

# TROPICAL FISH

HOBBYIST

More Color Photos,  
More Information And  
More Readers Than  
All Other Aquarium  
Magazines Combined.

APRIL, 1966

DOMESTIC 35c

BRITISH ISLES 2.6





Dr. Herbert E. Axelrod, President  
William Vandenwinkel, Publisher  
Mike Reed, Editor  
Dr. Leonard F. Schultz, Advisory Editor  
Dr. Aaron Axelrod, Business Manager  
Ronald Crenshaw, Art Director  
Tony Liguori, Art Assistant



Colorful Tetras, by Wilfred L. Whitern, 50c from your dealer or direct from TFH.

COLORFUL TETRAS is a new TFH book devoted to giving hobbyists all the facts about those lively, flashing jewels of the aquarium, the Tetras. Necessarily broken into two volumes to allow the most comprehensive treatment possible, this Tetra information is given in two companion volumes, both by Wilfred L. Whitern. The two books are COLORFUL TETRAS and TINY TETRAS.

COLORFUL TETRAS covers the Characters of the genera *Hemigrammus*, *Moenkhausia*, *Aphyochorax*, *Phenacogrammus*, and others, with emphasis placed on the popular little *Hemigrammus* species. Everything that the hobbyist needs to know is covered, from aquarium arrangements and water conditions to foods and feeding and prevention and treatment of disease.

For each species customarily bred, author Whitern has listed all requirements for a successful spawning. Each species is treated both in general, in the section devoted to over-all recommendations for spawning the Tetras, and in particular, in the section which deals with the specific fishes.

Breeders, experienced or beginning, will find plenty of good, practical advice. For many, special benefit will be derived from the listings of the average amount of spawn received at each spawning.

**Contents**

Vol. XIV, April, 1966 (#122) No. 1

Spawning *Phractura ansorgei* ..... 1

The Indiana State Prison Story ..... 19

A New Cyprinid for Billie Jane ..... 27

*Austrofundulus maculatus lineatus* ..... 27

Malaise Species of *Apistogramma* ..... 33

More About the Rainbow Arowana, *Osteoglossum bicirrhosum* ..... 38

How to Become an Ichthyologist Part I ..... 47

Harold Schultz, the Man ..... 73

FEATURES

Shell Cells, p. 27; Guppy Curves, p. 48; Softy From The Sever, p. 71.

COVER

The attractive painting of angelfish that is featured on this month's cover has an interesting story behind it. It was painted by an inmate of Indiana State Prison and presented to the publisher of TFH, Dr. Herbert E. Axelrod. The occasion of the presentation was a recent visit to the prison by Dr. Axelrod for the purpose of searching for the inmates about tropical fishes. You might be surprised to learn that tropical fish have been kept by inmates of this particular prison for many years. Dr. Axelrod was so pleased with the painting that he got the artist's permission to use it as the cover picture. He has since it, and he was so interested in what he found at the prison that he has written about it in the story beginning on page 79. Painted by Paul Owens.

EXOTIC TROPICAL FISHES SUPPLEMENTS

Pages 50 to 56, 52 to 54. These pages are perforated for easy removal and punched to fit into the Looselot Edition of EXOTIC TROPICAL FISHES.

RATES: 25c per copy in the U. S., 35c per copy in Canada or foreign; \$3.50 for 12 issue subscription in U. S.; Add 60c per year for foreign subscriptions. All back issues available at 25c per copy; index available in every 12th issue.

In Canada: Tropical Fish Hobbyist magazine and books are sold exclusively through Canadian Aquarist Supply Co., 1125 Falbot Street, St. Thomas, Ontario. All subscriptions and inquiries from Canadians should be directed to them.

In England and the western Sterling area: Tropical Fish Hobbyist magazine and T.F.H. Books are distributed exclusively through T.F.H. Publications (London) Ltd., 13 Haverhill Lane, Bagnat, Surrey, England. All subscriptions and inquiries should be sent directly to them.

© 1966 T.F.H. Publications, Inc.  
Second Class Postage Paid at Jersey City, New Jersey. Published monthly by T.F.H. Publications, Inc., at 245 Connecticut Avenue, Jersey City, N. J. 07307. Printed in U.S.A.

**EDITORIALLY . . .**

My February editorial seems to have stirred up a bit of disagreement. A reader in Canada tells me that a betta fight neither results in a high mortality rate nor is it overly cruel, and quotes Dr. Myron Gordon as saying so in his "Siamese Fighting Fish" as well as Dr. Hugh Smith in his "The Fresh-Water Fishes of Siam." He quotes them as saying that the fishes' physical discomfort is apparently so negligible and their recovery so complete, that there is little reason to have sympathy for them, and their graceful movements, muscular agility, acumen, tenacity, and wonderful color displays during battle cannot fail to arouse enthusiasm even in the most sensitive spectators. One question seems to be, how much does it hurt a fish if you tear off part of a fin, or get hold of his gills and tear out a piece? The mortality rate among the losers in betta fights is directly dependent on how long the fight is allowed to continue.

Personally, the whole thing reminds me of two gladiators in an ancient Roman arena hacking away at each other until one or the other succumbs from the loss of blood. The human race has come a long way since those days, but we still stage boxing matches, with padded gloves replacing the swords of those days. Bullfights still draw crowds in many countries, and they are a fairly bloody proposition. Maybe my sympathies are with the bull, who is doomed before he enters the ring, and maybe I'm just a bit too squeamish, but I just wouldn't think of putting two male bettas together to tear away at each other, even if they wouldn't actually kill each other!

*William Vandenwinkel*

**A first attempt.**

**Spawning *Phractura ansorgei***

BY DR. WALTER FOERSCH  
Munich, Germany

One day several years ago, I stood in the Munich-Riem Airport and waited for an SAS plane to come in from Copenhagen. It was bringing, among other fishes, three *Phractura ansorgei*. J. Scheel, of Virum, Denmark, had told me that these African catfishes outwardly resembled the *Loricaria* species from South America, and that he would send me some to study. The Danish zoologist Stenholt Clausen had collected these particular specimens in Nigeria at Yemaji, in the vicinity of Ijebu Ode (about 50 miles south of Ibadan) and had sent them to Copenhagen.

Scheel informed me that *Phractura ansorgei* was a member of a family endemic to Africa, Amphiliidae (sub-order of Siluroidea), of which eight genera and 45 species have been described, most of which come from the Congo Basin. These consist mostly of small bottom-dwelling fish which are found primarily in mountain brooks. Only a few species are found in the flatlands. Largest member of the entire family is *Phractura scaphirhynchura*, which attains a length of 7 inches. According to Boulenger, all *Phractura* species have an elongated body with an extremely long caudal base and a

When the author received his *Phractura ansorgei*, they all looked like males. Photo by Dr. Walter Foersch.



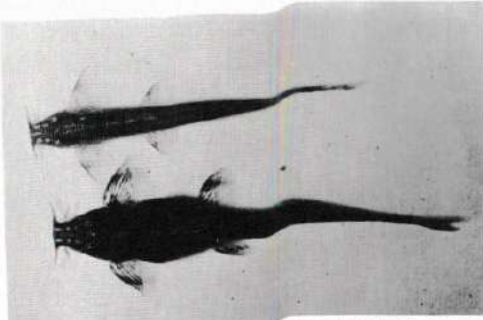
When the fish were fed vegetable fare in addition to their regular menu, two of them began to take on a plump appearance like this one. Photo by Dr. Walter Foersch.

small mouth with thick lips and three pairs of barbels, of which one pair originates in the upper jaw, two pairs in the lower jaw.

Even if my *Phractura ansorgei* are reminiscent of the *Loricaria* species from South America, close examination shows a distinct difference. The caudal fin of *Phractura* has rounded lobes and does not show the elongated ray that that of the *Loricaria* species do. The eyes of *Phractura ansorgei* and their pupils are small and much like those of the *Loricaria* species. They do not have the changeable layers of skin over the iris which by their stretching and contraction regulate the amount of light allowed to pass into the eye. The *Phractura* also have no sucking mouth; larger barbels; and, when seen from above, a differently shaped head. In contrast to the South American armored *Loricarias*, they are smooth to the touch, because their bodies are not covered with armored plates. Finally, *Phractura* does not have the spines on its head and pectoral fins which are so very evident on the males of the South American armored catfishes.

There existed no report of any importation of any *Phractura* species, nor of their being kept in the aquarium. Scheel told me that the waters from which they came had a hardness of less than 1 DH and a pH value of 6.2 to 6.3. From his findings, these catfish like a hard bottom and during the day hide among dense plants. After transferring them from one aquarium to another it can take weeks and even months until they lose their timidity and come out after food in the light. He said further that they are fond of daphnia and





A well conditioned pair of adult *Phractura ansorgii* are easy to sex. The slimmer, smaller fish is the male (above). Photo by Dr. Walter Foersch.

mosquito larvae, which they feed out with their barbels. As soon as one is touched by a barbel, a quick sideward movement of the head captures it. When fed live daphnia they like to stand on their tail bases, propped against the front glass, and hop sideways, catching the daphnia from this position. If the water gets cloudy the fish become pale, their bodies swell, and they refuse to accept food.

A. Werner, of Munich, told me later that in 1954, in the Stanley Pool (a 10-mile widening of the Congo River near Leopoldville), he had caught *Phractura ansorgii*. He went out a few hundred yards from the bank to a spot where a sandbank had formed. There the *Phractura* congregated among the fine roots of *Eichhornia crassipes* which floated in the shallow water. Werner had to push his net under the roots about ten times before he caught the first fish. The water was about 12 to 16 inches deep, and the water temperature during April and May was a constant 82°F, with very little current. One hundred and fifty fish were captured, but only a small number reached Munich alive. The fish were sold quickly; nothing was ever mentioned of what happened to them afterwards.

Meantime K. Kluge, Hamburg, had caught *Phractura ansorgii* repeatedly and advertised them for sale. Kluge was nice enough to make available to me more exact information about the home waters of these fish. He caught *P. ansorgii* in Nigeria, in small, fast-flowing brooks with clear water, near the coast around Lagos and Port Harcourt. He could find them only in sunny,



This is a Loricaria species. The similarity between it and *Phractura ansorgii* is obvious. Photo by Harold Schultz.

shallow places where the water was 1 to 2 feet deep with a sandy bottom. He could never locate them in the dark jungle creeks. They hung mostly in the fern growths which grew into the water. The greatest number of *Phractura* were always found where hides or meat were washed in the brooks. These places always harbored numbers of red gnat larvae. Kluge writes: "The more gnat larvae, the more fish," and assumed that the increased occurrence of *Phractura* was a result of the increased amount of food. Their breeding period occurs in the time between rains from August to September. At these times the females are full of roe. As the fish are not to be found in these rainy periods in the places described, opines Kluge, they spawn elsewhere. During the rainy season, the water becomes roiled and deeper. Youngsters can be caught in October.

In 1959 Clausen sent nine *P. ansorgii* from Nigeria to Denmark. Three were still alive after 15 months. They were 1½ to 2¼ inches long and showed no outward signs of sex when I received them in June, 1960. Three larger and more fully developed specimens, which were probably females, had died. My three fish were all slender and looked like males. Their color was a medium brown with a pattern of darker markings on the body and fins. The underside was light gray to light brown with tiny black dots and a silvery glow on the belly. I put them in an 8-gallon aquarium containing Munich tap-water with a total hardness of 15-16 DH and a carbonate hardness of 13°, not hoping to spawn them, and kept the temperature from 72 to 74°F. They were fond of hiding in the plants and all three were often together, propped on their long tail bases, in the dark corner of their aquarium. Soon they were hunting food in the daytime. When the light poured in suddenly because I had pulled up

IF YOU WANT TO BE HAPPY FOR A DAY, KEEP PETS ...



IF YOU WANT TO BE HAPPY FOR A YEAR, KEEP TROPICAL FISH ...



IF YOU WANT TO BE HAPPY FOR A LIFETIME, KEEP TROPICAL FISH IN A BADER AQUARIUM ...



ON A DANSKE STAND ...

BADER INDUSTRIES, INC., PINE BROOK, N. J.

the shade in the morning they would be so disturbed that they dashed back and forth for several minutes until they came to rest on the bottom in a corner among the plants.

From my experiences with Loricarias, I knew that as bottom-grubbing fish with underslung mouths they fed mostly on detritus from the bottom, which consists largely of decayed vegetation and partly of animal wastes which are rich in algae and bacteria. Because such nourishment is usually not present in sufficient quantity in the average aquarium, my Loricarias were fed a supplement of scalded spinach or lettuce leaves in order not only to keep them in good health but also to ripen them for spawning. I did not know if *Phractura*, who relished daphnia, cyclops, grindal worms, and tubifex worms, also required this detritus. I played safe by feeding them small amounts of scalded spinach which had lain in water for several days.

