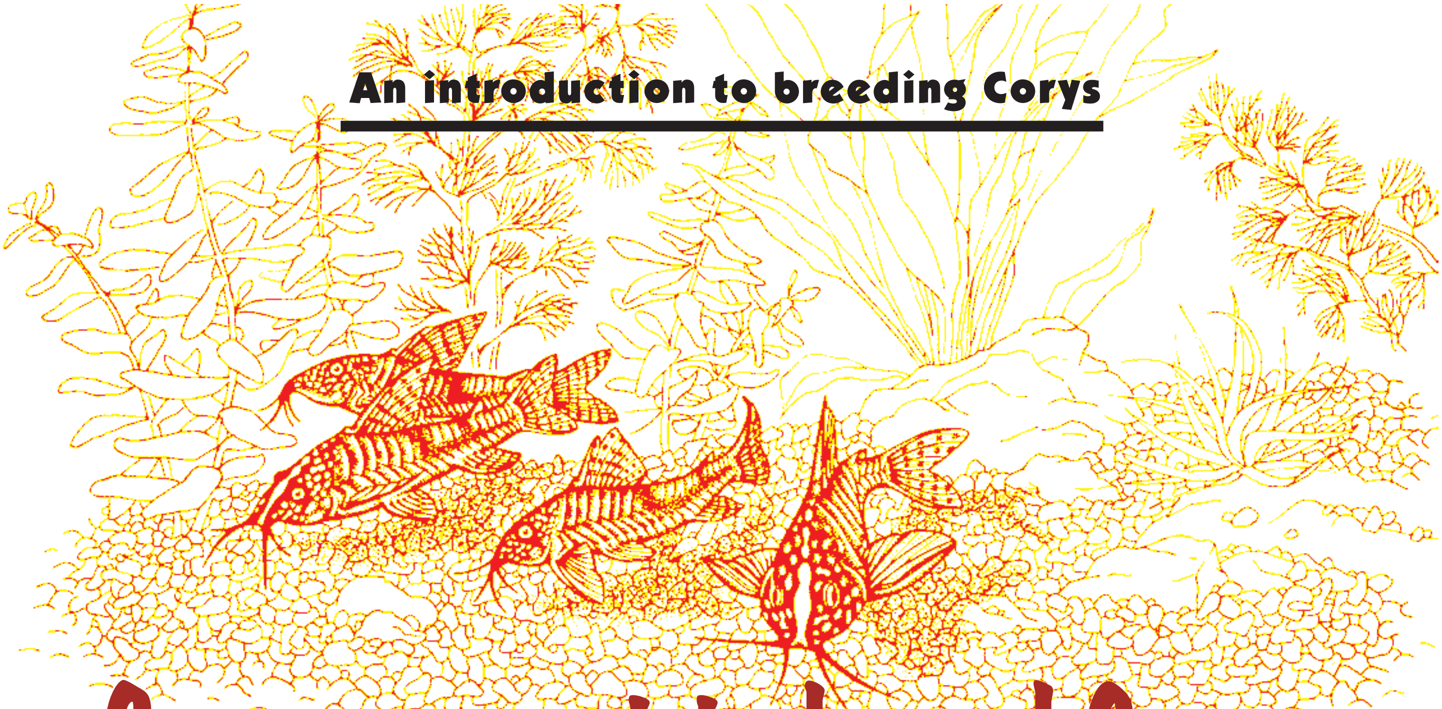
An introduction to breeding Corys



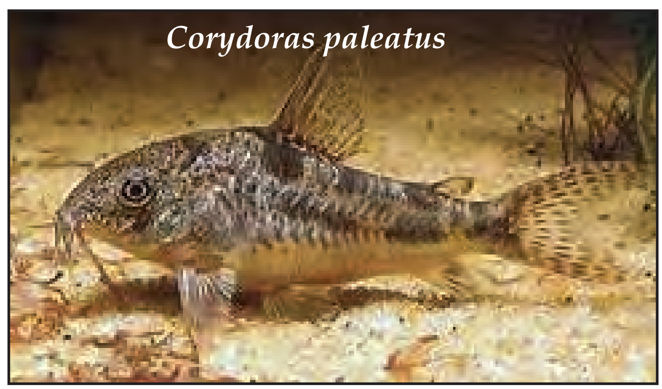
So you want to breed Corys

When first starting keeping tropical fish, the majority of people never give a thought to breeding them; their first experience comes when their female Guppy or Platy gives birth to a batch of youngsters. Watching a female livebearer deliver her young is an awesome sight the first time you see it happen and has probably been the beginning of many a lifelong journey for budding aquarists. It was certainly what started me on the road to fish breeding.

Among the many groups of fish that I have bred over the years, it's the group of small armoured catfishes from South America belonging to the family Corydoradinae that have intrigued me the most and for the longest time. In fact, my interest in them started within the first three years of taking up the hobby; it's an interest that has continued to this day.

There are more than one hundred and fifty described species, with equally as many more species awaiting scientific description. At any one time, there are probably twenty to twenty five species available to the hobbyist. These range in size from a little over one inch body length (25 mm), to four inches (100 mm). Their body shapes also vary, which is an indication that although they belong to the same family, they do not necessarily live in the same type of habitats. This means that providing the correct breeding conditions for them is not always a simple task. The substrate where most Corys are found is sand. Unlike common building sand, river/stream sand is different. Because it is constantly being moved by the flow of the water, the granules have been worn rounded and smooth. In some areas, there is larger gravel and in others the substrate is clay, which is not an ideal substance to use in the aquarium. In slower moving rivers, streams, flood plane pools and lakes, there may be thick layers of leaf litter or even deep silt. Therefore, selecting the correct substrate can be a problem. Water condition requirements also vary from species to species, at one end of the scale there are some that require very soft acidic water (0 - 2 dGH; pH 5.6 - 6.0) and at the other end the water needs to be medium hard and neutral (8 - 12 dGH; pH7.0). As aquarists, it's almost impossible to determine the exact needs of each individual species, so we need to have a starting point. I would normally start with what I call a basic set up; the size of the tank is not that important. Most of my Corydoras breeding tank are quite small, holding between six and eight imperial gallons of water.

The first decision is to select the species you want to breed. Here I would recommend one of the so-called easier and more readily available species. *Corydoras aeneus* the Bronze Cory and *Corydoras paleatus* the Peppered Corys. There are also albino forms of both species available,



which are equally as easy to breed. The ideal breeding group for any of these species would consist of two females and four males. To house them, an aquarium of 18" x 12" x 10"/12" deep (45 cm x 30 cm x 20/25 cm) would be a suitable size for a breeding set up. For those of you that have a limited amount of room, there are one or two dwarf species that are also very easy to breed. These are *Corydoras habrosus* and *Corydoras pygmaeus*. A small 10" x 8" x 8" (25 cm x 20 cm x 20 cm) aquarium would be an ideal size for these.

No more than a three-eighth of an inch (10 mm) layer of smooth grained sand should be used as a substrate for the larger species and about half that for the dwarf species. The reason for the shallow depth of substrate is so that when the adult fish are sifting through it in their constant search for food, they can actually penetrate to the base of the aquarium, which alleviates the risk of uneaten food causing pollution problems. By way of filtration, I would recommend the use of air driven sponge filters. These, once they have matured not only help to keep the water clean with their biological action, but provide what can only be described as a dining table for small fry. To mature new filters, I set them up in an already established tank, usually the stock tanks that house the fish I want to breed.

The only other additions I would add to a breeding tank would be either a floating spawning mop, constructed out of synthetic 4ply knitting wool. To make a spawning mop simply take a piece of stiff card about 18 - 20 cm wide and wind the wool around it fifty times. Tie off the loops at one end of the card and then cut through the strand at the other, attach a piece of cork to the tied off end and you have a spawning mop. The colour of wool is immaterial but I find that dark green or brown seem to be favoured more than any other colour. Once the mop has been soaked, it will provide an ideal egg deposit site. Java moss and Java fern also make good spawning sites; both plants are hardy and will tolerate being moved from tank to tank as required.

A new breeding tank set up will have a thin layer of well washed sand; water will be taken from the stock tank that the potential breeding stock are housed in, filling the tank to about three quarters full and topped up with new water of the same temperature. One or two sponge filters are added depending on the tank size and the species to be housed. The temperature is set to suit the species to be bred and then the tank is left to settle for a couple of days. For *Corydoras paleatus,* the temperature would be set at 70º F (21º C), for *C. aeneus,* a little higher at 75º F (24º C). Once the tank has settled, the adults are introduced. If the water parameters in the stock tank are different to those in the breeding tank the adult fish should be acclimatised, which is done by catching the fish and putting them in a container with water from the stock tank and floating it in the breeding tank. The water in the container is then slowly exchanged for water from the breeding tank; once the acclimatisation has been achieved, the group of adults can be released.

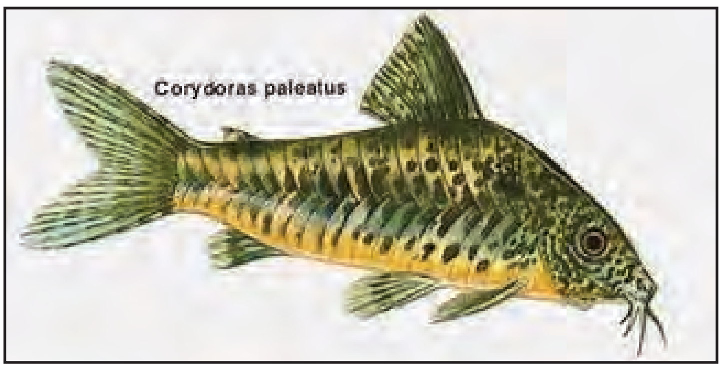
Now the potential breeding group need to be given the best diet possible to get them into the best possible condition for breeding. A staple daily diet of a quality flake or tablet food alternated with live or frozen foods. Daphnia, Tubifex, bloodworm or Cyclops would be ideal.

