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Coping with Colisa
by Bill & Joan Kratt

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The attractively marked but potentially deadly blue-ringed octopus, *Hapalochlaena*.

Photo by Keith Gillett.

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EDITORIALLY . . .

One of the best indices of the health of a hobby, its current size and potential for growth, is simply to look around and see what new products are being made available to consumers in the hobby. If the products are many and varied, the hobby usually is strong. If there aren't many new products, and if what there are of them are mostly low-cost items that don't show much inventivity and improvement over their predecessors, the hobby for which they're introduced usually is in bad shape. The reason is simple: making new products available costs money, and in most cases the people who would have to lay out the money know what they're doing. They're not right all the time, not by a long shot, but they're right much of the time, and they are careful about investing in the production of items that might not sell...they're not going to throw cash down a rat-hole by pursuing a market that is static or dying. So judging by the variety of new product announcements sent to us by manufacturers in the field in response to our recent request (we needed the announcements and photos of the products because next month we're going to begin a new products column as a regular feature of the magazine), the aquarium hobby is healthy. Manufacturers and distributors at all levels are putting money into it, which means that hobbyists will be taking more pleasure out of it. Good for us.

Not so good for us, though, are the forces underlying the winds of controversy blowing through the hobby in the form of squabbles between hobbyists who take differing positions regarding governmental restrictions about fish importations and the management of holding facilities of fishes for the aquarium market. There are basically two schools of thought at the extremes, the one holding that native fishes must be protected against the potential danger of disease introduction and environmental upset regardless of what cost the aquarium hobby pays, the other holding that the aquarium hobby should be protected against governmental meddling regardless of the potential danger to native fish stocks. Granting to the first school that there are ignorant and uncaring hobbyists and dealers and to the second that governments (all types in all places) mess up just about everything they touch, the obvious solution is to try to reach a sensible middle ground. Many people are working to do just that, but thus far the goal hasn't been reached. Let's hope it can be. If it can't, the hobby is in trouble.

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Colisa lalia, the dwarf gourami, is a nice fish, really an excellent choice for either the community tank or the single-species breeding quarters. Unfortunately, many hobbyists overlook the pretty and easy-to-live-with dwarf in favor of its bigger relatives. Maybe it's because they haven't had any good lessons in

COPING with COLISA
BY BILL AND JOAN KRATT

Although an anabantoid, the colorful little dwarf gourami has several characteristics which separate it from the more common anabantoids like *Betta* species. Most other anabantoid eggs must be carefully tended in the bubbler by the male, lest they sink to the bottom and perish unless spotted and retrieved by him. However, the eggs of the dwarf gourami float, making the presence of the male unnecessary after spawning is completed. As many anabantoids tend to, at times, consume their spawn,

Although this male *Colisa lalia* is guarding his nest, the beautiful colors he displays are not seen only at breeding time. At most, the male's colors are only slightly enhanced at spawning time, and the crisply attractive pattern shown here is normal for adult males of the species. Photo by Ruda Zukal.

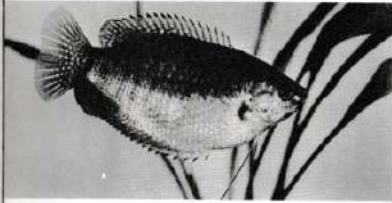


Tropical Fish Hobbyist

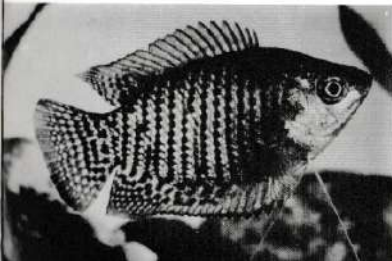
the fact that the dwarf gourami egg can be allowed to hatch unaided by a parent fish assures a successful spawning every time.

The buoyancy of these eggs also solves another problem that presents itself each time an anabantoid spawning is attempted: that is, with other anabantoids, the water level of the tank must be dropped to under 6" or so to aid the male in retrieving the falling eggs or fry. Unless your entire fish-room is kept at a temperature compatible to your fish, a heater must be kept in the spawning tank. With the water level not deep enough to accommodate one, it must be placed in a jar of water and set inside the tank. Even employing one of the new submersible heaters often fails, for the large air-space created between the water line and hood of the tank is next to impossible to keep warm and moist—conditions necessary for the rearing of fry. Also, the drop in temperature on a cold night would hardly be noticeable in, say, a 10 gallon tank when full, but the same tank with only a few inches of water will cool off enough, even with a heater working, to kill the delicate fry.