All three fish put on some growth. Two attained a length of 2½ inches; their brown color became darker; and in the rear of the body there were two well-defined dark brown vertical bars that were about ½ inch wide. (These bars also occur with the Loricaria species, but are narrower and more frequent.) When, in the middle of October, the bellies of both of these fish became swollen and shimmered a blue-green, there was no more doubt that these were two ripe females! The added growth of all three *Phractura* at this age, and particularly their ripeness, I attribute solely to their added vegetable fare, which seems to be close to what they get in their home waters. The third fish remained smaller and thin, grew to only 2 inches, and took on a light, brownish-red coloration. Its head shape, in contrast to the other two, observed from the side, seemed to have become more blunt. During the middle of November this smaller one would become very restless in the evenings,

These are some newly hatched *Phractura ansorgii* fry. Photo by Dr. Walter Foersch.





ALWAYS DEMAND THE BEST!  
for cleaner, healthier aquariums

Insert an  
**"E-2"**  
The Perfect Control  
**AQUARIUM  
CLEANER**

ONE HAND OPERATION

- Churning action separates and removes dirt deeply imbedded in gravel.
- Dull, white, clean dirt from top of gravel.
- Cleans aquariums without disturbing gravel, plants or ornaments.
- Durable, quality construction.
- No mechanical breakdown.
- "E-2" is operable.
- Made in U.S.A.

CHURNING ACTION SEPARATES DIRT FROM GRAVEL

WATER AND DIRT PASS INTO FILTER BAG

PRESSURE RELEASE VALVE

EQUIPPED WITH PORTABLE "E" EXTENSION TUBE

Early Snaps on for larger tanks

CLEAR WATER RETURNS TO AQUARIUM

Panel Pooling

Manufactured by  
**"E-2" AQUARIUM PRODUCTS CORP.**  
21 First Avenue, New York, N.Y.

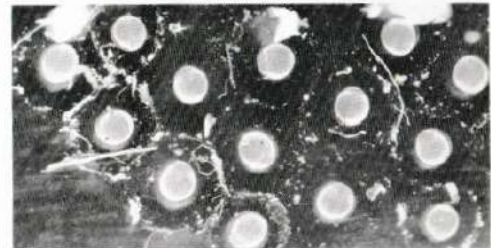
Please Mention T.F.H. When Writing to Advertisers

10

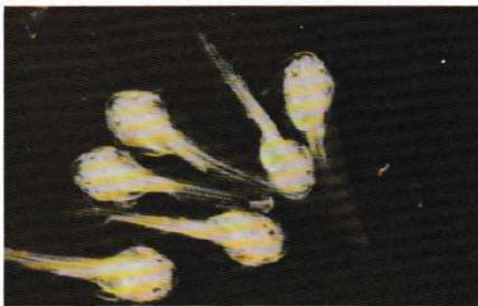
swimming back and forth and emitting weak chirping sounds which lasted about 1½ seconds and could be heard from up to a yard away. As this was repeated at the same time every day, and the chirps became more frequent when the females were approached, it became clear to me that this third fish was a mature male.

One evening, much to my surprise, I observed a spawning. The male swam back and forth very rapidly in the aquarium, and as his excitement mounted his chirps became more and more frequent when he came close to the females. The driving of the male caused the females to swim about, but they did this only for short distances and then settled to the bottom or in the plants. The male repeatedly swam to the females and touched them with his mouth on the back, sides, and head. He tried, swimming freely in the water, to place himself alongside a female or to swim from her side over her head. During actual spawning, which takes place in the open water, the male spreads his anal fin, bends his body in a U-shape about the female's head, and holds this position for several seconds. The female pushes ahead when the male bends his body about her head, her body remaining straight, and her mouth placed on the anal fin. The female, in harmony with the male, moves her body only very slightly back and forth, and while both fish sink slowly (sometimes as far as the bottom; after all, they have no swim-bladders), some bluish-green eggs are released and fall to the bottom. Perhaps a slight pressure by the female against the belly region of the male causes him to release his sperm. How and if the fish actually held onto each other I could not see clearly by the dim light. (They do not have sucking mouths!) The driving and "grasping" of the female takes place very rapidly. After every attempted and actual spawning, the male quickly swam to the farthest corner

These *Phractura ansorgei* eggs are 18 hours old; Sperm discs are easy to see. Photo by Dr. Walter Foerisch.



11



The yolk-sacs on *Phractura ansorgei* fry are almost completely absorbed 6 days after hatching. Photo by Dr. Walter Foerisch.

of the aquarium, and it was not for several moments that he began to swim back and forth in the entire aquarium again and searched for the female once more.

I made comparisons with the spawning habits of the South American *Corydoras* and *Loricaria* species. The *Corydoras* also spawns in the open water. The female, while driving, rams into the belly region of the male. The male presses the female's barbels against his belly with one of his pectoral fins and in this way holds the female to him. The *Loricaria* species rest alongside of each other while spawning atop a solid base. The female when spawning pushes her head against one of the ventral fins and sucks tightly against it. Doubtless, the spawning of *Phractura ansorgei*, with the female butting her head against the male's belly region, and the behavior of both fish during the spawning act is reminiscent of the spawning procedure of both *Corydoras* and *Loricaria* species. Africa and South America were joined together in prehistoric times by the so-called Gondwanaland, but during the Cretaceous Period (between 80 and 100 million years ago) the continents were definitely parted<sup>1</sup>. If the similarity between *Phractura* on the one side and *Corydoras*

<sup>1</sup>Translator's note: Dr. Foerisch kicks a large and very active hornet's nest here. Many geologists and paleontologists vigorously deny that the continents were ever so connected in prehistoric times, while many others just as staunchly uphold the existence of a connection, Gondwanaland. This magazine takes no sides and leaves it up to the readers to form their own opinions.

W.V.

12

and *Loricaria* on the other goes back to a common ancestry (a so-called homologous behavior), or if these fish species from different parts of the world arrived at similar patterns "by themselves" (a so-called convergent behavior), is hard to say. Probably it would be necessary to know still more about these particular fishes and others of both continents before the question could be answered. But as interested aquarium hobbyists we do well to recognize and give such problems a little thought!

The second female became very heavy, but did not spawn even after the first one was removed and she was chased by the male for more than an hour. The heavy female never moved her body when the male swam over her head. She finally released her eggs later, unfertilized, all 365 at once.

The first hatching of the first female's eggs took place on the 16th of November, 1960. Another hatching followed on the 24th of November, and on the 6th and 10th of December. Then I took the female out of the tank and did not put her back in until the 15th of January, 1961. The male began to drive on the afternoon of the same day, after the sun's rays had lost much of their intensity. But there was no spawning until that evening between 9 and 10 p.m. There were subsequent spawnings until the beginning of April, which I was too busy to pay much attention to.

From the January 15th spawning I removed about 100 eggs. They were bluish-green, about 1 mm in diameter and covered with a jelly-like substance. I put them in shallow dishes, in order to facilitate observation. At temperatures between 72 and 74 F. the larvae, about 4 mm in length, hatched after 2½ to 3 days. The green yolk-sac of the light gray larvae was still very big.

This *P. ansorgei* youngster is about 7 mm in length and is light brown in color. Photo by Dr. Walter Foerisch.



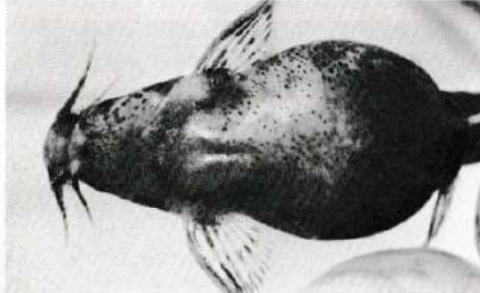
13



Not until 3½ days later, when the yolk-sacs had become somewhat smaller, could the pigmentation of the eyes be seen. Six days after hatching the yolk-sac was almost completely absorbed. The youngsters were still light green and transparent, but I could distinguish the eyes and long barbels. Now the real work was to begin; raising them.

The fry stayed mostly on the bottom. Only a few stayed just under the surface or hung on the glass sides. Like their parents, they were very sensitive to light, and if the lighting was made brighter or changed suddenly, even if it was only a slight change, they swam about restlessly for quite some time. They must be offered hiding places, or all this swimming causes them to become weak. Young *Loricaria* and *Ancistrus* species search for living and dead food by swimming back and forth on the bottom. The young *Phractus*, on the other hand, could never be observed eating, even with only a weak light. Seemingly they feed only at night. The first attempts at feeding them with living microworms were failures, because they were taken only in small quantity, and some of the youngsters strangled on them when the microworms came partially out of their gills and became entangled there. I then offered the young *Phractus* sediment from the aquarium, algae scraped from the sides, microworms which had been killed with hot water, cyclops nauplii, small cyclops, and brine shrimp nauplii. I have no idea as to how much of this was eaten. A few days after the first feedings I could see that at least some of the nourishment was being taken by the youngsters' filled intestines. When the fry had attained a size of 7 mm, the body had taken on a light brown

Sometimes a female *P. ansorgii* will swell with eggs until it seems she will surely burst. Photo by Dr. Walter Foersch.



This *P. ansorgii* youngster is under ½ inch long. Note the relatively well-developed finnage. Photo by Dr. Walter Foersch.

color. At 11 mm the formation of the unpaired fins from the embryonic fin tissue was already well advanced. At 15 mm the fins had become fairly well developed and the coloration of the mature fish had been reached.

Unfortunately, just in these months, I had no time for further raising experiments. These experiments are very difficult in shallow dishes, because even a slight fouling of the water can lead to egg-shell damage and premature hatching. Even among healthy fry the slightest clouding of the water can be the cause of great losses. Therefore, it is easier to raise them in small tanks without gravel bottoms, using filtration. Some fry suffered from dropsy, with a collapsed yolk-sac and the skin on the head lifted away. These sick larvae usually lasted a week, then died.

The second breeding resulted in only one youngster, which grew to a size of slightly over ¼ inch and then died suddenly. Five healthy youngsters resulted from the third breeding. They were left with their parents until June and died at that time as the result of a partial change with tapwater from pipes that were newly installed. Only one female remained, which became heavy with eggs in late autumn.

I recommend this fish to hobbyists not only because I was taught many new things by keeping them, but also because I am hoping that further observations will bring forth still more information. To close, I might say that keeping and breeding this fish in any medium-hard tapwater would be possible, and that they could be fed in the manner described, using vegetable fare as an additive.

NEW  
THE THINKING MAN'S FILTER...THE MIRACLE HIPOWER FILTER\*



- 1 The new Miracle HiPower Undergravel Filter is about 1" lower in the back than the older model and has optional knockouts for stems to fit on either side.
- 2 Just apply pressure firmly with your thumb and the disc easily breaks off to accommodate a Miracle HiPower stem assembly.
- 3 Don't break both discs unless you want to use both stem assemblies in one filter, as this kit contains only two filter stems, one for each filter.



- 4 Snap the filter stem into place; the wider nipple fits into the wider slot. In all cases the narrow air tube goes to the rear as shown.



- 5 This is the new Miracle HiPower Undergravel Filter set up and ready to be placed in your aquarium, where it never need be serviced again.



- 6 For ultra-high power filtration where your fishes are overcrowded, you can use two filter stems in one filter. (Perhaps stock and sell extra stems.)



- 7 The normal approach is a filter stem in each filter as opposite corners to the stems "hide" in the corners of the aquarium.



- 8 Look for the Miracle HiPower Undergravel Filter in the red and black box at your petshop. It is the most powerful undergravel filter in the world!

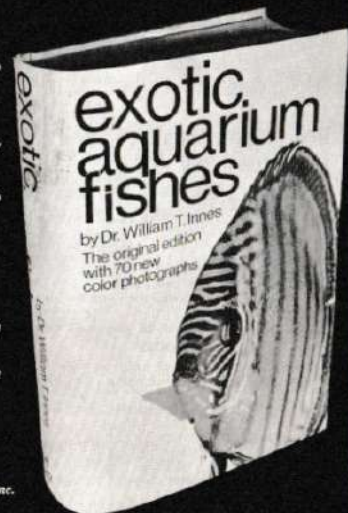
\*Patent Pending in the USA, Canada, England, Germany, Hong Kong and Japan.  
MIRACLE PLASTICS CORP. CHANGE BRIDGE RD., PINE BROOK, N. J.

The newest edition of the classical masterpiece  
Innes' EXOTIC AQUARIUM FISHES  
With 70 new color photographs

This is the latest edition of the famous Innes book first published in 1932. Brought up to date by the addition of color photographs of 70 new aquarium fishes, this edition contains color photos of Lobby Bettas, Lyretail Mollies, Leopard Danios, Topail Platies, Poecetropheus, Blue Discus, and other exotic species not contained in any previous edition of this famous work; with a new foreword by the author.

\$5.95 THE LOWEST PRICE EVER

Published by T.F.H. Publications, Inc. 245 Cornelian Ave. Jersey City, N. J.