Thirty percent water changes should be made twice weekly to keep conditions at their best, making sure to siphon all the fish waste and any debris that has accumulated on the bottom.

In many cases when the fish are in the best possible condition, a basic water change will be enough to trigger them into spawning mode, some species, however, will need a little encouragement, which may be achieved by a fifty percent water change using replacement water that is about 10º F cooler (6.5º C). Other species may prove even more difficult and daily water changes may be needed to start spawning interest. It's usually at this point that I advise people to make notes of what they are doing and to record all relevant details, such as tank size, water parameters, food and feeding regime, water changes; how often, how much and temperatures, etc. Another tip here is to only ever change one parameter at a time because by altering more, one thing could counteract another.

It will be pretty obvious when the fish are interested in breeding by their increased activity. What usually happens is the males will start to pay a female a lot of attention by performing little dances around and all over her, often offering themselves in arched sideways stances in front of her. They will stay in constant contact in an attempt to arouse a female's interest. It may only be one, two or all four males taking part in the ritual, each one competing for the chance to mate. The females will be more interested in cleaning various sites around the tank in readiness to deposit her egg/s. When a female is sufficiently aroused, the roles are reversed and she will pursue the male of her choice, nuzzling into his side just above his ventral fins. At this point, the male will clamp the female's barbels to his side using his pectoral fin spine, the male will be seen quivering for a second or two before releasing his grip on the female. This is what is known as the Corydoras "T" mating position and depending on the species is the time when the female releases egg/s into a pouch formed by clamping her ventral fins together. There are some species where the female releases her egg/s into the pouch after the male has released her. There is a lot of conjecture how or at what point the egg/s are fertilised and has been the subject for some lengthy discussions, which I do not intend to delve into here.

After mating, the female will rest momentarily and then swim off in search of a suitable site to deposit her egg/s, which may be on the tank glass or on one or all of the other tank's furnishings. I have found that *C. paleatus* seem to prefer the tank sides to deposit their eggs on, with *Corydoras aeneus* having a preference for plants and mops. Egg size varies from species to species; the smallest I have measured was from *Corydoras* sp. *pestai* at 0.7 mm diameter and the largest from *Corydoras metae* at 2.8 mm diameter. The size and the quantity of eggs seem to be related, a species laying small eggs produces large numbers and a species producing large eggs only produce small numbers. Once the spawning activity has ceased, it is best to remove either the adults or the eggs to avoid any possibility of the eggs being eaten. If there are a large number of eggs, it is best to remove the adults and return them to their original stock tank. A small number of eggs can be housed in a small container left floating in the spawning tank, where eggs have been deposited in the mop or on the plants, it's a simple case of lifting the whole plant or mop out and putting it in the container. Eggs that have been placed on the tank sides can be carefully lifted by using a razor blade; some species produce very sticky eggs that are quite difficult to remove and others have hardly any adhesion at all. Eggs that are removed should be put in a small hatching container (I use 1.5 or 2 litre ice-cream tubs) with water from the spawning tank and with an air stone added. If the container is floated in the spawning tank, it will be maintained at the same temperature. The addition of a proprietary anti-fungal solution will help keep any infertile eggs from contaminating the fertile ones.



Over the four or five day gestation period the water in the container should changed for water from the spawning tank, which will reduce the content of the anti fungal solution to zero by the time fry start to emerge from the eggs. Once the fry have escaped the confines of the egg membrane, it will take a further two to four days for them to become free swimming; the daily water changes should be continued. When the fry can be seen to have totally absorbed the contents of their yolk sac, they will need to be supplied with food. There is nothing better to start them off than small helpings of micro worm, here the term little and often should apply but this is not always a practical option. Therefore feeding twice a day will suffice making the daily water change before the second feeding. After two days of micro worm other foods; should be introduced, preferably live food; newly hatched brine shrimp or cyclops are ideal. Pre-soaked poweredflakes can also be given, alternating with the live food. At this time it will be necessary to increase the amount of water changes before each feeding.

Corydoras paleatus fry grow very quickly and within four or five weeks the fry will need to be moved to larger accommodations and by the time they are ten weeks old, they should be about one inch in body length.

Finally, do remember to keep notes because not everything you do will go according to plan and the record you keep may be invaluable at a later date.

Anthony P. Kroeger - BAS

MARINE ANGELFISH - PART 4

BIG! BOLD! BEAUTIFUL!

THE QUEEN ANGELFISH
Holacanthus cilaris

Queen angels are arguably the most stunning fish in the Atlantic Ocean!

Once seen, you will never forget its great beauty! Personally, this is my favorite Atlantic fish.

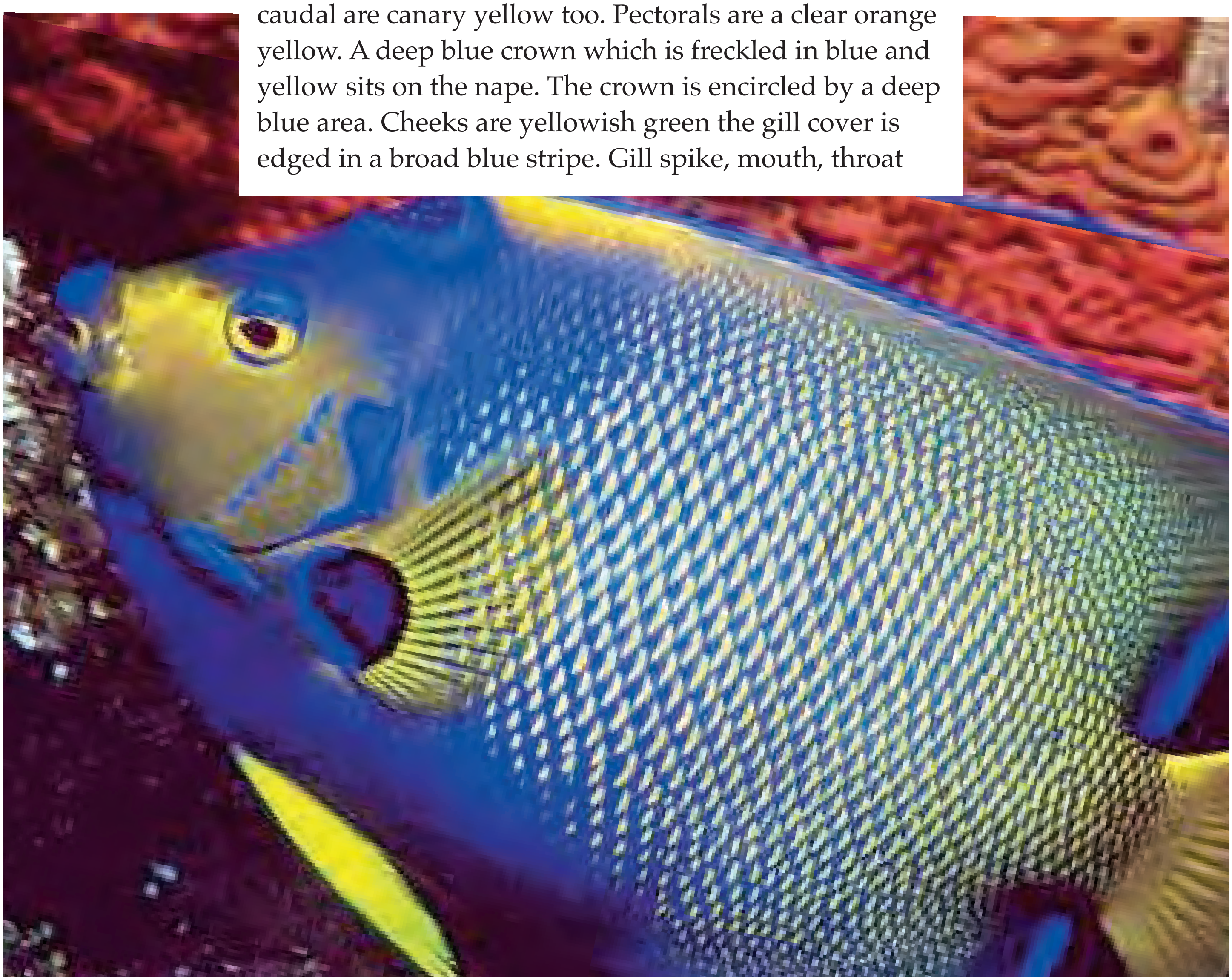
Queen angels are found from Florida to Brazil and the entire Caribbean and in between, although around some Caribbean islands it is rather rare. It's much more common in coastal areas, such as Florida, Belize and Brazil. As adults, queen angels grow to a length of 15" inches.

Queen angels usually are available at a medium to high price. Collection of both quality and size of queen angels is now strictly limited by the state of Florida. Demand for queen angels far exceeds supply.

Imports from Belize and elsewhere are now generally juveniles or sub-adults [transition phase] fish. Availability of large full grown adult specimens is very rare now.

You get what you pay for with queen angels; however, this angel is stunning!

In adults, the body is a beautiful turquoise blue, each scale is edged in canary yellow. The ventrals and caudal are canary yellow too. Pectorals are a clear orange yellow. A deep blue crown which is freckled in blue and yellow sits on the nape. The crown is encircled by a deep blue area. Cheeks are yellowish green the gill cover is edged in a broad blue stripe. Gill spike, mouth, throat



and belly are deep turquoise blue; the anal fin is long flowing and extends to a point. Base color is blue green with yellow speckles in the base. The leading edge is neon blue, followed by a glowing red stripe which changes to yellow at the fin tip.