With the preceding facts under your belt, about all you will have to do now is choose your pair of fish, place them in the spawning tank, and watch.



Sexing mature dwarf gouramis is easy: in addition to the difference in color that immediately sets the male apart from the female, the male also has pointed tips at the rear of both dorsal and anal fin, whereas the female's dorsal and anal are rounded at the rear end. The photos (male by Gunter Semft, female by G. J. M. Timmerman) illustrate the difference very well.



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Both males and females of *Cotia latia* are less bold and more retiring in nature than most other popular gouramis, but they are not secretive fish by any means. They do, however, prefer to have their tank well shaded against bright light entering from the top, and a good layer of floating live plants provides them with a sense of security. Photo by Dr. Karl Knaack.



The male dwarf gourami, shown here entwined around the female beneath the bubbliest, uses much more vegetative material in the construction of the nest than other popular gouramis. Photo by Ruda Zukal.



A good pair of dwarf gouramis should be large, at least 2" in size. If you don't happen to have a pair of these fish in your collection and must purchase them, look for both size and color. A pair of these fish in spawning condition are a sight to behold. The male will be stocky-looking, almost flamboyant in his attempt to show off his color, and have the overall appearance of glowing good health. The female should have the same qualities, but be just a bit larger, have less color, and be swollen with eggs. If, indeed, you are going to be attempting to spawn a newly-purchased pair of fish, it is a good idea not to place them directly in a spawning tank upon your return. Instead, place them in a holding tank for at least a week or so, so that they may "settle down" a bit. Feed them well, preferably on live foods. (They are not too large to relish baby brine shrimp.) Our holding tank for prospective spawners contains many pairs of fish. If not crowded, and of equal size and temperaments, many fishes may be brought to spawning condition in this manner.

When your fish seem ready, place them in the spawning tank. This should be at least a 10 gallon size, spotlessly clean, filled with fresh water, an airstone, a few clumps of an artificial spawning grass (floating type), but, except for these necessities, bare. We have much better luck with spawning fish in a "bare" set-up such as this rather than trying to employ a more "natural" looking tank which could harbor unwanted bacteria or pests within the gravel or plants.

A word here, also, about something we have *not* mentioned, and for good reason: pH. Your fish have either been in your possession for a time, or, if newly purchased, they have now been acclimated to your tank conditions. Also, more than likely, the dealer in your area from which your fish were purchased has the same water as you do. Your fish were brought into breeding condition in this very water, so it could only harm them to try and change it now. We mention this point in every article we have written, but we feel so strongly about it that we feel there is cause for repetition. Very few fish nowadays are not artificially raised somewhere in this country or abroad, and the fact that they are so many generations away from the wild makes it futile to try and change them back to an environment in which their ancestors existed. Perhaps to induce the first few spawnings of these fish we must be a bit more careful concerning pH, but for the common fish which are bred by hobbyists the world over, the pH factor is not critical.

To get back to our spawners, you now have your pair of fish in their breeding tank. If correctly conditioned, your gouramis should now make your efforts prove worthwhile. They may begin to spawn immediately, or perhaps as much as a week later, but eventually they will spawn. For cleanliness sake, do not feed the fish while they are in the breeding tank.

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Larger than *Colisa lalia* and in less good supply are two other pretty *Colisa* species that spawn the same way as the dwarf gourami, except that both of these other species (*Colisa labiosa*, above and *Colisa fasciata*, below) tend to be rougher on the females in pre-spawning maneuvers. Photo of *C. labiosa* by Dr. Herbert R. Axelrod; photo of *C. fasciata* by H. Hansen, Aquarium Berlin.



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If success is not met with within 4 or 5 days, move them back to the holding tank for rest and food for a few days. Clean the breeding tank once again, and again move the prospective parents into it. When success is met, you will notice a rather randomly constructed bubble nest around the spawning grass, and, if you did not actually witness the spawning, and if it indeed has been completed, a rather thin-looking and tired female should be seen huddled in one corner, while her mate has stationed himself under the nest, assuming full charge. The pair may now be removed, and the tank lights turned off. In about 48 hours, the tiny fry will be buzzing all over the surface of the water and will also be seen adhering vertically to the sides of the tank. A day or so later, when they actually begin to swim, they may be fed with newly-hatched brine shrimp. Growth will be rapid, and within 2 weeks the fry may be moved to larger quarters for raising.