Newest edition \$5.95



**HEADQUARTERS for WATER GARDENING**  
A New Adventure in Horticulture

**NEW GARDEN POOL**  
48"x38"x12"

*The Aqualite*



- A beautiful summer home for tropical fish
- Wonderful for breeding fish
- Dealers and distributors: a new field for summer sales
- Actual photo at left of the new Aqualite pool holding 50 gal. of water above ground without support.
- Free brochure on request
- ONLY \$17.95 SHIPPING PREPAID

**NEW COMBINATION FILTER AND PUMP KEEPS GARDEN POOLS CLEAN AND FRESH!**

AND RUNS YOUR  
FOUNTAIN OR  
WATERFALL AT  
THE SAME TIME!

ONLY \$34.50  
POSTPAID  
**Supreme**  
**POOLMASTER**



**SPECIAL PACKAGE DEAL** — Good until June 1, 1965. 1 Aqualite Pool, \$17.95; 1 Poolmaster, \$34.50; 1 Aqualite pool plant collection, \$10.00; Total \$62.45 — ALL FOR \$53.95 PREPAID

Receive The **NEW BOOK (A Complete Guide)**  
"GARDEN POOLS"

64 pages, Many in Color, plus our new Water Lily Catalog. Both for only

Postpaid \$1.50

**AQUARIUM PLANT COLLECTION (A)**  
(10 varieties - Enough for 15-gal. tank). Including New Ruby Plant Free. \$5.00 Postpaid.

**AQUARIUM PLANT COLLECTION (B)**  
(20 varieties - Enough for most large aquaria). Including Rare Varieties. \$10.00 Postpaid.

**Paradise GARDENS**

14 MAY ST., WHITMAN, MASS.  
Phone: 447-4711



Inmates of the Indiana State Prison are permitted to keep aquaria in their cells. This is inmate Loman with his set-up.

**The Indiana State Prison Story**

BY DR. HERBERT R. AXELROD

I've given talks in all corners of the world and before all sorts of people, but this one topped them all! To be called in to speak before a group in the Indiana State Prison left me with a feeling of uneasiness, not from a fear of being held there against my will, but due to a belief that my subject would fall on uninterested ears.

As it turned out, tropical fish keeping is nothing new to Indiana State Prison. I was told that for 30 years there had been an undercover fish trade going on, mostly in guppies. The men had to keep them where the guards

were least likely to find them, usually in little tin cans tucked away in a warm spot. If a guard found one, it was dumped into the toilet and the fish flushed away.

In spite of all this the trade persisted under the greatest difficulties, until the authorities decided that letting a prisoner keep a few fish was not such a bad thing after all, and might even be good. Led by Sgt. E. R. Koziatek, the men were encouraged to keep fish tanks in their cells, and many guppies could "come out of hiding," much to the delight of their owners.

The "Fin and Gill Aquarium Club" was formed among the inmates and Warden Ward Lane found that he had less trouble with the prisoners who kept fish! This was the group to whom I talked and showed my slides. And they loved every minute of it!

I've been wondering since how much a man could benefit by having little to do with his time but watch a tankful of fish. Certainly he could study more closely the individual quirks of each species and not just their

Sgt. E. R. Koziatek and inmate May discuss the typical tank set-up in the cell-house.



Please Mention T. F. H. When Writing to Advertisers

*Just Out!* **TWO GREAT NEW AQUARIUM PRODUCTS BY SUPREME...**

Revolutionary in Design—Outstanding in Quality!

**1 NEW SUPREME VALVE**

**WILL NOT LEAK!  
COSTS NO MORE THAN  
CHEAPLY MADE VALVES!**

**Don't Accept Substitutes!**  
Look for the name Supreme on the mounting bracket.

Maintains outlet to give constant flow of air. Air flow is easily regulated.



Special neoprene packing will not shrink or rot — therefore will not leak! Packing never needs adjustment.

All brass — American made to highest quality standards.

Available in 2 way, 3 way, 1200 valves and combinations of 2, 3, 4, 5 & 6.

Equip. by Mechanical Patent Applied For.

**2 New! Exclusive! SUPREME SWITCHMASTER**

**COMBINES MULTIPLE ELECTRICAL OUTLETS RIGHT ON THE TANK!**

No more shoving to insert plugs. Switchmaster hangs right on side of tank. Flat design allows placement anywhere. Has 8 electrical outlets.



Two outlets are automatically switched.

Highest quality, unbreakable plastic cover.



**Eugene G. Danner Mfg. Inc.**  
1660 Summerfield Street, Brooklyn 27, N. Y.





Dr. Axelrod and inmate Wislandt observing Wislandt's two 20-gallon and two 10-gallon tanks.

Sponsor Koziatek and inmate Reese present the painting that appears on this month's cover to Dr. Axelrod in behalf of the prison's Fin and Gill Aquarium Club.



breeding habits. Many works devote a great deal of space to fishes' breeding habits but neglect to mention such things as their everyday behavior when feeding, schooling, getting along with each other, and many other things. A man can also do a good deal of research on the various fish species if he has access to literature on the subject. Look at what Stroud did in Alcatraz! His findings on bird diseases gave him material for a book which is deservedly reputed to be a masterpiece on the subject. And what a long way this would go toward rehabilitation! This is not to say that every criminal is a latent scientist, but certainly our penal system is far from perfect, and enforced idleness is a very deadly thing. A penal institution is supposed to correct a man and put him on the right path, and boredom is not the way to do it. Giving a man a tankful of tropical fish to care for is not the perfect answer either, but it's an *improvement!*

The beautiful cover on this month's issue was painted by Paul Owens, one of the inmates, who was very happy to present it to me. Gulf Fish Farms, Inc. is sending a fish shipment to the prison, to be distributed by Sgt. Koziatek. And as long as the next invitation to go there is a *social* one, I'll gladly go again when asked.

Please Mention T.F.H. When Writing to Advertisers

# WAWIL

is the world's oldest dry food for aquarium fish (including salt water fish). And, in the highly competitive fish food market, this means something. Only a food that does its job gets a chance to stay around. The foods whose performances don't live up to their claims go where they deserve to go . . . off the market.

WAWIL'S year in year out dependability since 1908 in creating actively healthy, fast-growing, colorful, productive fish means something, too. It means that you can rely on WAWIL to do a good job for you. Remember: WAWIL IS THE OLDEST only because it's the BEST.



**RICHARD HANAU** GPO Box 514 New York, N. Y. 10001

## CONFUSED

BY CONFLICTING FILTER CLAIMS?  
READ THIS BEFORE BUYING ANY FILTER!

### 4 well-known outside filters VS SCATTERGOOD FILTERKING DELUXE

	G.	H.	L.	W.	FILTERKING
PATENTED Air Lift	NO	NO	NO	NO	YES
SELF-ADJUSTING Siphon	NO	NO	NO	NO	YES
RUBBER BULB instant-starting siphon	NO	NO	NO	NO	YES
FULL SIZE all-molded tank	NO	NO	NO	NO	YES
SELF-CLEANING by backwashing	NO	NO	NO	NO	YES
Full range of INTERCHANGEABLE stems	NO	NO	NO	NO	YES

OUTPERFORMS ALL OTHER OUTSIDE FILTERS! YEARS-AHEAD DESIGN IS FIRST CHOICE OF UNIVERSITIES, LABORATORIES, EXPERIENCED DEALERS — YOU, TOO! WHEN YOU WANT A REAL FILTER, ASK FOR A SCATTERGOOD, THE WORLD'S FINEST!

### 4 well-known undergravel filters VS SCATTERGOOD FILTERKING DELUXE

	E.	H.	M.	W.	FILTERKING
STUNTS PLANT GROWTH	YES	YES	YES	YES	NO
ACIDIFIES WATER	YES	YES	YES	YES	NO
WATER DISCOLORS	YES	YES	YES	YES	NO

OUTPERFORMS ALL UNDERGRAVEL FILTERS! A SCATTERGOOD operates as a WATER CONDITIONING plant, circulating water through a deep bed of activated carbon — the same principle used to provide high quality drinking water. When cleaning is required, ONLY THE FILTER TANK is removed and carbon backwashed, thus PERMANENTLY DISPOSING of accumulated dirt.

Contrast with undergravel filters, which operate on a SEWAGE DISPOSAL principle — NO DIRT is removed, but instead is concentrated in the gravel. Periodically, regardless of claims to the contrary, THE ENTIRE PLANTED AQUARIUM MUST BE DISMANTLED and the gravel cleaned.

SCACO ACTIVATED CARBON The wonderworking carbon that SCATTERGOOD filters are designed to use. Gives water so clear that the fish seem suspended in space! Enormously more effective than bone charcoal, as proved by laboratory tests.

NO OTHER FILTER OF ANY TYPE IS "JUST AS GOOD" AS A SCATTERGOOD DESIGNED AND MANUFACTURED ONLY BY SCATTERGOOD FILTERS CO.

• See our complete line at quality dealers everywhere

If there is no Scattergood dealer near you, write for free catalog and booklet "Getting the Most Out of Your Filter"



## Scattergood Filters Co.

MILLER 7, MISSOURI



A male *Austrofundulus transilis limmaeus*. Note the pointed tips on his tail fin. Photo by Heinz Quell.

## A New Cyprinodont for Killie Fans, *Austrofundulus transilis limmaeus*

BY JOHANNES FRANZ  
Dresden, Germany

The country of Venezuela, in the northern part of South America, harbors in its waters a great many egg-laying toothcarps for the hobbyist, among many other fishes. (There are also various species of *Rivulus*, *Pterolebias*, *Rachovia* and *Austrofundulus*.)

Little has been written so far about species in the genus *Austrofundulus*, but these have been described scientifically: *A. transilis transilis*, *A. transilis limmaeus*, and *A. stagnalis*. This account concerns itself only with the subspecies *A. transilis limmaeus*.

The habitat of this fish is the overflow regions of the Orinoco River. They were originally found 15 km west of San Felix, Estado de Falcón. Bodily, they resemble the African genus *Nothobranchius*, but are larger in size. My males attain about 2½ inches in length, and the females about 2½ inches.

The body color of the male is dark brown, which pales toward the belly region. On the lower forepart of the body there are dark spots, while toward the caudal base there is a reticulate design. On the upper part of the body, as well as the upper dorsal and anal fins, there is a sea-green gleam which extends into the caudal fin. The rays of the large pectoral fins are dark in color, and the fin tissue has a light greenish hue. The small ventral fins are an even brown, while the dorsal and anal fin carry an additional pattern of spots.

The prettiest feature is the sea-green caudal fin, which is edged with red and black. The red color is very variable, and the fish I bred showed some



specimens with red dots and stripes in the upper and lower part of the tail, while in others the red color was entirely missing. In shape, the tail is usually irregular, with a pointed tip above and another below, somewhat frayed on the edge.

The female's back is a light brown, the belly whitish, and the scales make a reticulate pattern. Here also there is a greenish tint over the after part of the fish. Pectoral and ventral fins are colorless, while there are dark spots on the dorsal and anal fin. These fins are smaller in the females than they are in the males. The rounded female tail is darker and somewhat frayed on the edge.

In June 1963, I received some eggs of this species. At the time, the fish were called *Austrofundulus* U3. Later I was told that they were identified by Dr. George S. Myers in 1942 as *Austrofundulus transilis limaensis*.

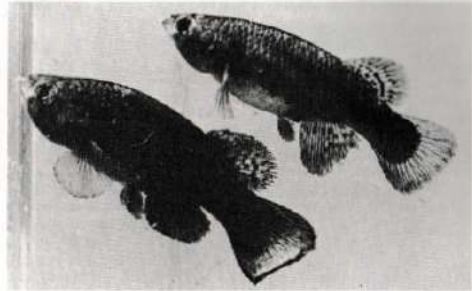
This fish, like some of the *Cynolebia* species, comes from waters which dry out periodically. Their life span in nature is limited to only 7 months, but my first ones are still living after 20 months. According to a reliable source, the dry period there begins in the month of January and ends in the last week in May, in other words, it lasts 5 months. The spawning period of the parent fish in most cases is finished at the end of November, so the eggs lie on the bottom from December until they hatch in June.

I set the eggs and the peat moss in which they were sent into water which I added a drop at a time, and after 24 hours the first fry were swimming. They were a little under 1/4-inch in length, and, with good feeding with baby brine shrimp, grew very rapidly. After a week they were able to take small cyclops. After 4 weeks they had grown to 1/2 of an inch, and in 8 weeks were about 1 1/2 inches long. The smaller youngsters, which were in the minority, almost all turned out to be females. At this size the first attempts at mating began.