The nape between the crown and dorsal fin is golden yellow. The dorsal is long, broad, glowing and extends to a tip well past the caudal fin. Base color is blue with yellow stripes and the dorsal and anal are edged in neon blue.

Juveniles are a golden brown with a yellow snout, blue ventrals, shoulder and tail. A deep blue and covers the eyes This band is edged on both sides by electric blue stripes, additional stripes adorn the flanks. A broad neon blue edge surrounds the dorsal and anal fins. Any size queen angel is an amazingly beautiful fish.

Care of queen angels is straight forward: they need room, a 55-gallon for juveniles and at least 125-gallons for adults, power or canister filtration and good quality water. Salinity should be 1.020

Juvenile queen anglefish

to 1.024. Temperature between 76˚ and 78˚F. Zero ammonia/nitrites. I change 25% of their water weekly.

Feed them a wide variety of commercial prepared pellets, frozen and flake foods, as well as a lot of fresh veggies and algae. Queen angels are not picky or fussy feeders as many other large angels can be.

To insure they get enough vitamins, give them commercially prepared marine angel sponge diets at least twice a week.

Queen angels are fairly restant to disease. They also seem to be more resistant to lice than most large angels are. However, do not tempt fate. They can get lice if you do not maintain good water quality or feed them well. Although people commonly keep angels alone, that need not be the case. Juveniles will coexist together. Sub-adults usually will be okay too. Adults are found in pairs on the reef. A compatible pair of adults will coexist in a large enough tank. But expect to swap out specimens to try to find a compatible pair; even then make sure you have lots of hiding places just in case a disagreement erupts between them.

Queen angels are peaceful with all other fish. I have never had a problem with them in a community tank. I find the suitability for queen angels in a marine tank mixed. Smaller specimens are usually okay. Adults can be a problem.

Sponges and gorgonians are never safe with queen angels, but larger polyp corals usually will be safe.

Small polyps can be seen as a snack especially for adults. Put a queen in your reef tank at your own risk, but observe it closely, it just might work, especially a juvenile queen angel.

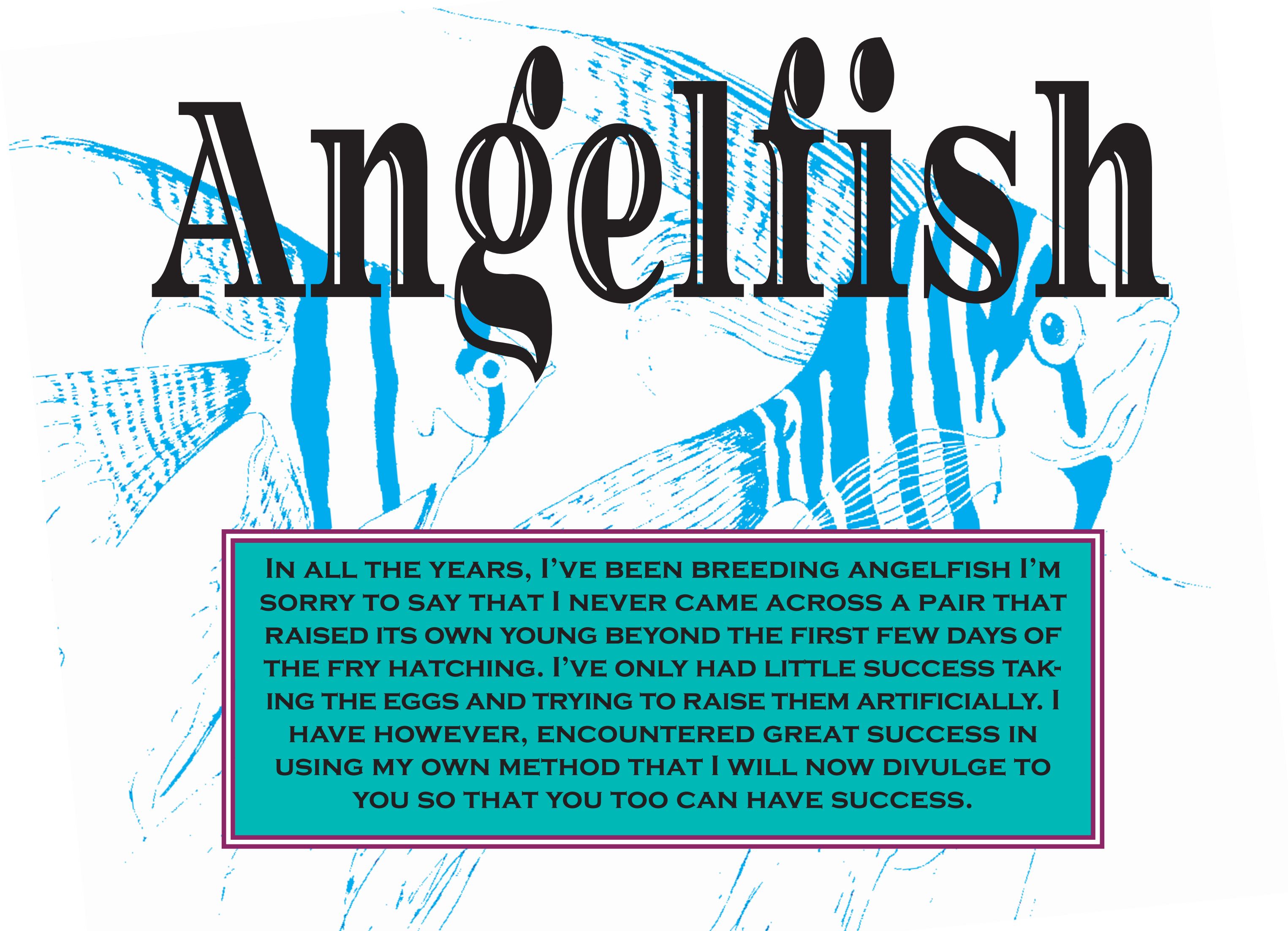
I heartly recommend this large angel. Its beauty, hardiness and ease of care makes it a hard fish to beat.

Happy marine fishkeeping

Tony

Al DiSpigna – BAS

Angelfish

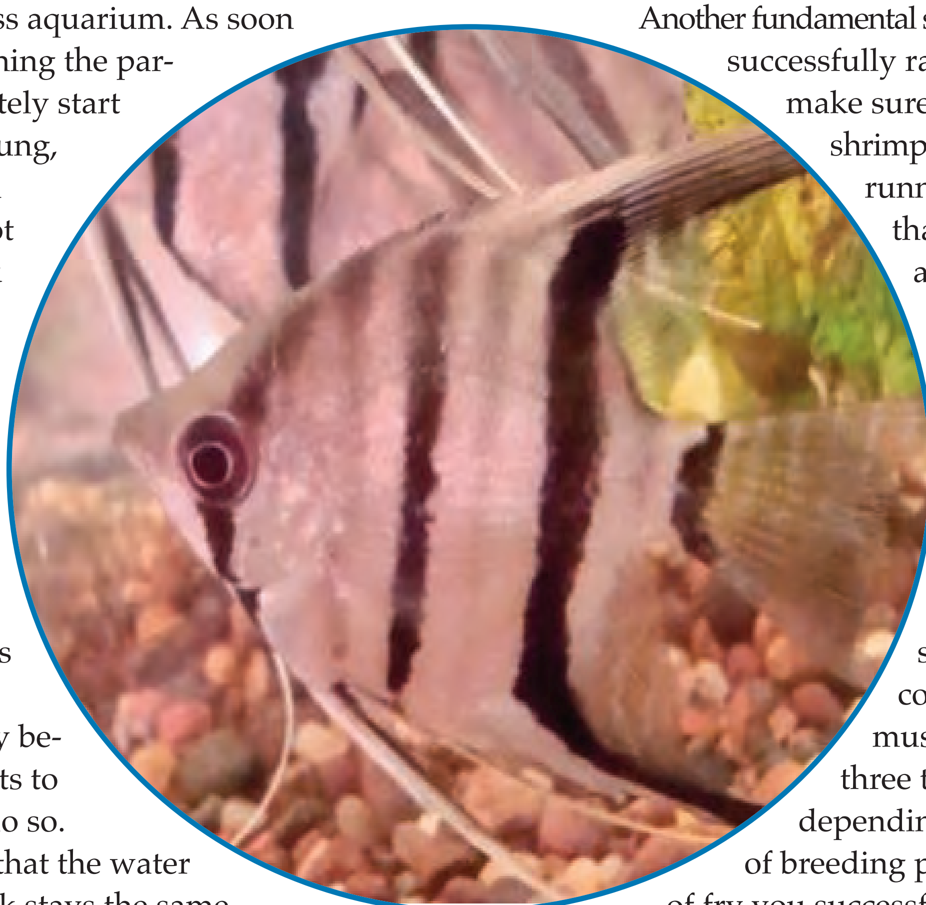


IN ALL THE YEARS, I'VE BEEN BREEDING ANGELFISH I'M SORRY TO SAY THAT I NEVER CAME ACROSS A PAIR THAT RAISED ITS OWN YOUNG BEYOND THE FIRST FEW DAYS OF THE FRY HATCHING. I'VE ONLY HAD LITTLE SUCCESS TAKING THE EGGS AND TRYING TO RAISE THEM ARTIFICIALLY. I HAVE HOWEVER, ENCOUNTERED GREAT SUCCESS IN USING MY OWN METHOD THAT I WILL NOW DIVULGE TO YOU SO THAT YOU TOO CAN HAVE SUCCESS.