By no means did we mean, in this article, to discourage you from attempting to spawn any of the numerous other anabantoids. By all means, try them all, but start with an easy one. Being almost assured of a first-time successful spawning with the dwarf gourami, you will, in the process of watching the courtship, the spawning, the emerging fry, and finally the actual raising to maturity, gain the knowledge and confidence that will enable you to spawn and raise the other anabantoids . . . SUCCESSFULLY!

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INDEX TO EXOTIC TROPICAL FISHES SUPPLEMENTS

Below is a complete index to the first 178 supplements to *Exotic Tropical Fishes*. The index, arranged alphabetically according to the scientific name of the fish or plant(s) that form the subject matter of each supplement, gives the number of the supplement, the date of issue of *Tropical Fish Hobbyist* magazine in which the supplement appeared (or will appear), and the scientific and popular name of the fishes and plants concerned. Additionally, the index provides the number of the supplement book containing any given supplement. (These first 178 supplements to *Exotic Tropical Fishes* are available in 13 books of supplements at a price of \$1.00 for each book.*) Supplement book #1 contains supplements 1 through 16; supplement book #2 contains supplements 17 through 32; supplement book #3 contains supplements 33 through 41; supplement book #4 contains supplements 42 through 52; supplement book #5 contains supplements 53 through 68; supplement book #6 contains supplements 69 through 84; supplement book #7 contains supplements 85 through 100; supplement book #8 contains supplements 101 through 114; supplement book #9 contains supplements 115 through 128; supplement book #10 contains supplements 129 through 141; supplement book #11 contains supplements 142 through 154; supplement book #12 contains supplements 155 through 167.*

Reading from left to right, the first column gives the supplement number; the second column gives the month and year of issue; the third column gives the scientific name; the fourth column gives the popular name; the fifth column gives the supplement book number.

*Supplements 168 through 178 are listed separately at the end of this list.

* For the convenience of readers, supplement book #1 through 10, together with standard colorful looseleaf binder and complete index to the basic volume and first 141 supplements, are obtainable as a unit for \$15; purchased separately, items in the unit would cost \$16.95.

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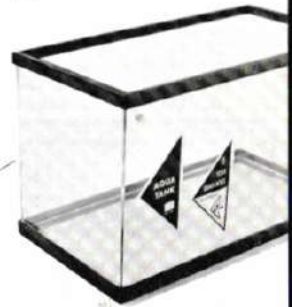
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68	2/67	<i>Acanthopthalmus javanicus</i>	Javanese Loach	5
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144	8/70	<i>Haplochromis desfontainesi</i>	Desert Mouthbrooder	11
65	1/67	<i>Helogenes marmoratus</i>	Marbled Helogenes	5
135	2/70	<i>Hemigrammocypris lini</i>	Garnet Minnow	10
64	12/66	<i>Hemigrammus coeruleus</i>	Cerulean Tetra	5
74	5/67	<i>Hemigrammus marginatus</i>	Bessam Tetra	6
28	10/64	<i>Hemigrammus nanus</i>	Silver-Tipped Tetra	2
29	11/64	<i>Hemigrammus pronch</i>	Pronek's Tetra	2
30	11/64	<i>Hemigrammus vorderwinkleri</i>	Vorderwinkler's Tetra	2
136	3/70	<i>Hemihaplochromis philander</i>	South African Mouthbreeder	10
62	11/66	<i>Hemiodopsis goldii</i>	Gold's Hemiodus	5
63	12/66	<i>Hemiodopsis storni</i>	Stern's Hemiodopsis	5
91	2/68	<i>Hemiodus gracilis</i>	Slender Hemiodus	7
72	4/67	<i>Heterandria formosa</i>	Mosquito Fish	6
47	2/66	<i>Heteranthera</i> species	Heteranthera plants	4