The male, who begins with a twitching of his body, swims around the

#### WHEN YOU CHANGE YOUR ADDRESS

You won't want to miss your TROPICAL FISH HOBBYIST when you move to your new home — so please tell us, well in advance, what your new address will be. (It isn't enough just to tell the Post Office, for they won't forward your copies unless you pay extra postage.) When you write us, be sure to give us your old address, too — even better, enclose a clipping of the address label from a recent wrapper. We'll see that you don't miss a single copy if you notify us at least six weeks in advance of your moving date. Please don't forget to include your zip code number! Write to: TROPICAL FISH HOBBYIST, 245 Cornelison Ave., Jersey City, N. J. 07302.



A mature pair of *Austrofundulus transilis limaensis*. Upper fish is the female. Note that the tip at the top of the male's tail is missing. If these tips are bitten off, they grow back again quickly. Photo by Heinz Quall.

female with outspread fins. At this time the body colors get very dark, and only the red of the caudal fin gleams brightly. The female swims away a few times, but after the male pokes his head into the bottom to look for a suitable place to spawn, the female follows him. The actual spawning is usually delayed a bit, and the female buries herself completely in the peat moss at the bottom several times, after which the male follows her. However, I noticed spawnings where the male swam into the bottom first and was followed by the female almost at the same time. Both partners appear almost at the same time in a cloud of peat moss particles, and the mating is completed. The number of eggs is small, and a reduction in the girth of the female cannot be noticed.

Even without a previous wet period the embryos develop fully within the eggs in 6 months. Most of them hatch within a 24-hour period of one another, but a few take up to 48 hours more. With shallow water, all of the youngsters become capable of swimming, and an addition of water can be made without any losses. *Austrofundulus transilis limaensis* require heavy feeding with whatever food a fish of its size can handle, for instance worms, insects and their larvae, also small livebearers. As a sort of dessert, daphnia and cyclops are not refused.

Despite the fact that they are not advised for the community tank, these fish will find many enthusiastic supporters if they are kept in soft water and at a temperature which is not too high. Their interesting breeding habits make them a recommended addition to the collections of advanced hobbyists.



This is the kind of place in which one finds Arowanas. It is a still-water region of a backwater in the Peruvian Amazon District of Loreto. Also found here are the big cichlid *Cichla ocellaris* and the predatory *Hoplias malabaricus*. Photo by Dr. K. H. Lüling.

A German authority tells

## More About the Rainbow Arowana, *Osteoglossum bicirrhosum*

BY DR. K. H. LÜLING,  
Bonn, Germany  
Photos by the Author

In the magazine *Tropische Fische* (Vol. II, 1962, No. 3) as well as in this magazine (Vol. VIII, 1959, no 3, pp. 5-7) there appeared an interesting article by M. D. Bellomy on the Arowana, *Osteoglossum bicirrhosum*. In this work, the author commented on the ability of this fish to take atmospheric air in addition to gill-breathing. She wrote: "The development of this characteristic feature must doubtless have taken place by degrees to save the species from extinction during the centuries in which the fish had to put up with tropical swamps of small oxygen content."

A detailed examination of the anatomy of this outstanding feature which permits a special way of breathing must wait, however, for the future. We are

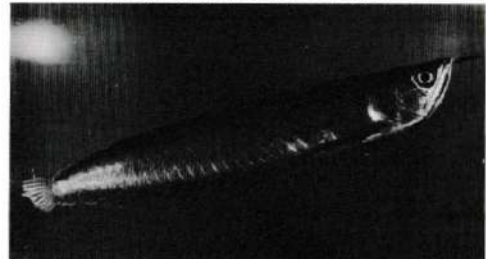
far better informed about this peculiarity in the case of the Paiche, *Arapaima gigas* (Cuvier 1829), which is the closest relative of *Osteoglossum*. A variant of the name "Paiche" (popular name in the Peruvian Amazon districts) is "Pirarucu" (literally "red fish," a popular name in the Brazilian Amazon districts. This fish shares its spawning habitat with *Osteoglossum*).

The membrane of the Paiche's swimming bladder is covered with a so-called "miracle net" made up of innumerable thin blood vessels which are concentrated in the dorsal part. They blend into alveolate and spongy caverns. Air taken from the surface is absorbed in the membrane. It is generally held that during the evolutionary development of fishes the air-absorbing efficiency of the swimming bladder was at first primary, only gradually giving way to hydrostatic absorption. However, substance must be lent to the assumption that there is a continuous development of early forms in those cases of recent fishes where swimming bladders serve for breathing. This hotly contested moot question was commented on by Max Rautner, an excellent fish anatomist, as early as 1940.

The swimming bladder has a breathing function with only very few species (some Catfishes breathe through their intestines), but it is of great advantage to those fishes possessing the versatile organ. Thus, according also to M. D. Bellomy, they are capable of living in water with a very small oxygen content, conditions which normally exist in swamp-water.

But to get back to Miss Bellomy's statement as to the slow process of adaptation which was necessary "to save the species from extinction during the centuries in which they had to put up with tropical swamps with small oxygen content": One ought to be cautious in statements concerning evolu-

*Osteoglossum bicirrhosum* gets to a length of slightly over 18 inches in the aquarium and much larger in the wild. Photo by Harold Schultz.





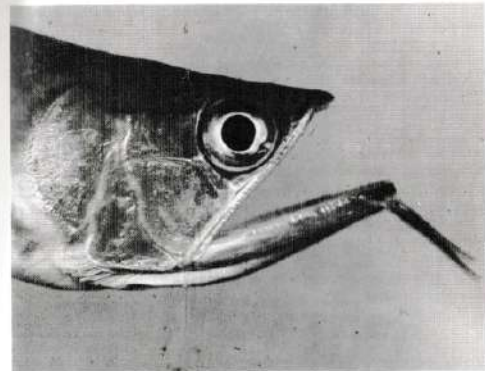
tionary development. The following suggestion would, to my mind, be far safer: Because the swimming bladder could originally absorb air, this condition lasting with some species or being developed additionally, these species might have been able to adapt themselves anew to waters with a small oxygen content. The ability to take atmospheric air must have been primary. This must have made possible a subsequent adaptation to a new habitat with altered oxygen conditions.

According to my statement and that advanced by Miss Bellomy, one is easily led to the assumption that the genus *Osteoglossum* is confined to swamp-water. Quite the opposite is true. During my expedition to the Amazon-Ucayali district in 1959-60, I devoted much of my time to research into the peculiarities of *Arapaima* and *Osteoglossum*. *Arapaima gigas* was the main object. We often caught specimens of *Osteoglossum* in order to feed their chopped flesh to young specimens of *Arapaima gigas* we had caught. I quote from a paper I wrote on the subject: "The habitat of *Osteoglossum bicirrhosum* ranges from the so-called "cocha" (backwaters) of the Rio Pacaya to the river's bayous, such as down-river Caño Yarina, as well as the Rio Pacaya itself."

This is true also of one far bigger member of the family Osteoglossidae, namely *Arapaima gigas*. These fish live more or less singly in moving shallow waters. They appear in pairs only during spawning time. *Osteoglossum*, on the other hand, may be encountered in still more shallow waters, grouped together in schools quite near the banks in the shade of overhanging branches. Here we speared big specimens a yard or only a little less in length. These regions do not provide ample space for a bulky "Paiche."

The shady marginal regions of Zapote Cocha, an otherwise sun-bathed shallow backwater on the one side of Caño Yarina, teem with *Osteoglossum* of various sizes. We stalked the fish most carefully, gliding in our canoes from the lake into the bays and many-shaped bayous. We then flung our three-pronged spears right into the sun-sheltered water. There was an immediate seething and churning. Some of the fish darted like streaks of lightning over the surface to make their escape. Every fifth or sixth throw yielded a large-sized silvery *Osteoglossum*.

The water regions referred to are by no means swampy or weedy areas in a drying-up process. They are cut-off backwaters during the dry season, even including many areas of moving water. During the rainy season, they are again connected with the river system. The water regions may also be narrow inlets ("canoes") of the main river, with both slowly moving water and still water if they include inlets not yet fully overgrown. After the rainy season, the water of these regions—especially that of the cut-off cochas—becomes



A close-up shot of the head of the Arowana shows the extended barbels that are so characteristic of the species. Photo by Harold Schulz.

clear. If not dyed green by algae, it is slightly dusky as a body, due to its acid content. The pH of Zapote Cocha (lower Rio Pacaya) is 6.5-6.6 during the dry season, while the pH of Caño Yarina is 6.8.

The schools of *Osteoglossum* mentioned enjoy the shade of overhanging branches rather than the shade of underwater plants. This holds good also for the large and colorful Cichlid Tucumaré (*Cichla ocellaris* Schneider). These fish, however, are far more given to solitary life when mature.

The water of shallow bayous and especially of extremely shallow cochas is subject to a great rise in temperature during the dry season. In spots the water may be even warmer than the air above. At the end of September 1959 (second half of the dry season), on a hot, sunny day, the air above Zapote Cocha showed a temperature of 96.5° F. The temperature of the lake's surface had risen to 98.8° F. due to sun radiation, while the water near the bottom, at a depth of 5 to 7 feet, stood at only 92.5° F. Everywhere large Arowanas were enjoying the shade of overhanging branches.

Stale water thus heated always shows a small oxygen content. This may be lessened still more by a profusion of billions upon billions of phyto-

plankton developing at places in backwaters like Zapote Cocha during the dry season. The water assumes a grass-green color which may eventually reach a peak. In these circumstances the absorption of atmospheric air is of special advantage.

What has been said above underlines Miss Bellomy's statements concerning the Arowana's heat requirements: "The temperature of the water recommended for Arowana is in the neighbourhood of 77° F. Some aquarists, however, have kept their specimens in water of a constant 73°. This seems to be of no detrimental influence, but the fish apparently grow faster in a large tank where the temperature is 77° F. or above."

According to my observations, the haunts of *Osteoglossum bicirrhosum* seem to be extended from the marginal zones to off-bank regions well into slowly moving water in semi-darkness as well as at night. However, circumstantial observations do meet with great difficulties. I think Miss Bellomy was in the right when she wrote: "In the night (the fish) move directly below the unsheltered surface, an easy prey for native spears."

It is possible that *Osteoglossum* hatches its fry in the interior of its mouth. But there has not been a single record proving this theory, which therefore remains utterly speculative, as it has been set up with a view to the relatives of this species. Even the *Arapaima* is said to have developed mouth-hatching, which is not only unproven but very unlikely. This is evident from my painstaking and persevering observations of these fish, from which I have arrived at the conclusion that *Arapaima gigas* does not hatch its fry in its mouth. This belies stories to the contrary by native fishermen. It is true, however, that the fish do lead and guard their fry. The phases of this parental care are very intriguing, for it turns out that the smaller the fry, the more devoted the care.

I handled many a big ripe Arowana. The sides of some female fish showed long slashes from spear wounds, and there were visible almost marble-sized amber-colored eggs, strongly reminiscent of those of a large salmon when stripped. We did not find a single specimen with eggs or fry in the mouth.

It is safe to say that specimens which have taken kindly to a life in captivity can be tamed easily by means of a certain mode of feeding. This is no outstanding achievement, as some other fishes can be tamed in this way. But it is a figment of the imagination to believe that specimens of *Osteoglossum* soon learn to "recognize the members of the household."

*Note by W.P.:* To lend a little substance to the question of whether or not the Arowana is a mouthbreeder, Dr. Axelrod tells me that he has speared many of them on his numerous trips. Frequently the fish spat out a mouthful of young when dumped into the boat, but never once were they observed to spit out eggs. It would seem plausible that the eggs are incubated outside of the parent's mouth, but when danger threatens the parent hides the fry there for protection. Perhaps some day we'll know all the answers!



The author is one of the foremost ichthyologists in the world. A biographical sketch covering his career appeared in the May 1965 issue of this magazine.

## How to Become an Ichthyologist

### Part 1

BY DR. GEORGE S. MYERS  
Professor of Zoology  
Stanford University

During the many years I have been teaching ichthyology (the scientific study of fishes), many boys (and a few girls) have written to me or visited me to ask how they could become ichthyologists. Each case is different, but there is a great deal of advice that applies to all of them, and Dr. Axelrod has suggested that I put some of it down in writing for the readers of TFH.

First of all, I think that the man who has, or develops, a deep, abiding interest in a subject is the man most likely to succeed in that particular line of endeavor. The ichthyologists who have made names for themselves often developed an interest in fishes in their younger days—and kept it through thick and thin. However, such people usually have one big difficulty. While young and inexperienced, they do not (or will not) understand that every line of work has its drawbacks, and that in order to become a first-class ichthyologist (or anything else) there is a great deal of tough preparation and drudgery to be done. The young enthusiast often does not see the need of



learning a lot of things which do not seem to him to bear any immediate relationship to what he so dearly wants to do. You simply must learn them, for they are the groundwork upon which everything that follows will be based.

Ichthyology is a small but growing profession. Nobody is likely to get rich at it, but really good, well-educated, professional ichthyologists are in growing demand, and the supply is limited. At the present day, such a man can command a starting salary (just out of the university) of something between \$8,000 and \$10,000 yearly. Older professionals are likely to be getting something between \$10,000 and \$14,000, a few considerably more. And the work, or most of it, is interesting.