I had five breeding pairs of marble angels, each in bare bottom 20-gallon aquariums. Each tank had a 200-gallons per hour outside power filter. The pH was maintained at 6.8, temperature at 82 to 84 degrees F, and lighting was provided by a standard 20 gallon strip fluorescent light. Each aquarium had a 12 inch x 3 inch x ¼ inch black slate propped up on the side of the glass at a 45 degree angle. You can purchase slate at any tile store and they'll even cut it to size for you. Rinse the slate well of any dust or debris before placing it into the aquarium.

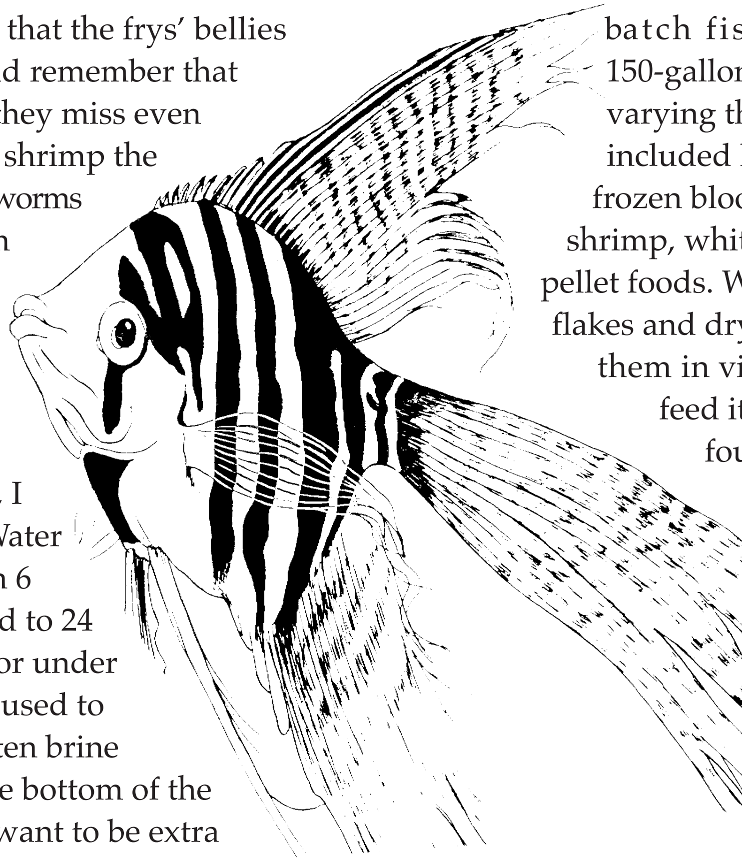
I feed the angels black worms to condition the females to develop eggs. All the pairs were 2nd generation from fry that I had previously raised. They were all large, but one pair was about 3 inches in body circumference. This large pair laid about 1000 eggs which isn't unusual, but the average egg clutch is more in the vicinity of 500 to 750. As with most of the other pairs I had kept in the past, the parents would tend to the eggs, but two days after the fry became free swimming the parents would eat them. Now I will tell you what I did to make sure that the fry would survive.

First, I siphoned the free-swimming fry from the 20-gallon tank to a 5-gallon tank. This is done by using a 1 inch ID (Inside Dimension) clear flexible tubing. It's essential that the 5-gallon tank is already filled about one third of the way with tank water from the parents' tank before you start siphoning the fry It is also essential that the hose end going into the 5-gallon tank is held in such a way that when the fry come out of the hose, they do not smack directly onto the floor or the side of the glass aquarium. As soon as you start siphoning the parents will immediately start to defend their young, and therefore, you must be careful not to damage or suck in the parents. At this point, the parents will most likely start fighting (as if they're blaming each other for the loss of fry); I've noticed the fighting is less intense when you leave some fry behind for the parents to tend to, so try to do so.



Make sure that the water in the 5-gallon tank stays the same temperature as the parents' tank; this can easily be maintained with the use of a heater. You want to test the settings of your heater before you introduce the fry into the tank. This can easily be done by filling the 5-gallon aquarium and adjusting your heater so that the temperature is within the same parameters as the parent's tank. Once you have found the proper setting, unplug the heater, drain the tank, and you will be ready to begin. This is also very important because any type of temperature fluctuation will kill the fry! Filtration is accomplished through the use of sponge filters. You want to make sure you use the ones that sit on a plastic pedestal, so that the fry don't get trapped under the ones that sit directly on the bottom of the tanks. About two to three weeks prior to setting up your 5-gallon nursery tanks, you can start a healthy bacteria culture by running the sponge filters in the parents' tank.

Another fundamental step to guaranteeing successfully raised fry is to make sure that your brine shrimp hatchery is up and running; this ensures that you have an ample supply of baby brine shrimp for feeding. Brine shrimp are only nutritious for the first 24 hours, so be sure to have freshly hatched brine shrimp on hand constantly. As you must feed the fry three times a day, and depending on the amount of breeding pairs and number of fry you successfully siphoned out, this adds up to a lot of brine shrimp. I have a rotating stock of three one gallon glass jars filled with salt water, and an air stone. The jars are sitting in a 10-gallon glass aquarium filled with freshwater just below the level that the jars are filled and it is equipped with a heater and kept at 80˚ F. Every 24 hours I place one level teaspoon of brine shrimp eggs in the jars so I would have a constant supply of live baby brine for fish fry when they hatched. After one jar is exhausted of brine shrimp, it would be cleaned and fresh salt water replaced. Make sure that the frys' bellies are full at each feeding and remember that fry can weaken and die if they miss even one feeding! Besides brine shrimp the fry were also feed live micro-worms occasionally. A micro worm culture was always kept going in case one of the brine shrimp jars would fail to hatch.



About a half an hour after each feeding, I perform a water change. Water changes are best done with 6 foot air line tubing attached to 24 inch ridged tubing (used for under gravel filter tubes). This is used to siphon out the dead, uneaten brine shrimp and debris from the bottom of the aquarium into a pail. You want to be extra careful not to suck up any fry, but if you do, you can use a brine shrimp net to fish them out of the pail and carefully put them back. Replacement water came from the parent tank, again making sure all the parameters such as pH, temperature, etc. are the same.

After a month and a half, I transferred the fry into a 10-gallon tank, still taking care that the temperature was the same, and that water changes were meticulously done with water from the parent tank, which was changed 50% once a week. At 6 weeks, the fry started to look like the parents with their dorsal and anal fins elongating. At this time, I started feeding the fry ground flake food sparingly, making sure that most of it was eaten. At two months, I put approximately one half of the fry into a 40-gallon breeder tank and the other half in another 40-gallon breeder tank. At three months, they were outgrowing the 40-gallon breeder tanks, so I transferred each batch fish into their own 150-gallon aquariums. I began varying their diet, which now included live black worms, frozen blood worms, brine shrimp, white fly larvae, flake and pellet foods. When feeding the flakes and dry food I would soak them in vitamins and then feed it to the fish. I found it interesting when I fed them flake food, all the little hungry mouths would chomp on the surface like hundreds of hungry piranhas.

Out of this particular spawn, I managed to raise 750 fry to adulthood, the same large size as their parents. It only took about 14 to 16 months for the fry to reach adulthood. Very few were stunted, very few had missing ventral fins, and the losses were in there first month of life. It was amazing that I had very few losses. If you remember, about 100 fry were left with the parents whom they eventually ate! I recommend breeding fish to every hobbyist, because it's such a rewarding experience for young or old.

I did want to share with you this one last observation. The parent angelfish didn't eat the fry I had left with them until two weeks later, and I noticed that these fry where twice as large as the ones that I was raising.

AL

Carl Zimmer – September 28, 2018 *New York Times*

A version of this article appears in print on Oct. 2, 2018, on Page D6 of the New York edition with the headline: *In the Sea, a Big Appetite for Jellyfish.* –

WHO WANTS TO EAT A GOOEY JELLYFISH? PRETTY MUCH EVERYONE IN THE OCEAN

Scientists had long assumed that few creatures dined on these gelatinous animals. But new research suggests that jellyfish may be an important part of the ocean's food supply.

Marine biologists had believed that jellyfish don't hold enough calories to be a significant part of the ocean's food chain.
Credit Hassan Ammar/Associated Press

For a hungry fish in search of a meal, a jellyfish would seem to be a huge disappointment. These gelatinous animals are 95 percent water. As a result, a cup of live jellyfish provides just five calories — one-third the amount in a cup of celery.

It should come as no surprise, then, that marine biologists long ago dismissed jellyfish as an insignificant item on the ocean menu. Other animals rarely bothered eating them, the idea went, and so they represented a dead end in the ocean's food web.

"Historically, they were just ignored," said **Thomas K. Doyle**, a marine biologist at the University College Cork in Ireland.

But recent research has shown this to be a mistaken view. Many species, from tuna to penguins, seek out jellyfish to eat. "The more we look, the more animals are feeding on jellyfish," said Dr. Doyle. "They're absolutely, really important."

It's even possible that jellyfish help stabilize the ocean's food webs, providing a dining option to other animals when times are tough.

"Our perception has switched hugely," said **Jonathan D.R. Houghton**, a marine biologist at Queen's University Belfast in Northern Ireland. "It's almost a reboot of jellyfish ecology as a central part of the ocean system."

Dr. Doyle, Dr. Houghton and **Graeme C. Hays** of Deakin University in Australia recently surveyed new evidence supporting this revised view in the journal Trends in Ecology and Evolution.

The meager calories in jellyfish weren't the only reason that scientists dismissed them. Animals on the hunt for prey rarely were seen catching jellyfish. When biologists cut open fish or inspected bird droppings, they almost never found jellyfish remains.

There were exceptions. Leatherback turtles and ocean sunfish have long been known to gorge on jellyfish, gobbling hundreds of them every day.

But leatherback turtles and ocean sunfish are exceptionally big. Leatherbacks can weigh over 2,000 pounds; ocean sunfish can reach 5,000 pounds.

Many scientists considered their size to be a special adaptation for living on jellyfish. Only by filling a vast stomach with gelatinous prey could they hope to get enough food to survive.

For animals without such adaptations, a diet of jellyfish would seem to be a dangerous strategy. The predators would be far better off eating other prey. Bite for bite, fish provide around thirty times more calories than jellyfish.

It seemed to biologists that the ocean must hold a colossal amount of uneaten food. No one knows how many jellyfish there are, but scientists regularly come across vast hordes of them.

Barrel jellyfish, for example, can form dense armadas that stretch for dozens of miles. And each one can weigh as much as sixty pounds.

If other animals weren't eating all those jellyfish, then all that organic matter was being lost from the food web. "They might die and fall to the seabed, and the microbes had a good day," said Dr. Houghton.

This understanding of jellyfish has come under scrutiny in recent years as marine biologists have used new tools to figure out what eats what in the sea.

Prey leave a chemical signature in the predators that consume them. Elements like oxygen and nitrogen in the muscles of animals can reveal the kinds of prey they consume.

As it turns out, a number of fish species carry a jellyfish signature in their muscles.

Scientists have also invented new ways to peer inside the guts of ocean predators. Rather than searching for pieces of half-digested jellyfish, researchers began rummaging for their DNA. And they found a lot of it came from jellyfish.

In eel larvae, for example, researchers found that 76 percent of prey DNA belonged to jellyfish. From the feces of albatrosses, scientists determined that jellyfish made up 20 percent of their diet.

By mounting miniature cameras on marine animals, biologists have been capturing days' of video. Footage of penguins has revealed that they also eat jellyfish. In fact, the birds actively seek them out even when other options are available. Jellyfish may make up over 40 percent of a penguin's diet.

These new techniques "have allowed us to scratch the surface and get a glimpse of another world," said **Julie McInnes**, a biologist at the University of Tasmania.

It's a world with a tremendous appetite for jellyfish. So why are many animals eager to

Jellyfish Lake in Palau. "There's a lot more to jellyfish than jelly," said one researcher.
Credit: Benjamin Lowy/Getty Images Reportage

eat a seemingly useless food?

Part of the attraction may stem from how easy it is to catch jellyfish. They can't dart away, and once an animal eats a piece of jellyfish, it can digest the meal far faster than a fish full of bones or a shrimp covered in an exoskeleton.

Some animals may not swallow the entire jellyfish, instead biting off the nutritious parts. While the bell of a jellyfish is mostly water, their reproductive tissues offer calories and protein.

"There's a lot more to jellyfish than jelly," said Dr. Houghton.

The enormous amounts of jellyfish that other animals are eating has left Dr. Houghton and his colleagues wondering about the animals' effects on the entire food web. It's possible, he said, that jellyfish keep ocean ecosystems stable.

Marine animals like fish are more vulnerable to population crashes. They can only survive if there's enough food that is the right size to fit in their mouths at each stage of their life cycles.

Jellyfish, on the other hand, are far more versatile. When there are small fish available, a jellyfish can capture them in its tentacles. But if these morsels are missing, jellyfish can eat tiny zooplankton — or even just feed on ooze.

Then other animals may survive lean times by eating these versatile creatures.

"That might bring stability to a food web," said Dr. Houghton. "They could provide a buffer for the system."

Dr. McInnes agreed that jellyfish are more important to the ocean ecosystem than scientists once thought. But she noted that it's still too early to say precisely how much jellyfish other sea creatures are eating.

"There's still a lot we don't know," Dr. McInnes said.

Mike Hellweg - CFN (Certifiable Fish Nut) - MAS

Reprinted from the *Darter* Nov/Dec 2017 Vol. 43, No. 6 the official publication of Missouri Aquarium Society

The Scarlet Badis

Dario dario

AT THE 1999 American Cichlid Association convention in Detroit, there was a vendor with a tank of really cool fish that were drawing comments from just about everyone.

The fish were tiny, about one half to three quarters of an inch long. They were glowing bright red with pale silvery blue stripes. Some specimens were glowing like bright red crayons on a sunny day; others were more washed out, but all with colors that until that time had not been seen on wild caught freshwater fish. Wow! Even with all of the fantastic show fish, folks were lined up just to see these new beauties. They were for sale, too! The price was astronomical - around $100 each if I remember correctly. They looked similar in shape and fin structure to the well known blue chameleon fish, *Badis badis*. The seller was calling them Scarlet Badis. That name seemed to fit them well.

When I got back to St. Louis, I asked **Bill McCrum** at Beldt's to keep an eye out for them. When he did find some, the price was still pretty high, so he didn't order them. It would be another year or so before the price came down enough that I was willing to spend the money on a group of them. I was a bit disappointed when I first got them.

I bought all they could bring in, just 8 tiny fish. All were less than a half inch long. Three were beautiful just like the ones I remembered from the ACA. Two had washed out red colors, were very thin, and died a few weeks later. Three were plain silver with clear fins. At the time I was told they were brackish fish from "Southeast Asia". Around the same time the Internet was starting to become a bit more widespread and word was getting around that these guys actually came from Northern India. I decided to set them up in a 20 long heavily planted with *Cryptocoryne*, Java ferns, *Anubia*s on drift wood and Java moss.

Photos don't do them justice. The colors of the male literally glow. Their head, shoulders, and back are rusty orange to ruby red. Their flanks are covered with 7 red bands which extend into the fins. These bands are interspersed with 8 silver blue stripes which also extend into the fins. The fins are outlined in pure white. The ventral fins are intense bluish-white and are often nearly as long as the fish is tall. The iris is golden to pale amber.

As gaudy as the males are, the females are that plain. Females are a dull silver gray, clear ventral fins are more in proportion to body size. Some larger females exhibit a few thin, pale orange stripes on their flanks, but that's it for color. Probably due to this marked difference in coloration, females are rarely, if ever, imported. This is also probably the biggest reason why hobbyists fail to get these fish to breed - they only have males!


Female. © Charles König

Since these fish recently appeared in the hobby, it would probably be surprising to learn that they were actually described in 1822 - nearly two hundred years ago! They were described by the renowned naturalist **Francis Hamilton Buchanan** in his paper "An account of the fishes found in the river Ganges as *Labrus dario"*. For a paper published nearly two centuries ago, it is still taught today! This is where they sat for 180 years until scientists took a closer look at them in 1995 when the Chinese ichthyologist **Zhu** looked at them and moved them to the Genus Badis. **Kullander** and **Britz** created the new genus Dario in 2002 and set them up as the type species, where they remain today. The hobby "discovered" them around 1999, and they became fairly common by 2006 or 2007. While they are diminutive fish, the Scarlet Badis are by no means shrinking violets. The males are usually out and about where you can see them and enjoy their colors. In fact, while we might today call them nano fish, they have piscinalities that make them seem much larger. As with most nano fish, their behavior is fascinating. The biggest problem with the Scarlet Badis is trying to find females. For some reason most sellers only get males, with just a few females as contaminants to the shipment. If you see a plain silver fish, usually much smaller than the others, with no color in the fins, grab it. That's a girl! If you get really lucky you might find more than one! You'll rarely see them if you keep them with a lot of other fish, but if you keep a group by themselves, in a well planted 20-gallon long, you will be treated to a very active socially interactive fish. If you keep them in a smaller tank, be sure to give males places to get out of the line of sight of other males as they will scrap and fight amongst themselves. One large male will dominant while other males stay in hiding most of the time. In a large tank they will be fine. In a smaller tank the dominant male might eventually kill the weaker males.

Scarlet Badis are undemanding for water parameters, as long as both very hard, alkaline water and very soft, acid water are avoided. Tap water in St. Louis seems to suit them fine. Keep the temperatures in mid 70s°F, use a slowly circulating filter like a sponge or Mattenfilter and they will be very happy.

Plant the tank with lots of *Crypts*, *Anubias*, Java ferns on driftwood, and similar plants, and give them several clumps of Java moss and they will glow. To give it a more natural effect, add a couple of handfuls of soaked oak leaves to the tank. These will slowly break down and provide home to microscopic critters for the young fish to eat, as well as give them places to hide

They do not seem to enjoy flake foods. Some specimens will eat fine pellet foods like Hikari micro pellets, while others will turn up their nose and starve rather than eat anything artificial. Some folks get them to eat frozen brine shrimp, but I've found they absolutely thrive on live foods like Grindal worms, newly hatched brine shrimp, microworms, Daphnia, young Gammarus and similar fare. I've even seen them go after blackworms! Certainly you will not get them to reproduce successfully without live foods.

Small *Neocaridina* shrimp make great tank mates, as do most of the popular fancy snails, though some snails are not above eating caviar, so use caution. Small Rasboras such as members of the genus Boraras or killies like the dwarf clown Killie (*Epiplatys annulatus*) or Norman's lamp eye (*Aplocheilichthys us normani*) make great companions as they spend most of their time in the upper part of the tank while the Dario spend their time in the lower third of the tank.

If you can get a group of a half dozen or more including both sexes, set them up in a heavily planted tank, and feed them lots of live food, after, you will see young fish, almost exact copies of their parents but not so bright in color nearly three-eighths of an inch long. Look around the tangled roots of *Anubias* and Java fern, in dark places near driftwood, under decaying oak leaves, or under Java moss to get your first glimpses of the youngsters.

They are egg scatterers and usually release the eggs in Java moss, though I have also seen them lay eggs in the roots of Water sprite (*Ceratopteris* species) in the past. There aren't a lot of young, so they will find plenty of micro food for their first few days amongst the plants. About the time you first see them they will be large enough to take newly hatched brine shrimp, microworms, young Grindal worms, etc. which they will continue to eat for the rest of their lives. As with most nano fish, growth is rapid and they will often be ready to spawn on their own when they are about 12 weeks old, though they won't reach full adult size for almost a year. This precocious spawning seems to be pretty common among nano fish from different families and is likely a response to being near the bottom of the food chain, where even juvenile fish of other species will consider them as a snack.