The budding ichthyologist in his teens often has no idea of the type of fish work he really would like to do. However, professional scientific work dealing with fishes has many branches, only a few of which are usually called "ichthyology." In fact, it is a peculiarity of this and a few similar professions that the person who does scientific work (research) on fishes is often paid ostensibly or largely for something else. As in so many other scientific fields, a considerable number of ichthyologists are teachers—professors in colleges and universities where they teach some general biological subjects in addition to classes (and graduate-student instruction) in their specialties. The better institutions demand that their professors spend time on, and publish articles on, research projects in their special fields. Even the head of the fish department of a large research museum is likely to be paid as a curator—that is, as an administrator and caretaker—of the research collections in his department, although an assistant may do most of the physical caretaking.

Unlike such scientific lines as chemistry, there is little or no call for ichthyologists in industry. However, there is call for ichthyologists of certain sorts in government work such as the U.S. Fish and Wildlife Service, and the pay in the latter is good. Rather than go on with such remarks, it seems best to list and describe some of the branches of ichthyology best recognized at the present time.

**Systematic ichthyology**—that is, study of the classification, evolution, and distribution of fishes: Usually, but not always, the man deals largely with the external and internal anatomy of preserved specimens of fishes of the particular fish-groups in which he specializes. There are perhaps 20 institutions (museums and universities) in North America which maintain more or less extensive research collections of this type of fish material. The man may be a curator, or an associate or assistant curator of such a collection, or he may be a professor, or an associate or assistant professor, if the institution is a university. A few systematic ichthyologists (currently not over a half dozen) are governmental workers. Time for research varies, but is usually fairly extensive. Collecting trips, often to far places, to obtain new specimens, are relatively frequent, but the teaching or curatorial duties have to be done.

**Marine fishery biology**—that is, study of the ecology, habits, life-history, and related phenomena of (usually) food-fishes in the ocean, in order that wise use may be made of the resource. Such work is almost wholly confined to the different bureaus of the U.S. Fish and Wildlife Service, especially the Bureau of Commercial Fisheries, to a few foreign and international organizations making such studies, and to the fish and game departments of certain seacoast states. A few men teach about such things in universities. A great deal of the work tends towards mathematical studies of the data accumulated, and towards oceanography.

**Fresh-water fishery biology**—that is, studies similar to those just enumerated, but confined to fresh-water fishes, and in North America more often to game fishes such as salmon, trout, black-bass, etc. The U.S. Fish and Wildlife Service is also large in this line, and a few men teach about it in universities, but, in addition, most of the states have professional employees engaged in such work.

**Fish physiology**—that is, study of any of the many processes which go on within a fish. This is so far not a very well recognized field, and it is very diverse. Few people call themselves fish physiologists, because the usual "physiologist" is more likely to deal with such a subject as endocrinology (study of certain glands) or osmotic regulation (regulation of body fluids), or neurophysiology (physiology of the nervous system), in many animal groups, rather than confining himself to one group, such as fishes or crustaceans. However, the number of physiologists who work primarily with fishes is growing, and there are a very few positions open specifically for such people. Usually they are professors in universities or in marine or freshwater laboratories connected with universities.

**Fish behavior**—that is, experimental analysis of the various acts and habits exhibited by fishes. This is also a small and not well recognized but growing field, but the man who works in it is likely to use different groups (sometimes fishes, sometimes birds, or other animals) and to call himself an "animal behaviorist." The positions available are usually in universities.

There are also a number of other phases of fish work in which several people specialize, such as fish paleontology (the study of fossil fishes), fish anatomy or embryology, fish genetics, and the study of the larval stages of fishes. Moreover, all these different lines tend at times to mingle, and sometimes to merge in one man. For example, a number of systematic ichthyologists combine their research on preserved specimens with observations or experiments on live ones, or with studies on fossil fishes, or some other phase of fish study. The modern tendency for biological specialties to unite, or to merge—to the good of the science—is just as observable in ichthyology as in other kinds of biology.

Continued next month

THE **Danske**  
by BADER ... of course

**BADER INDUSTRIES, Inc.**  
CHANGE BRIDGE ROAD, FINE BROOK, N. J.

# MAIL CALL

By William Vorderwinkler

If you have an aquarium question that you would like answered, send it to MAIL CALL. Each month the most interesting questions received and their answers will be published in this column. Letters containing questions cannot be acknowledged or answered personally. Address all questions to: MAIL CALL, T.F.H. Publications, Inc., 245 Cornelison Avenue, Jersey City, N. J. 07302.

**Undergravel filters**  
Q. When I first set up my aquariums my dealer said not to use undergravel filters because they don't use charcoal, which is necessary for the removal of gases. As a result, for the past 7 years I have been using outside filters. After reading the article in the November 1965 issue of *TFH* by Dr. Herbert R. Axelrod, I was completely sold on the idea of his Miracle HiPower Undergravel filter except for the fact (no charcoal) which I have mentioned. My question is as follows: is charcoal necessary for the removal of excess gases such as CO<sub>2</sub>, and, if so, what provisions does Dr. Axelrod's filter make for their removal?

Jay Alexander,  
Allentown, Pa.

A. I'm not going to say that charcoal does not remove gases; it does, and very efficiently. But it's not the only way; what charcoal can do chemically can also be done by the undergravel filter in a slightly different manner. First let us take what happens in an outside filter: water is passed through a layer of glass wool,

Please mention T.F.H. when writing to advertisers

**Grow Your Own LIVE FOOD**

Freshwater SUBMYPHAPS (pre-filid) \$1.25, WINGED FRUITFLIES \$1.75, MICROWORMS \$1.25, WHITEWORMS \$1.50, DAPHNIA \$2.00, HAIR ALGAE \$1.00, DECORATIVE NETS (6 by 30 in.) \$2.75 (same color), 60-day PROGRAM renewal, Parasites (16.00), Exotic Marine Life (\$50.00), Guppy Strains (\$10.00). We pay postage, free directions. Annual 30c meter on each live food. Shyfoam netting for fish (with plastic socks, etc.) \$1.50.

**AQUA ENGINEERS**  
Box 1, Crossville, Michigan 48642  
Box 97, St. Basile la Grand, Quebec

Please Mention T. F. H. When Writing to Advertisers

A New Concept in pH Testing . . .

**RILA fresh water pH TEST KIT with a LIFETIME GUARANTEE**

- GUARANTEED to remain STABLE & ACCURATE INDEFINITELY!
- ACCURATE and EASY-TO-READ Color Chart supplied.
- Tests performed instantly . . . Results always Reliable.
- The FIRST & ONLY pH Test Kit with a written lifetime guarantee. Ask your dealer today . . . or write for complete Product Information.

RILA PRODUCTS • Box 114, Teaneck, N. J. 07666

57



which traps the larger waste particles, after which it is purified by passing through charcoal, then returned to the tank. In an undergravel filter, the water is pulled through the bottom gravel, which traps the wastes, and is then returned. These wastes are broken down by bacteria (which are in the gravel), which to a great extent is what happens in nature. This process inhibits the formation of gases, and the circulation of water promotes the presence of oxygen and brings CO<sub>2</sub> and noxious gases to the surface, where they are dispelled. Most important is the fact that there is so little to do when an undergravel filter is used: no glass wool or charcoal to wash or exchange and no messy filter box hanging from your tank frame! As for Dr. Axelrod's new filter, it offers a great many advantages over even the best underground filters formerly available. But then, you read his article anyway, and that's what probably convinced you to look once again into this type of filter.

**Cichlasoma meeki**  
 Q. 1. Just lately I purchased a pair (male and female) of firemouths, *Cichlasoma meeki*. They are babies, and only about an inch long. Could you please answer some questions on the breeding habits of this fish? What pH is needed? Hardness? Temperature? How can I condition them? What is a good



*Cichlasoma meeki*.  
 food for large fish? Earthworms? At what stage in breeding should I remove the parents?

## BREEDER'S BONANZA!

Longlife's Brine Shrimp Eggs by Sanders in 2 sizes



**Guaranteed Fantastic Hatch!** Longlife's new, improved eggs by famous Sanders. Offering the incomparable nutritious value of live food, ready for hatching, in vacuum packed containers of 4 lbs. 6 oz., and 1 lb. 4 oz. Write for our complete price list, on your letterhead. No order too large!

**LONGLIFE FISH FOOD PRODUCTS**  
 DIVISION OF STERCO INDUSTRIES, INC., 30 COOPER SQUARE, NEW YORK, N. Y. 10001

2. One thing that bothers me is that in one or two of my tanks, when I stir the gravel bubbles rise. I have read in several places that this is bad for the fish and should be remedied, but nowhere have I been able to find a reference stating the reason for this. Could you tell me why it harms fish, or if it really does?



A jewel cichlid.

3. Are firemouths and jewel cichlids really as vicious as they are reputed to be?

**Bill Spohn,**  
 W. Vancouver, Canada

A. 1. What you purchased is two fish with a little luck they may turn out to be a pair when they grow up, but one-inch babies are impossible to sex with any accuracy. Like most cichlids, water characteristics are not very important as

## AQUARIUM PLANTS THRIVE

and so do fish... when you use Plantabbs Aquarium Plant Foods.



## PLANTABBS

AQUARIUM PLANT FOODS  
 Plantabbs, Titanium, Molybdenum

Please mention T.F.H. when writing to advertisers

long as the water is clean. Best breeding temperature is about 78° F. Earthworms are very good food, but there are times when you may have trouble getting them. The best food is frozen full-green brine shrimp. Add to this basic, bits of shrimp,

Please Mention T. F. H. When Writing to Advertisers



Fish Farms, 248 P. Leong Suong Road, Pasirang 9 M.S. Singapore 19

## IMPORT DIRECT FROM SOUTH EAST ASIA

Exotic Malayan Fish, Coral Marine Fish, Oriental Goldfish, and all types of Aquatic Plants

## TROPICAL FISH AQUARISTS

P. O. Box Geylang 31, Singapore 14  
 Cable Address: "TROPFISH" - Tel.: 81457

(WHOLESALE ONLY)

## PET TOWNE

THE MOST COMPLETE TROPICAL FISH STORES  
 Always The Best Quality

**Featuring:**

- Extra Fancy Guppies by: Emile Para
- Hifi and Lyrrtail Swords
- Libby Bettas by: the Youngs
- WETHERSFIELD, CONN.**  
 671 Silas Deane Highway - Route 9
- PROSPECT, CONN.**  
 Waterbury Road - Route 69
- SPRINGFIELD, MASS.**  
 776 State Street - Route 20

**SHOP PET TOWNE**

Please mention T.F.H. when writing to advertisers

clams, or mussels. As soon as the youngsters are swimming by themselves and can scrounge around for food, the parents should be removed. Their presence is no longer essential, and there is always the danger that some day they may mistake their babies for food.

Please Mention T. F. H. When Writing to Advertisers



Aquatic Plants—Grown indoors in Greenhouses.  
 Superior Quality—Rare Plants. Get our list.  
 Tropical Fish—We produce them like minnows, by the thousands. We import many rare varieties.  
 Our large warehouse is full of aquariums and supplies at bargain prices.

**WHOLESALE RETAIL**

Color Chart showing 90 fish in color 19" x 28" - \$3.00 Postpaid  
**BELDY'S AQUARIUM, Inc. - Hazelwood 22, Mo. Since 1920**

## NOTICE TO AQUARIUM SUPPLY DEALERS, JOBBERS DISTRIBUTORS



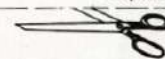
## AN ANNOUNCEMENT

EFFECTIVE immediately the deliveries to aquarium supply dealers, jobbers, distributors of

**LIVE BRINE SHRIMP** in the United States will be handled under the direction of San Francisco Fish Farms, Inc., 711 Hamilton Ave., Menlo Park, Cal.

Normal delivery schedules will be observed. For information, please call or write:

**SAN FRANCISCO FISH FARMS, INC.**  
 711 Hamilton Ave., Menlo Park, Cal.  
 Telephone: 415-323-2434



If you're not now stocking Live Brine Shrimp, you're missing a good profit maker in fish hobbyist sales. Cut out this announcement for a reminder to ask us about being a Live Brine Shrimp dealer.



**Salt Water Fish!**  
Sea Horses, Angelfish, Gobies  
Butterflyfish: All Kinds



**FAST DELIVERY!** Little Waiting!  
Don't be fooled by dealers who offer cheap prices on marine fish. They can't deliver and will only disappoint you.  
Send \$1.00 for Sea Horse Book and Marine Pamphlet. National Distributor for Reef Salt and Reef Carbon. Lowest prices on Salt and Filter Medium. Dealers wanted.  
Robert F. L. Strouhan, Marine Collector.