Spawning is a brief affair - this female has just deposited a batch of eggs on the underside of a leaf...
© Charles König

The spawning embrace of this species is typical of badids and similar to that in anabantoids.
© Charles König

The Scarlet Badis is a true living gem. Give them a decent sized, well planted tank of their own and you'll be treated to a long lived, interesting beauty.

Photographs from
www.SeriouslyFish.com and © as noted

Why Southeast Asia and Australia's Coral Reefs Became So Rich in Species.

Biodiversity is a long game.

A school of convict blennies over a reef near Ambon, Indonesia.Credit: Georgette Douwma/Science Source

These fish can be an inch to more than eight feet in length. They can be skinny like cigars or hefty like footballs. Some are somber-colored; others look like they're attending a rave. Different species have their own creative feeding strategies: humphead wrasses crush shellfish; tubelip wrasses slurp corals and cleaner wrasses act like carwashes, eating parasites and dead tissue off other sea creatures.

This spectacular diversity stems from wrasse ancestors that migrated from the prehistoric Tethys Sea to the area that now bridges the Pacific and Indian Oceans. There, in a vast and vibrant cradle of coral reefs, they settled and steadily diversified over tens of millions of years.

Their story fits into a larger pattern. This region, the Central Indo-Pacific, has become the hot spot with the most biodiversity in Earth's oceans because many ancestors of today's marine life colonized it so long ago, according to a recent paper in Proceedings of the Royal Society B.

The study emphasizes that biodiversity is a long game, and that the richness of species in the world's oceans will not be easily replaced if it is lost to human activities.

"It has taken tens of millions of years to build the biodiversity of coral reefs, but it may take us only decades to destroy it," said **Mary Wisz**, a professor at the World Maritime University in Sweden who was not involved in the study.

Explorers have long wondered why the Central Indo-Pacific holds such exceptional bounty, said **Elizabeth Miller**, a Ph.D. candidate studying ecology and evolutionary biology at the University of Arizona and the lead author of the paper.

Compare the experience of five minutes scuba diving in Indonesia or Australia with five minutes in the Caribbean, and the difference is obvious, she said. For every species of butterflyfish or parrotfish you spot in the Caribbean, you might see three or more species in Southeast Asia's Coral Triangle or Australia's Great Barrier Reef.

"People say the Caribbean is a garden, whereas the Central Indo-Pacific is a jungle," said **John Wiens**, a professor at the University of Arizona.

Using databases that aggregate research done by hundreds of scientists, Ms. Miller's team categorized more than 12,000 fish species as present or absent in eight marine regions around the world.

The researchers then traced living species back in time, using an evolutionary tree, statistics and computer simulations to infer where their ancestors originated and when their lineages might have moved to different places.

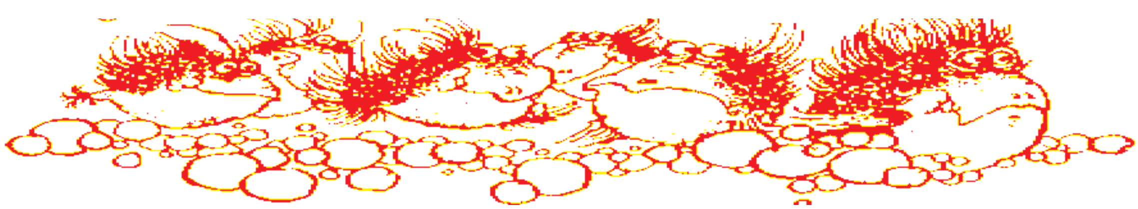
Overall, the scientists found, biodiversity in a region today is highly related to the age and number of colonizations it has experienced. The Central Indo-Pacific is so diverse largely because many old lineages have settled there.

This likely has to do with the dance of tectonic plates. Not long after the dinosaurs went extinct, the Tethys Sea, which once separated the ancient supercontinents of Laurasia and Gondwana, was the peak of biodiversity in the world's oceans. But slowly, the continents drifted.

Around 35 million years ago, as the Tethys was closing off, the Australian and Pacific plates were colliding with continental Southeast Asia, creating an expanse of shallow ocean ideal for coral reefs. As species migrated from the Tethys (now the East Atlantic) to this area, the hot spot of marine life shifted.

Since then, the Central Indo-Pacific may also have been less strongly influenced by major extinction events than other warm regions, Ms. Miller said."What a rich treasure it is to have this biodiversity," Dr. Wisz said. "If we are to safeguard it, we must take action, globally and quickly."

Today, more than 500 million people depend on coral reefs for food, income and coastal protection. But these ecosystems are in crisis.



Nicholas St. Fleur - Oct 25, 2018 *New York Times*

Nicholas St. Fleur is a science reporter for the *New York Times* who writes about archaeology, paleontology, space and other types of interesting research, regularly for the Trilobites column.

An artist's impression of *pituriaspids*, among early types of fish, which are first thought to have evolved around 480 million years ago. Credit: Nobumichi Tamura

Where Did Fish First Evolve? The Answer May Be Shallow.

Some had armor and spikes. Many lacked jaws. They evolved in the shallow coasts around supercontinents and they were some of our earliest ancestors with spines.

More than 400 million years ago, ancient oceans were teeming with many fish that might seem alien in today's seas.

Back then some wore plates of bony armor and lacked jaws, like the arandaspids, which looked like a clam with a tail. The *heterostracans* sometimes resembled underwater armadillos with spikes. There were also *galeaspids*, some of which sported swordlike helmets, and the *osteostracans*, which had horseshoe-shaped heads.

Not all jawless fish were heavily armored. The thelodonts, for example, had torpedo-shaped bodies and bony scales that looked like shark skin. Some anaspids had scales and a leaf-shaped body. And then came the first jawed fishes like armored placoderms, some of which used their tanklike exterior and razor-sharp teeth to dominate the water world.

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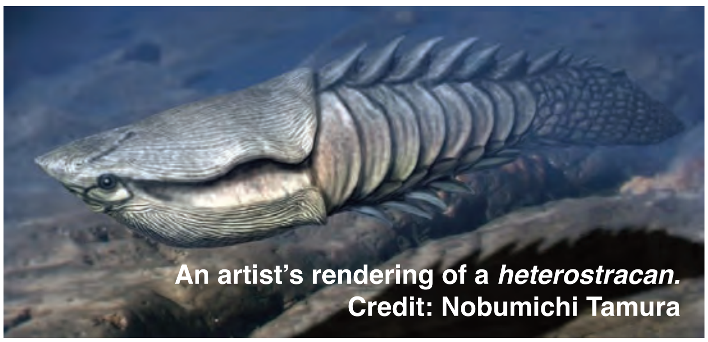
All of the groups kept originating in the shallow water over the whole 100-million-year period, which was completely unexpected," said **Lauren Sallan,** a paleontologist at the University of Pennsylvania and lead author of the study. "This


Placoderm. Credit: Nobumichi

is an unexpected diversity hot spot that persists for a long time."

The finding changes what scientists previously assumed about where the earliest fish evolved, said **Michael Coates,** a vertebrate paleontologist at the University of Chicago, who was not involved in the study.


An artist's rendering of a *heterostracan.* Credit: Nobumichi Tamura

"Previously we thought the early reef systems would be the cradle of diversification," said Dr. Coates. "But no, it seems that these early armored forms were in much nearer shore environments. That explains why our early record is so cryptic."

The team is not exactly sure why fish evolved near the coast in clear, shallow lagoons and intertidal zones that were typically no deeper than about 100 feet. They think it may have to do


Anaspid. Credit: Nobumichi Tamura

with the waves, sea level changes, runoffs, rainfalls and other environmental factors of shallow water habitats.

"We've come to the suspicion that there's something going on with water chemistry and potentially with oxygen levels in these active and dynamic environments," said **Ivan Sansom**, a paleobiologist from the University of Birmingham in England and an author of the paper.


Thelodont. Credit: Nobumichi Tamura

The team also found that as the fish evolved in the shallow water, the more flexible swimmers, like the thelodonts, eventually left and invaded deeper areas like coral reefs and the deep sea. There, they may have encountered mollusks, trilobites and fearsome sea scorpions.

Over time, many of the hunkering, armored fish evolved into bottom dwellers and might have stayed in the waters near shore and moved to freshwater rivers and lakes.

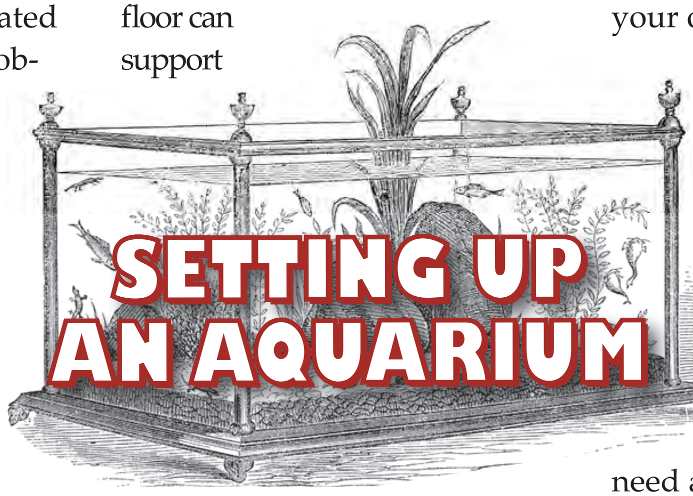
Today, evolution has left us with two main fish groups. Bony fish like salmon, marlin and some 28,000 other species make up the *osteichthyes.* And the *chondrichthyes* are cartilaginous fish like sharks, rays and skates.

But a couple of oddball jawless fish still lurk in the seas, like goopy hagfish and the bloodsucking lampreys. They may not be armored, but they're a reminder of the evolutionary footsteps and missteps that eventually led to all vertebrates, underwater and up here on dry land.


Galeaspid. Credit: Nobumichi Tamura

Steven Matassa – BAS

SETTING UP AN AQUARIUM



There are several factors to consider when setting up an aquarium. I have been keeping aquariums for almost 50 years, and have made my share of mistakes over the years. The trick is to have proper planning and consider where your aquarium will be located prior to its purchase so problems are prevented. This might seem like a minor thought, but it should not be taken lightly. I will try to shed some light on those ideas in this article.

When purchasing an aquarium, **the first thing** to consider is your budget. Most hobbyists do not have an unlimited budget. Aquariums can get expensive, so do your homework before time and shop around. The tank is usually just the tip of the iceberg. There are other necessities that must be considered such as the filter, gravel or sand, light, heater, canopy or hood, rocks, stand or cabinet, ornaments, and livestock; it can add up quickly. It can be as simple as a box filter or as complicated as a plumbed in wet-dry filtration system.

The second item to consider is the location of the tank, because you do not want to move a tank after it's initially installed. Keep in mind a few things such as try to stay out of direct sunlight, which will only increase algae growth, unless that's what you want. Also, understand even small tanks can be heavy. Tanks average about 10 pounds per gallon with all the equipment included, so make sure your floor can support the total weight of the aquarium and stand. This is why my tanks are all in my basement, on a concrete floor. If you are on a wood floor, it is a good idea to go perpendicular to the floor joist if you can tell which way they are running. Going with the floor joist, you probably only catch 1 or 2; going perpendicular, you should catch several more depending on the tank length.

A third thing that is most overlooked is leveling the tank. I can't stress enough how important this is. I have seen many tanks leak just because they were not leveled. Too much water puts uneven stress on the aquarium's seams, and almost guarantees a leak. Even the smallest tanks can deposit a lot of water on the floor when they leak, never mind the large aquariums.

The fourth thing to consider is electricity. Make sure your outlets can handle the amps/wattage you plug into it. If you are not sure, have an electrician check it out. No one wants a house to burn down because of a fish tank.

The fifth thing to think about is the temperature of the room. If it is not a heated room you will need a strong heater or several to heat the aquarium. I like to run 2 heaters in larger tanks, so if one does burn out the tank temperature will not drop to fast.

I hope this article will help you when setting up your tank. A great way to learn the right way to set up your tank is to join an aquarium club like the Brooklyn Aquarium Society. Hope to see you at the next meeting.

Steven

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Our local aquarium shops are important friends of the fishkeeping hobby. They're here to serve your immediate needs - medications, live foods, or a replacement part for a filter, and best of all, you can inspect the fish you want to buy in person, plus most shops will special order fish for you.

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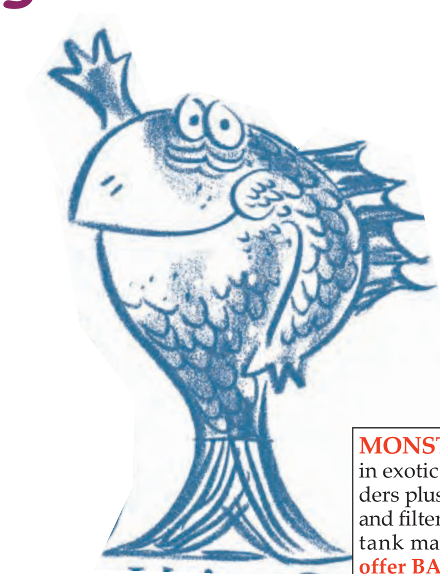

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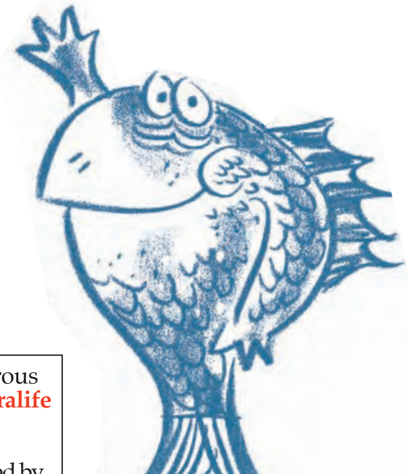

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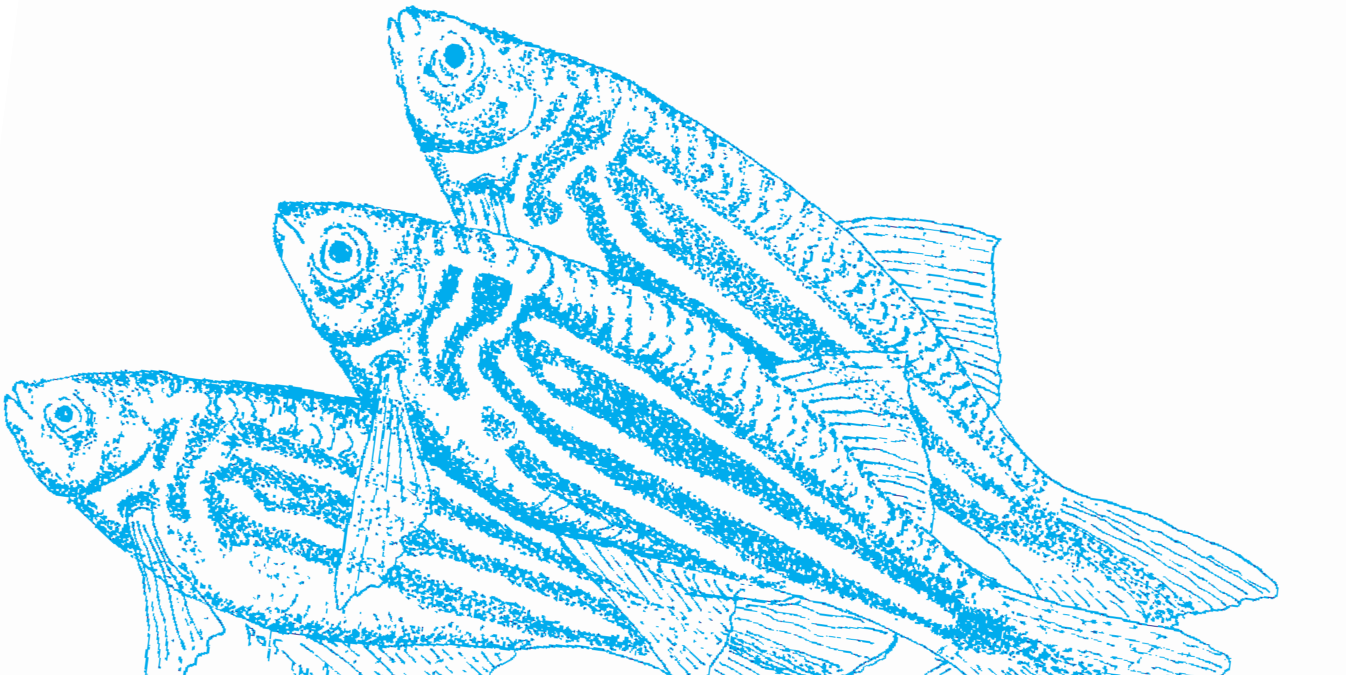

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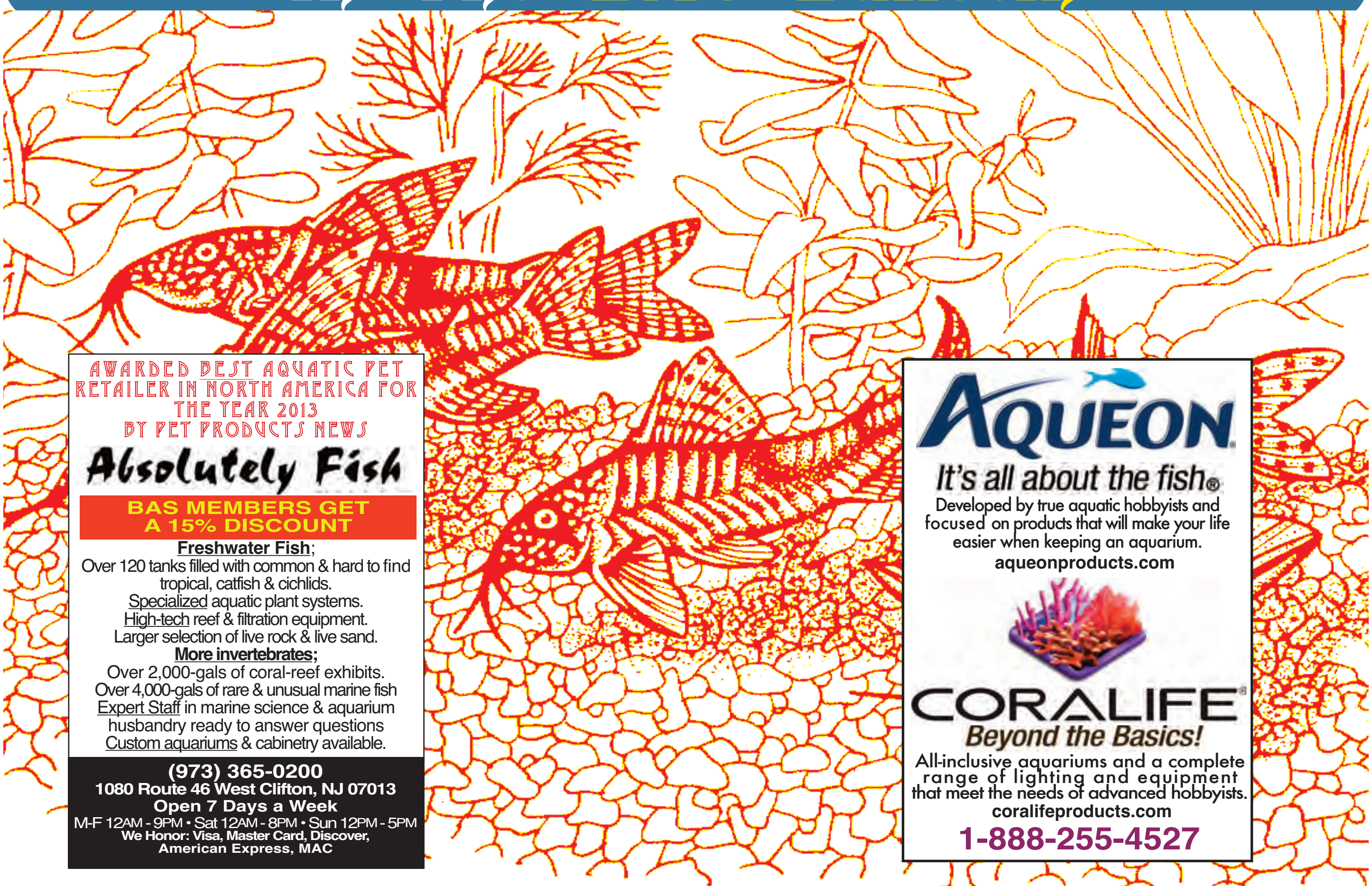