**CORAL REEF EXHIBITS**  
P. O. BOX 59-2214  
MIAMI 59 (AMF BR.), FLA.  
Ph. Miami 271-3331

Send for free price list.  
"We deliver fish and premiums."

Please mention T.F.H. when writing to advertisers.

number of times and learned the hard way. The duties of an aquarium cover are varied, but one of the most important is to keep your fish from jumping out. A fish

Please Mention T.F.H. When Writing to Advertisers

**YES, IT'S EVERGLADES WHO Supplies:**  
**QUALITY FISH AND RARE PLANTS To Discriminating PET SHOPS AND AQUARIUMS**

If you are a Dealer or Jobber, write for our large list. Use your business letterhead or card for identification.  
No fancier list available.

**Everglades Aquatic Nurseries, Inc.**  
P. O. BOX 587 - 706 PLAZA PLACE TAMPA, FLORIDA 33601

leaps for a number of reasons: he may be just playful, he may be startled, or he may be chased by one of his tankmates. The thing to do is to eliminate the holes through which he can jump. The hole through which you feed can be rigged with a simple cover, a piece of plastic which covers it completely and is held in place by a strip of adhesive tape. Keep the cover in place, and when you have to remove it, make sure that you do not frighten the fish.

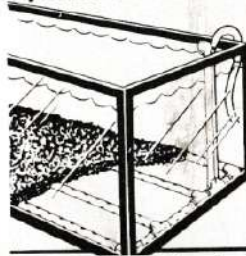
2. Here's another thing you found the hard way: it's always a poor policy to add very small fish to a tank which already has some big ones in it. The little ones were probably bullied to death by the larger fish, then eaten.

**Show judging**

Q. 1. Recently we had a "Fish Show", and I need a lot of questions answered. I would appreciate it if you could help me. The judges gave me excellent ratings on the health of my fish and on my "show tank", but I lost by one point, which was compatibility. I couldn't figure out why. Could it be because I had two male gouramis in the tank? The reason for that was because of their color. We all know that the males are so much more colorful than the females. They were dwarf gouramis. Or could it be because my blue gouramis were so much larger than all the other fish in my aquarium? (Although I remember that

**EUREKA**  
Assures More Healthful Aquariums!

World's Finest **EUREKA** GRAVEL FILTER... **AQUARIUM PURIFIER**  
Completely Sectional, Adjustable and Convertible



**349** For Tanks up to 16" x 8" **FITS ANY TANK**

TANK SIZE	RETAIL
up to 20" x 14"	399
up to 24" x 14"	449
up to 30" x 14"	499

**SUPERIOR TO PLATE-TYPE FILTER**  
Eureka Purifier continuously circulates aerated water THROUGH THE GRAVEL so there's no space below for decayed materials or gases to collect. Works years without cleaning, installs without removing fish or gravel.

**POWERHOUSE VIBRATOR PUMP**

STAINLESS STEEL DIAPHRAGM  
NEVER NEEDS CHANGING

QUIET! LONG LIFE!  
HIGH POWER!  
RUNS 10 OUTLETS!

**\$11.95**  
SUGGESTED RETAIL

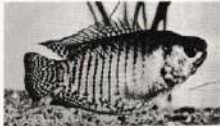
2 YEAR GUARANTEE



manufactured by **EUREKA** PRODUCTS CO., 4 BROS ST., NEWARK, N. J.  
**WORLD'S FINEST AQUARIUM PRODUCTS**

IF YOUR SOURCE IS UNABLE TO SUPPLY YOU, WRITE FOR INFORMATION

the aquarium that won was of only 10 gallons capacity with 15 tiger barbs, which was very beautiful, may I add.) I had two blue gouramis, two dwarf gouramis, two bettas (male and female),



A mole dwarf gourami

two black lace angels and two silver lace angels (they were babies), one glass catfish, two red-finned sharks, and two small red moons. Well, sir, I guess there could have been any number of incompatible fishes there. As you can see I have too many reasons, and I am not sure of any one of them. I am so confused.

2. Why does one have to change half the water after the fish have been treated with potassium dichromate or potassium permanganate?

Anna Vertrees,  
Elizabethtown, Ky.

A. 1. All fish seems have a set of rules by which the competitors have to abide. My educated guess would be that the rules of your show demanded that fish be shown in pairs, except in cases where they could not

Please Mention T.F.H. When Writing to Advertisers

**GOLDFISH TROPICAL FISH**

- Transportation by air, sea or rail costs less than 1 cent per fish for most areas nationwide.
- You pay only for LIVE FISH RECEIVED — 99% of shipments arrive in perfect condition.
- No packing charge — no carton charge.
- Three Springs is best, not because it is the largest, but largest because it is best.

Color: healthy, live goldfish, tropical fish, aquatic plants, turtles and related items from

**THREE SPRINGS FISHERIES**

2740 Lilypond Road, Ligtown, Maryland 21717  
Phone: 301-874-5333  
and more with every order

Fishery Overnight  
Fresh Delivery

well; plants and algae were growing until 3 weeks after I put up the aquaria. In one of the tanks the algae suddenly started to peel off, and not a big fan of the grown algae. I never had to clean off the front glass. I used the same lighting, gravel, plants, and water in both tanks. I keep the temperature about 76° F. The pH in both tanks is 7.0, and the German hardness, since we have extremely soft water, is 2 DH. I have kept tropical fish about 12 years, but cannot find out what the cause might be. Do you have a clue?

2. What is the conversion table for German hardness, if you want to change to American?

3. What can I use to bring up the hardness a few degrees?

4. Can one use coke or sponge coal with white gravel to make it darker?

5. On a package of frozen daphnia the instructions read to feed small pieces

while still frozen. Doesn't this give indigestion to fish? While still living in Germany some of my angelfish died when I forgot to warm tubifex worms which I had been keeping in a cool basement.

6. In your June 1965 edition of T.F.H. you showed several pictures of "Novely Aquariums" with scenes like "Christmas" and "Oriental Garden." Can you tell me what this has to do with the hobby, even though there are some fish swimming around? I would not even dare to let my aquarium friends in Germany see those pictures, or they would never take me seriously again.

Martin Fischer,  
Wabush, Labrador, Canada  
A. 1. I take it you might get your plants from Germany. These are better, as you no doubt know, is considerably harder. The extreme water softness in your present location is the only thing I can see that

Please Mention T.F.H. When Writing to Advertisers

**New Strain... "KING COBRA GUPPY"**

We are proud to announce the availability of the prize-winning guppy strain named the "KING COBRA." This "King" carries a large Delta-Tail and snake markings throughout its body and tail. Refer to May issue of T.F.H., page 69, for full color, true life photo and history. "KING COBRA" is priced so that all hobbyists can afford to enjoy its magnificence.

\$15.00 a pair — \$20.00 a trio (2 females, 1 male)

Choose from Blue, Red, Green, Lavender. Please state 2nd color choice. Limited quantity, so order now!

\$7.00 a pair — \$12.00 for two pairs

\$9.00 a trio — \$16.00 for two trios

Colors are Red, Green, Blue, Multi, 1/2-Black Red Tails.  
All guppies shipped range 4 to 5 months of age and are Prepaid Air Mail, Special Delivery. Live delivery guaranteed. Make checks payable to:

**MAC GUPPY HATCHERY** 10-63 Jackson Ave.  
L. I. C., N. Y. 11101



might be affecting your large plant or algae growth. Plants require a little hardness in the water, even those native to soft water locations, and 2 DH is very soft.

2. Each degree of German hardness (DH) is equal to about 18 parts per million, the way we Americans most frequently measure our hardness.

3. Try filtering your water through marble chips or crushed shells until the desired hardness is attained.

4. A real danger with the use of coils in the aquarium is that it is sometimes processed with oil to make it burn better. I would be inclined to try using crushed anthracite.

5. What you may have done with your tubifex worms is to pour in the cold water along with the worms. I have fed frozen daphnia and frozen brine shrimp for years without it doing any noticeable damage. If you really want to play safe, take about

an ounce of warm water and let the amount of frozen daphnia you intend to feed melt completely before feeding.

6. These aquaria are not intended to be taken seriously as a hobbyist's full-time tank! They are merely unusual exhibitions. An aquarium which might be considered amusing if placed on exhibition would certainly be a masterpiece if it were set up permanently in this way. It's like putting a trained bear on a motorcycle in a circus: interesting enough as an exhibition, but not what you'd expect to see in a zoo. Explain it to your German friends this way, and I'm sure they'll understand.

**Unusual behavior**  
**Q.** While it has been known for some time that cichlids will on occasion adopt the young of other fishes, something has happened to us that is for the books. An extra slate of common angelfish eggs was placed as food in with a tank of

Please Mention T. F. H. When Writing to Advertisers



**Megaton Air Pumps? Who needs 'em!**

**YOU DO!** — if you're an aquarium operator. Megaton Air Pumps take a load off your mind. They're built to do a job and keep on doing it. Day and night. How come?

Because Megaton Air Pumps deliver reworked efficiency continuously. They're compact, yet high powered. And because they're precision machines, they give years and years of trouble free service.

So who needs the dearthability of a Megaton Air Pump? YOU DO.

**INTERNALLY COOLED MOTOR**  
 Full 1/2" drive piston arm bearings  
 Heavy duty shaft and bearings  
 Flared cast iron impellers necessary, can't be jammed out of position

**ONE PRICE TRANS OPERATION**  
**THE MEGATON LINEUP:**  
 1" cylinder 170 H.P. .325 cu. in. (Min. 6 tanks) \$18.95  
 1 1/2" cylinder 300 H.P. .500 cu. in. (Min. 3 tanks) \$24.95  
 2" cylinder 1,100 H.P. 200 cu. in. (Min. 3 tanks) \$24.95

**AQUARIUM STOCK COMPANY, INC.**  
 31 Warren St., New York, N. Y. 10017 • 8070 Beverly Blvd., L.A., Calif.

this is no exaggeration:

**FLAVOR FLAKES**

is the world's best flake food . . .



**bar none . . . and it will not cloud the water**

Flavor Flakes is a combination of five nutrition-packed flakes containing the highest percentage of proteins and vitamins ever locked into a single fish food.

This new form of food was developed in Western Europe by a famous marine biologist. Its ingredients are scientifically balanced to reduce mortality, increase growth, bring out the natural color of fish and provide better health. And Flavor Flakes tastes so good fish eat them like mad. Get some today and see.

**Money-Back Guarantee:** If you're not completely satisfied return can with unused portion and your money will be refunded.

All Aqua-Stock Products are Thoroughly Tested in our own Laboratories.


**AQUARIUM STOCK COMPANY, INC.**  
 27 MURRAY ST., NEW YORK, N. Y.  
 8010 BEVERLY BLVD., LOS ANGELES, CALIF.

paired discs. Not only did the discs allow the eggs to hatch and take care of them, but they also caudal their food alone as though the angelfish were of their own production. Nature, not to be fooled in the process which had gone so far, somehow communicated to the angels what this strange food source was all about, for from the time the fry were free-swimming, they were seen feeding on the sides of the discus parents. Apparently the angels retained some of their true identity however, for when they were removed some weeks later and placed with some of their conventionally raised brethren, they seemed to suffer no psychological traumas. The discus, on the other hand, are still wondering where all those angels went.

**Raymond Dale, Lake Worth, Fla.**

**A.** Your bit of news does not ask a question, Raymond, but I am sure it would be of great interest to MAIL CALL readers, so I am putting it in the column, along with some of my comments. In the first place, the angelfish and discus are closely related, and spawn in almost the exact same manner. It is only natural for a female discus to "adopt" a clutch of angelfish eggs and take care of them as her own, and this act seems to trigger some sort of body mechanism which causes the production of the slime which acts as food for the fry. The fact that the angels accepted this as food may not be due to a mysterious process at all; my guess would be that it probably smelled good to them! Perhaps some day this substance will be analyzed and synthesized, causing some kind of furor in the field of fish nutrition. I wonder if the slime-like angel youngsters grow bigger or more rapidly than their normally-raised brethren? To my mind, this may be a good way to assure yourself that a pair of discus will spawn properly: give them a clutch of angelfish eggs, and if they raise them, chances are that when they lay eggs of their own, they'll be old hands at it and will not eat them, as so many discus do.

**Guppy Corner**



By Paul Hahnel

**Water**  
**Q.** I've seen, in booklets, pictures of some of the guppies you breed. I think they are beautiful. I'm doing a science project and wondered if you would tell me what kind of water guppies reproduce best in.

**Nancy White, Monona, Wisconsin**

**A.** In my long experience of fishkeeping, I find that the state of the water is most important. Rain falling to the earth will pick up carbon dioxide and dust particles from the air, then the water, making its way through the rocks and ground, picks up a variety of minerals. This is the water which you will have in your aquarium. Beside the chemicals which are in your water, the wastes of the fish add other substances. The most important chemicals which are in your aquarium are potassium, calcium, magnesium, iron, hydrogen, oxygen, sulphur, phosphorus, nitrogen, and carbon. To these are added the sub-

stances which are produced by the decomposition of the fish wastes. In order to prevent the overloading of the water with these wastes, part of the water should be changed weekly. I have found that fish do best in medium hard water, 10 to 14 degrees of German hardness (DH) and a little below neutral in pH.

**Trout eggs as food**  
**Q.** I am an amateur fish hobbyist who has a 10-gallon tank, reflector, bottom filter, and an air pump. My question is about fish food. I have guppies, sword-tails, two cutfish, and four common minnows. I am a fisherman and caught some trout this week. In some of them were eggs, as they were about to spawn. I kept the eggs, which each fish had in

Please mention T. F. H. when writing to advertisers

**FANCY GUPPIES**

Our Guppies are winning blue ribbons for their proud owners everywhere. Letters tell us that even the best of friends aren't willing when they bought their Guppies. All of our Guppies are tank raised indoors. About water available: \$6.00 a pair; 2 pair for \$11.00; \$8.00 per trio; 2 trio for \$15.00. Write for descriptive brochure. Special shifroon in isolated customer issues guaranteed free delivery by Air Mail. No C.O.D. please.

**RAINBOW GUPPY AQUARIUM**  
 P. O. Box 525 Leesburg, Florida

Please Mention T. F. H. When Writing to Advertisers

FIRST PRIZE WINNER AT THE INTERNATIONAL 1960 GUPPY SHOW, BERLIN, GERMANY

**THE BRONZE DELIGHT**

After more than 30 years of breeding exhibition quality, Mr. Hartung now introduces his greatest achievement — the Bronze Delight with its large Vail tail breeds true. They are a firm hybrid of goides and gony species. You may choose from Green, Leopard, Blue, Variegated or Blue-green fish. \$14 per pair; \$53.00 extra for Trio.

**HARTUNG GUPPY SPECIALIST**  
 Other prize winning varieties are: our choice of Red, Blue, Black, Dark Blue, Marbled — only \$6.10 a pair. Albino Vail, \$8 a pair. Beautiful Green Bony and Vail \$5 a pair.

**GUARANTEED Live Delivery** — Postpaid. Send check or money order to WM. HARTUNG, 91-24 88th St., Woodhull 21, N. Y. — Wt. 7-2238.

two membrane sacs, to try to see if my guppies would eat them. I slit the sacs a little and held them in the water; the fish actually tore them from my hand. They like them better than brine shrimp, it seems. My questions are as follows:

1. Are trout eggs a good source of nourishment for fish?
2. Are most small fish eggs taken this way while fresh from various fish all right for feeding tropical fish?
3. Can I freeze them and thaw them in the water, like brine shrimp?
4. What do you consider the best foods for feeding my types of fish?

**Ross Hoffman, Norristown, Pa.**

**A.** 1. Fish eggs are excellent fish food, provided they are of a size that the fish eating them can swallow them easily.

2. Yes, as long as they come from healthy fish.

3. Yes, and freezing kills a great many of the harmful organisms which may exist,

**THE DEGAULLE GUPPY**  
 (Flag of France)

The most unusual breed of this era. A large, firm hybrid with light blue, jet black body, flashing red tail, and white dorsal fin. Both females are olive color with black tail. They breed true. \$12.50 female; \$14.50 extra for trio.

Other varieties include Albino Vail, Red French, Los Vegas Green, Leander; \$7.50 per pair; \$12.50 extra for trio.

Guaranteed Live Delivery, Postpaid. Airstail. Send check or money order to . . .

**MANHATTAN AQUARIUM SERVICE**  
 224 - 21st St., Manhattan Beach, Calif. 90248  
 Phone: FR 2-4621

Please mention T. F. H. when writing to advertisers

it is safer to freeze them. It also makes them easier to keep.

4. I use tubifex worms, baby brine shrimp, adult brine shrimp, and white worms, plus all the frozen foods available in pet stores and at least 15 different kinds of dry foods.

Please Mention T. F. H. When Writing to Advertisers

**Condé leads in Quality Air Pumps!**

**NEW!**  
 Model O DRI-AIR PUMP



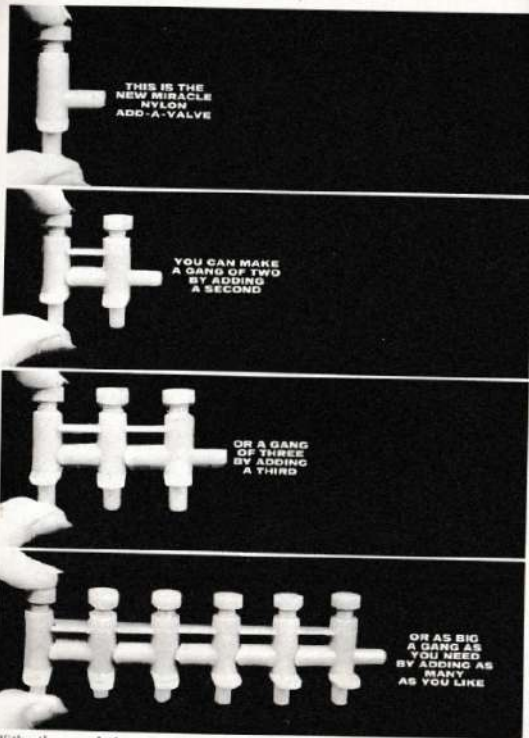
- Delivers clean oil-free air
- Long Life • Quiet Operation
- No diaphragms • No pistons
- Precision made — interior surfaces ground to low micro finish
- Easily serviced — anyone can replace any renewable part with screwdriver in 2 min.
- Cushion mounted • No vibration
- Beautiful sea-foam green finish

**The Best pump costs less per month to own!**

See your aquarium supply dealer or write for literature.

**PUMP DIVISION**  
 Condé Milling Machine Co., Inc.  
 Dept. 17 Phone: (Area 212) 363-9000





With the revolutionary new Miracle Nylon Add-A-Valve, you get unlimited flexibility in creating custom-made gangs with exactly the number of air outlets you want. Only the specially made Miracle Nylon Add-A-Valve offers all these advantages: The Ability To Custom-Create Gang Valves - Absolute Airflow Control (No need for constant adjusting) - Can't Introduce Metal Poisons To Your Aquarium - Less Expensive (Nylon, which does the job better than metal anyway, costs less.) - Guaranteed Corrosion-Proof. Buy the Miracle Nylon Add-A-Valve at your local pet shop.

**MIRACLE PLASTICS CORP. CHANGE BRIDGE RD., PINE BROOK, N. J.**

## Salts From The Seven Seas



By Alfred A. Schultz

Q. I have been a freshwater hobbyist for many years, and I have decided to try saltwater fish. I had read every available source of information on the care of marine fish before I went out to purchase the tank of my choice. A plexiglas tank of 50 gallons capacity was my choice since I already own a power filter that would circulate enough gallons per hour. My wife gave me my allowance, and we went to a dealer who sold plexiglas tanks, but almost had a stroke when she learned the tank would

cost \$115. We put our heads together and decided to collect our saltwater specimens and try building our own saltwater tank out of plexiglas. We have ruled out getting a metal-frame tank. I have a source of good thick plexiglas and the bonding agent ethylene dichloride. I would use plexiglas angles to reinforce the seams, and I have the tools to cut the plexiglas. My problems are in the use of the bonding agent ethylene dichloride to obtain a good seal to prevent leaks. How would I go about bonding the plexiglas together? Anything you can advise short of getting a divorce would be helpful.

William Smith, New York, N.Y.

A. Ethylene dichloride has the property of melting the plexiglas, and when two pieces that have been treated are put together, they fuse, rather than bond, to-

Please mention T.F.H. when writing to advertisers

### "NEPTUNE SALTS" KEEP SALT WATER FISH ALIVE FOR YEARS & YEARS!



World's #1 product for marine fish and sea horses. Invented, supervised and used by experts at 12 public aquariums, over 80 universities, U. S. government agencies, industrial researchers, and hobbyists throughout the world. Just mix with tap water. It's as simple as that. Crystal-clear water lasts 4 to 7 years and longer to actual experience. NEPTUNE SALTS, each fish has are over 100 other products ever developed since one but it only costs... do NOT have to change water every few weeks. Write for new salt-water catalogue, letters and orders, no charge hobbyists. 25c

**WESTCHESTER AQUARIUM SUPPLY CO., INC.**  
454 Monmouth Avenue  
White Plains, N. Y.  
Tel: 914 WH 8-0011

Please mention T.F.H. when writing to advertisers

### Teo Way Yong & Sons

Importers & Exporters of  
Fancy Tropical Fishes,  
Wild Birds & Animals  
Shipments to Any Part of the  
World

1063, Yio Chu Kong Road  
Singapore 19

Cable Address:  
"CATFISH" SINGAPORE

## Tropical Fish Hobbyist

gether. Its use is a bit tricky, and you may run into wash spots that could leak. An excellent bonding agent is Silastic, made by Dow-Corning. This makes an adhesive pad between the plexiglas surfaces which sets to a rubber-like consistency. As long as you have a source of plexiglas, fine, but have you considered how difficult it would be to scrape algae from the soft, easily-scratched surface? In your place I would use ordinary glass. And another thing, I have had great success using properly-protected metal framed tanks for marine fishes.

Q. 1. Are artificial salts 100% satisfactory in a saltwater tank? When using these salts, is it necessary to add fresh salts each time the tank is siphoned, or will topping up the water level with fresh water suffice?

2. What is the correct temperature for marine fishes and seahorses?

3. Will the puffer fish Tetraodon exist in normal fresh water or do they need salt water?

Winston Barker,  
Morecambe, Lancs., England

A. 1. Yes; not only do they provide a satisfactory medium for the keeping of marine species, but they make it much more convenient for people who live away from the seashore to keep a marine aquarium. When removing water from this type of aquarium, you must remember

that you are also removing salts, and when replacing you must add water of the same salinity. When water evaporates, this is a different story: the salts remain behind, and all that must be replaced is fresh water in equal volume.

2. 73° F.

3. The Tetraodon species have a tremendous distribution over many parts of the world; some are native to strictly marine waters, others occur in brackish waters, and, amazingly enough, there are species which are found in purely fresh water. For this reason I cannot generalize, and can only give specific information if I know what species you are referring to.

Please mention T.F.H. when writing to advertisers

### LIVE SEAHORSES

Order LIVE MATED SEAHORSES now for Fall period here. All orders receive a bit with FREE food, care cards and simple instructions for raising these beautiful little pets in a jar, tub bowl or aquarium. The Father (male) Seahorse gives birth to the young alive. The Educational, Relaxing, and Enthralling hobby with hours of fun for all the family.

LIVE DELIVERY GUARANTEED.  
ONE PAIR \$1.25  
THREE PAIR SPECIAL - \$4.00 - Order TWO PAIR and receive (1) ONE PAIR FREE (ONE SEAHORSE GIVEN)

F. F. MARINE LIFE  
P. O. BOX 120-17-16 DANIA, FLA. 33004

Please Mention T.F.H. When Writing to Advertisers



### WHY RILA MARINE MIX?

Simply because you'll be getting the finest synthetic sea salt available - proven by years of consistent, dependable performance.

A quality product guaranteeing the highest degree of uniformity and purity.

Contains the 19 major trace elements of natural sea water. Provides the ideal media for all marine life.

Ask your dealer today or write for complete Product Information Bulletin and free Salt Water Bulletin.

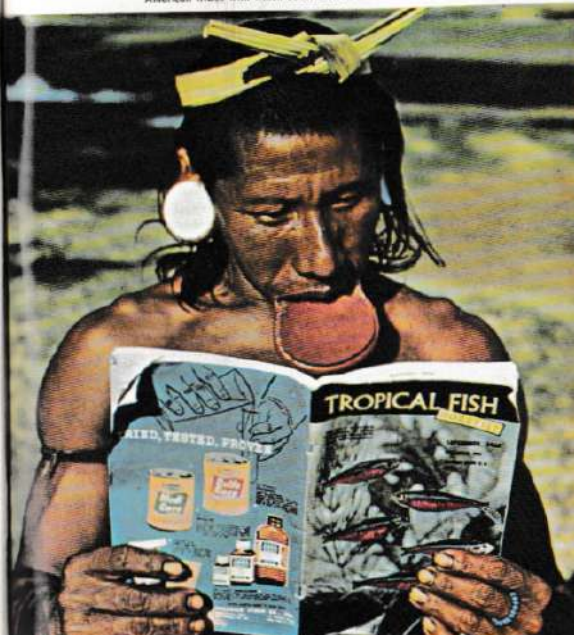
RILA PRODUCTS • Box 114, Teaneck, N. J. 07666

## Harald Schultz, the Man

The recent death of Harald Schultz moved an extraordinary number of people. This is not surprising, for he was an extraordinary man. The readers of TFH knew him too to some extent through the many, many articles that he wrote for us in his years as our expedition chief.