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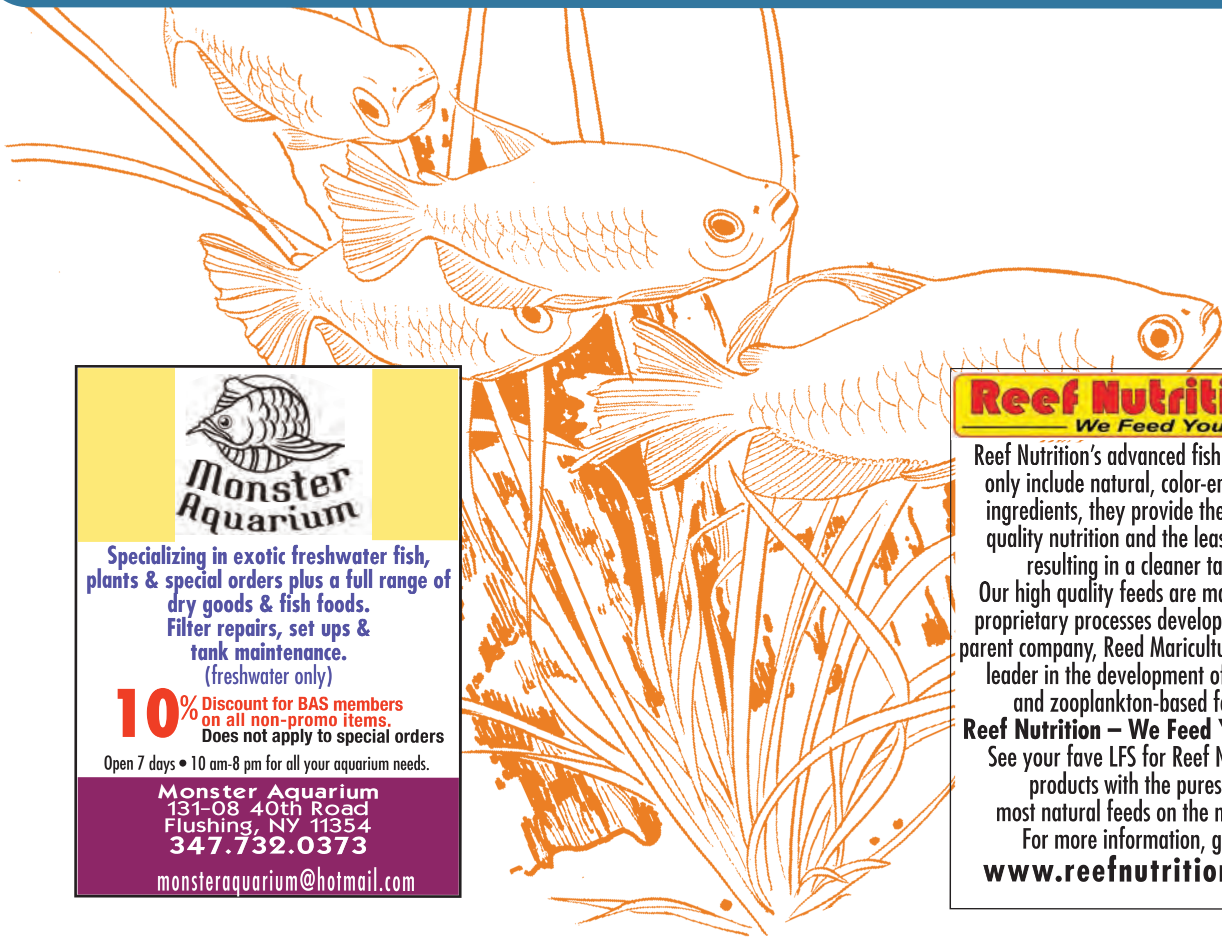

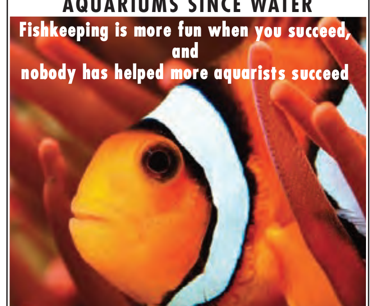

THE BENEFITS OF MEMBERSHIP OF THE BROOKLYN AQUARIUM SOCIETY

Your Membership Card is your Passport to Becoming an *"Educated Aquarist."* Don't lose it. Put it in your wallet or purse. You'll need it to attend Monthly Events and get discounts at participating pet stores.

YOUR MEMBERSHIP BENEFITS INCLUDE:

Free Admission to all general meetings, held on the 2nd Friday of the month (except July & August) at 7:30 pm at the Education Hall of the New York Aquarium, Coney Island, Surf Avenue at West 8th Street , Brooklyn , N.Y. The Society presents expert speakers on all aspects of the hobby, from freshwater fish to marine aquatic life.

Breeder Awards Program (BAP) – Certificates and trophies awarded.

General meetings are open to the public (a $5 donation is requested for non-members, good towards membership that evening). Free parking and free refreshments.

Special Interest Groups (SIGs) hold meetings, free at members' homes, for members only. Here's your chance to network with members with the same interests. Discuss, ask questions, learn, teach and develop your expertise in freshwater and/or marine aquarium keeping.

Aquatica, The Journal of the Brooklyn Aquarium Society, our bi-monthly (5 issues except July & August) award winning publication is on our web site. Each issue is filled with articles on both marine and freshwater aquaria keeping, Articles can be downloaded.

The ***BAS Bulletin.*** All members receive our monthly (10 issues except July & August) Newsletter, the *BAS Bulletin* via email, keeping members up to date on the latest events at the Society, notices of interest and monthly regional society events. All non-commercial members are entitled to a free classified want ad in each issue, to sell, give away or request fish or dry goods.

The **BAS is on-line at BASNY.org.**

You'll find up-to-date information about our monthly events, links to other aquarium societies in the US and stores, manufacturers and related aquarium sites. We have an on-line library with downloadable articles. We have our own BAS forum, where you can interact with other freshwater, marine or reef members and post free hobby-related classifieds where members sell and trade fish, corals, plants and equipment.

BAS Hotline: For the latest information, call the BAS 24 hour Hotline 718 837-4455 for event and inclement weather information. If you need advice on fish keeping, breeding or where you can find rare or hard to find fish, you can often get help calling the Hotline. Help from the Hotline is always free.

Volunteer: The Brooklyn Aquarium Society is an organization run by volunteers. Without them, there would be no BAS. Volunteers help set up events, write articles, coordinate projects, assist and work on committees, help at auctions and meetings. Join in, help, learn and have fun doing it. Call **Steven Matassa**, President (718) 238-1792.

Discounts for Members at many BAS participating pet stores when you present your current BAS membership card.

Welcome and we hope you take advantage of the many benefits BAS has to offer.

The Officers & Board of the Brooklyn Aquarium Society

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Meetings are held at the NY Aquarium Education Hall on the 2nd Friday of the month at 7:30pm. Knowledgeable speakers on fish care and culture, and fish auctions. Free parking and refreshments. All meetings are free to members. Visit us on line: WWW.BROOKLYNAQUARIUMSOCIETY.ORG

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INDIVIDUAL				**FAMILY**				[ ] **$15 STUDENT** 1YEAR (UNDER 18 YEARS)
1yr. $20	2yr. $36	3yr. $51	4yr. $68	1yr. $25	2yr. $45	3yr. $63	4yr. $85	

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1_________________ 2_________________ 3_________________

4_________________ 5_________________ 6_________________

Number of tanks [ ] marine [ ] freshwater [ ] Do you breed fish? [yes] [no]

If yes, what types do you breed:_______________________________

____

Special interest (if any)___________________________________

____

How did you hear about BAS [friend] [dealer] [flyer] [*Aquatica*] [mag ad] [online]
other__________________

To volunteer check [yes] [no] A board member will contact you if you check yes.

On occasion, the Brooklyn Aquarium Society uses its mailing list to send notices of interest to our members.
If you **DO NOT** wish to receive these mailings please check here [ ]

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