Shortly after his death, the letters began to come. From all over

This is probably the best known of Harald Schultz's many hundreds of fine photographs taken for TFH. The active is a Suya Indian, a member of one of the many South American tribes with which Schultz often lived and worked.





### Tropical Fish Hobbyist

the world came expressions of shock and grief. No magazine article could tell enough about Harald Schultz, the man. No article could tell how people who knew him feel. From the many letters and tribute articles we received, some of us who knew Harald have chosen five which we feel tell the most about him. The names over each are the names of the writers. They include two of the foremost writer-publisher personalities in the tropical fish field, two of the top ichthyologists in the world, and a former king.

King Leopold, III

*The news of Harald Schultz's death came as a great shock to me. He was, as you know, a man for whom I had great respect.*

*For so sober a man, his death would appear sadly premature. I still see him — and this, only a few months ago — surrounded by Indians in a remote village in the upper reaches of the Xingu River. What an extraordinary gift he had with those shy and diffident people. He loved them, and they in their turn, with the unfailing instinct found amongst primitive people, recognized in him the sterling qualities which made him the selfless, generous-hearted person he was.*

*He was really an exceptional man; I have some of his photographs in front of me now, as I write, and looking through them only accentuates the poignancy of his untimely end.*

*We all know the ardours involved in documenting the stone-age life of the primitive tribes to be found in the sprawling tropical jungles of Amazonia! Journeys he was obliged to undertake were long and tedious and often dangerous, particularly when they involved areas to which no white man had previously travelled.*

*And yet, in his photographs we are not conscious of any strain, only beauty. He had a lively, inquiring mind and was a sensitive observer who seemed to establish a sympathetic relationship with every subject on which he focused his lens. He gave us revelatory glimpses of the Indians in their green twilight world, a world of primeval nature far removed from the stress of our twentieth century civilization.*

*To those who share an interest in the primitive tribes of Brazil, the passing away of Harald Schultz will mean a great loss, and to many, many Indians, his death will mean the loss of a true friend and protector.*

74



Harald Schultz was a versatile man who did many things well. Above we see him as a collector with his friend Dr. Herbert R. Axelrod. He was one of the foremost collectors of South American species, contributing greatly to the knowledge of the fish fauna of that continent. Center we see Schultz in more civilized surroundings. His business suits never hid his true nature: civilized men found him as sensitive, friendly, and likeable as did the Indians of South America. Below is Harald Schultz the photographer and scientist. His fine fish photographs have been used not only in the many articles he wrote for TFH, but by ichthyologists as well.



### Tropical Fish Hobbyist

Dr. Herbert R. Axelrod

Dear Harald:

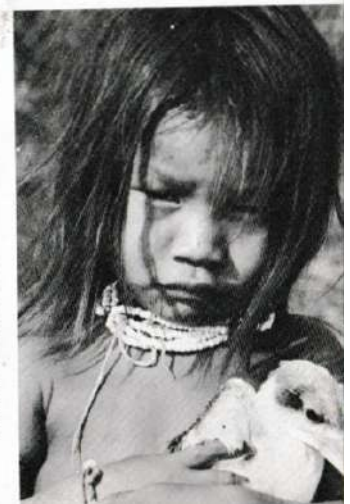
*Today I received word that you are dead. How can that be? Are people so omniscient that because your heart stopped beating and your eyelids closed, they believe you are no longer with us? No, Harald, I know better than that.*

*Do you remember one of our first trips into the Brazilian jungle together? We went down river from Manaus to the funny little town called Itacoatiara. It was the dry season, Harald, and halfway down the Amazon our small boat (I even remember its name: Baron of the Madeira) became grounded on a sandbar. None of the peasants (caboclos) would jump into the water and help free the boat. They were afraid of Amazonian monsters, piranhas and sting-rays. What did you do? I remember. You jumped into the water, and, with everybody watching, proceeded to take a bath, soaping your head and doing everything possible to attract any fish or animal that wanted to eat you. When you had finished a very leisurely bath, Harald, you simply pointed to four or five men and told them to help you move the boat . . . and if they didn't feel strong enough, to send their little children. In a few minutes, the boat moved off the sandbar and we were on our way. How can I forget when they honored us by allowing us the only cabin on that boat . . . and it was so small that your feet stuck out into the passageway while we slept on the floor!*

*A few days later, Harald, we walked into the town of Itacoatiara. It was a huge town of about 75 families. I remember the day because it was this same day that Pope Pius died and they were having a mock funeral at the church. Everyone was crying. Our plan to get some assistance from the town was impossible since they were all in mourning . . . so we went up the Urubu River alone, with just one Indian to guide us.*

*When we reached the river, we settled down in a lean-to which kept us a little warm, anyway. Funny how cold it is in the jungle at night. The second night we were there, Harald, was the first time you saved my life. I took the dugout into the middle of the Urubu River. It was the dry season and the water was very shallow in some spots. I used a strong flashlight to shine into the water and see the Discus hiding among the branches of fallen trees. Suddenly a beautiful Prochilodus sprang from the water, hit me in the face and knocked me down. I was unconscious when you dragged me into the boat and I don't remember anything that happened until*

78



Harald Schultz was a man who radiated a love for people. The Indians sensed this and opened their hearts to him as they could never have done with any other man, white or dark. His great feelings toward them and his sensitivity to their emotions are illustrated in hundreds of beautiful and revealing portrait photographs like these.



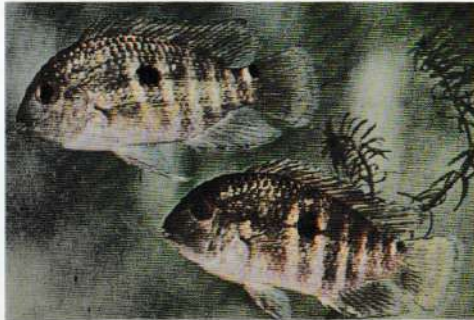
Tropical Fish Hobbyist

the next morning when I awoke in your hammock . . . with you sleeping next to me to keep me warm. It was the next day that you told me about your love of life. Your family. The Indians. It was then that you said many Indians, once they saved the life of a man, become brothers, and swear eternal friendship and brotherhood . . . and we did, too. That was only eight or nine years ago, but since then you always wrote: "Dear Herbrother."

How many times have we starved in the jungle? Do you remember the time we were on the Rio Araguaia? When it took weeks to fix a dugout, only to have it spring a leak when you, Evelyn and Vilma went upriver. How excited we were when we discovered new fishes together . . . and how frightened I was when you caught large Piranhas from the bow of our boat and then pushed me into the water to attract more! (Now I believe you that Piranhas are not as ferocious as many arm-chair scientists claim them to be!)

But we had other great thrills together, Harald. We not only fished a dozen different river systems in Brazil, we walked the streets of Porto Alegre, New York and Frankfurt; we ate water-rat, crocodile, filet mignon, and haserpfeffer; we slept in hammocks, on the ground with bats flying around our head, and in palaces. You were always the same Harald. I never saw a Brazilian Indian weep,

This photograph of *Aequidens awani* is just one of hundreds that could be chosen to show Harold Schultz's great skill as a fish photographer.



# SALT WATER AQUARIUM FISH \$7.95

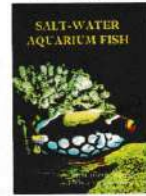
BY DR. HERBERT R. AXELROD & WILLIAM VORDERWINKLER

The most complete up-to-date book on marine-fish keeping ever published in any language, this book has more color illustrations (335) of marine fishes and marine invertebrates than all other books on the subject combined!

Printed on the finest, non-glare, water-resistant, coated paper (never before used on an aquarium book), SALT-WATER AQUARIUM FISH contains fact-filled chapters on all the various kinds of marine fishes, from the popular Anemone Fish to the playful Batfishes.

Dr. Axelrod took four years to write this book with the assistance of Mr. Vorderwinkler. He journeyed 135,000 miles from Pakistan to Hawaii to Australia to the Fiji and Hawaiian Islands, through Japan and Ceylon, Singapore and Hong Kong, as well

as Europe, the West Indies and South America, not to mention Africa and the Mediterranean, to collect and photograph fishes which have never appeared on a printed page before.



NOW AVAILABLE AT YOUR PETSHOP  
Published by T.F.H. PUBLICATIONS, INC.  
245 Cornellison Avenue Jersey City, N. J. 07302

Tropical Fish Hobbyist

Harald, until I saw you leave the Karaja in Aruana. I saw you fierce, Harald, when I disobeyed your orders and went hunting at night all alone. You wouldn't let me eat the monkeys I shot, but you gave them to the Indians. I had to eat dry corn which you baked, but which was harder than the corn I feed my pigeons. I also saw you as gentle as a woman, when I was ill in the jungle and you shot a pair of macaws and made the best 'chicken' soup I ever tasted.

I can't believe that our jungle trips are over, dear brother. No, really, they are not over, for how can I dip my net into another river without thinking of you? I know you are in Heaven watching me, Harald. I'll try to live up to the standards you set for me. I won't kill any animal that won't be eaten. I won't take fishes that are in their spawning grounds. I won't scream at the Indians because they tear our nets and eat our largest Discus. I'll only promise, dear Harald, that I'll try to be as wonderful a person as you are, helping and never hurting others. I can only promise that I'll try, for I know deep in my heart, that when you left the Earth, a good part of me went with you.

I'll talk with you later.

Your loving brother,  
Herbert

Dr. Martin R. Brittan

On January 8, 1966, Harald Schultz died in Sao Paulo, Brazil, apparently of a cerebral hemorrhage, at the age of 56. Thus, anthropology lost an outstanding authority on the Indians of Brazil, and ichthyology lost an outstanding collector and student of fishes. Schultz claimed that he was in no respect an ichthyologist, but his contributions were considerable in terms of new species collected and brought to the attention of scientists and of ecological data amassed. Much of the latter Schultz published as incidental to his research on Indians, with whom he often lived not as a guest really, but as one of them. But, he published more in various American and European magazines covering aquarium fishes and general natural history. His photographs, whether of Indians, birds, or fishes, were always superb, to the point where he was a regular contributor to the National Geographic.

Harald Schultz was a big man, six feet three or so inches in height, balding, and with a bespectacled, smiling face. He was sincere, gentle, and selfless (I shall never forget his spending the better part of a day travelling the perplexing streets of Brasilia locating some medication for me when I was ill). His body bore a

## SUBSCRIBE TO ICHTHYOLOGICA, The Aquarium Journal

Whether you are an ichthyologist, professional breeder or scientifically oriented hobbyist, if you are interested in keeping abreast of the latest scientific developments in aquarium fishes and their care, you can do so in only one magazine in the entire world — Ichthyologica, the Aquarium Journal. Fill in the form below, and if you are a student, be sure to check the proper box and get your subscription at half price.

Please print. Detach and send to:

T.F.H. PUBLICATIONS, INC.  
245 Cornellison Avenue, Jersey City, N. J. 07302

Gentlemen:

I am interested in subscribing to Ichthyologica, the Aquarium Journal. Enclosed please find check, money order or cash for:

- Sample copy — \$1.00
- 12 issues (one year) — \$10.00
- 12 issues at special student price — \$5.00

School Attending \_\_\_\_\_

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



Your name should be on the cover of this magazine



If it isn't, mail the coupon

Subscribers receive every issue of TROPICAL FISH HOBBYIST without fail. Subscribers are kept informed about every important development in the aquarium hobby . . . the new fish, the new people, the new products, the new techniques . . . every month. They also know that they'll always be up to date with their free supplements to EXOTIC TROPICAL FISHES. Subscribe NOW to TROPICAL FISH HOBBYIST, the biggest (more pages, more pictures, more information, more readers), most colorful (a minimum of 24 color pages in each issue), most interesting aquarium magazine in the world.

**TROPICAL FISH HOBBYIST**  
245 Cornelison Avenue, Jersey City, N. J. 07302

Enclosed please find check, money order or cash for:

- Sample copy - 35¢
- 12 issues of Tropical Fish Hobbyist, \$3.50
- 24 issues of Tropical Fish Hobbyist, \$6.25
- 60 issues of Tropical Fish Hobbyist, \$13.00

Foreign Subscribers:  
Add 50¢ per year's  
subscription.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ zip \_\_\_\_\_



The beautiful blue discus *Symphysodon ocellifasciata haraldi* is the best-known and most attractive fish named after Harald Schultz. Photo by Dr. Herbert E. Axelrod.

great scar on his drooping left shoulder, the result of a machete attack by an Indian.

Harald's wife, Vilma, and his son, Alexander, also often lived with him among the Indians, and with him accumulated many pets brought out of the jungle — beautiful fishes, birds, and mammals, including a young female spider monkey, which Harald thought of almost as a daughter.

Harald is survived by his wife, Vilma, his son, Alexander, and