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#	Date	Scientific Name	Popular Name	Book #
146	9/70	<i>Pangasiusutchi</i>	Siamese Shark	11
156	11/71	<i>Parasilva longifilis</i>	Mottled Glass Catfish	12
12	2/64	<i>Pelmatochromis arnoldi</i>	Arnold's Cichlid	1
102	7/68	<i>Pelmatochromis guentheri</i>	Guenther's Mouthbreeder	8
70	3/67	<i>Pelmatochromis klugei</i>	Kluge's Dwarf Cichlid	6
110	11/68	<i>Pelmatochromis subocellatus</i>	Violet Cichlid	8
141	6/70	<i>Pelmatochromis thomasi</i>	Thomas's Pelmatochromis	10
16	4/64	<i>Periophthalmus papilio</i>	Butterfly Mudskipper	1
89	1/68	<i>Petrotilapia tridentiger</i>	Blue Petrotilapia	7
92	2/68	<i>Phractocephalus hemiliopterus</i>	Redtailed Catfish	7
93	3/68	<i>Phractura ansorgei</i>	African Whip-tailed Catfish	7
32	12/64	<i>Pisibicus dentatus</i>	Golden-Striped Slender Tetra	2
10	1/64	<i>Pimelodella gracilis</i>	Slender Pimelodella	1
95	4/68	<i>Pimelodella pictus</i>	Spotted Pimelodella	10
138	4/70	<i>Procatopus nototaenia</i>	Blue Lady Minnow	7
167	6/72	<i>Protopterus annectens</i>	African Lungfish	12
108	10/68	<i>Pseudochalceus kyburzi</i>	Kyburz Tetra	8
155	11/71	<i>Pseudoplatystoma fasciatum</i>	Tiger Catfish, Shoelmouth	12
69	3/67	<i>Pseudotropheus auratus</i>	Nyasa Golden Cichlid	6
94	3/68	<i>Pseudotropheus elongatus</i>	Slender Pseudotropheus	7
83	10/67	<i>Pseudotropheus zebra</i>	Nyasa Blue Cichlid	6
54	7/66	<i>Pterophyllum dumerilii</i>	Long-Nosed Angelfish	5
160	2/72	<i>Pterophyllum scalare</i>	Naja and Wong Golden Angels	12
140	5/70	<i>Pterophyllum species</i>	New Angelfish Varieties	10
117	4/69	<i>Pygocentrus nattereri</i>	Black-tailed Piranha	9
53	7/66	<i>Rasbora bankanensis</i>	Bangka Rasbora	5
82	9/67	<i>Rasbora cephalotamia</i>	Perthole Rasbora	6
20	6/64	<i>Rasbora sarawakensis</i>	Sarawak Rasbora	2
84	10/67	<i>Rasbora sumatrana</i>	Sumatran Rasbora	6
139	4/70	<i>Rasboraichthys altior</i>	Green Rasbora	10
46	1/66	<i>Rorippa species</i>	Water Nasturtium	4
115	3/69	<i>Simpsonichthys boitoni</i>	Brasilia Lyrefin	9
165	5/72	<i>Symphysodon species</i>	New Red Discus, Real Red Discus	12
161	3/72	<i>Syngnathus pulchellus</i>	African Freshwater Pipefish	12
132	1/70	<i>Synodontis davidi</i>	David's Upside-down Catfish	10

#	Date	Scientific Name	Popular Name	Book #
11	2/64	<i>Tetraodon lineatus</i>	Congo Puffer	1
157	12/71	<i>Tilapia mariae</i>	Tiger Cichlid, Zebra Cichlid	12
151	12/70	<i>Tilapia mossambica</i>	Mozambique Mouthbreeder	11
1	9/63	<i>Tropheus duboisi</i>	White-Spotted Cichlid	1
2	9/63	<i>Tytochavax madeirae</i>	Bristly-Mouthed Tetra	1
14	3/64	<i>Vandellia cirrhosa</i>	Candiru	1
126	8/69	<i>Xenotodon canala</i>	Silver Needlefish	9
162	3/72	<i>Xenomystus nigri</i>	African Knife Fish	12
71	4/67	<i>Xiphophorus helleri</i>	Lyretail Swordtail	6
113	1/69	<i>Xiphophorus helleri</i>	Piedtail Hi-Fin Swordtail	8
107	10/68	<i>Xiphophorus helleri</i>	True Hi-Fin Lyretail Swordtail	8
37	5/65	<i>Xiphophorus helleri</i> x <i>Xiphophorus variatus</i>	Sunset Hi-Fin Variatus	3
35	3/65	<i>Xiphophorus helleri</i> x <i>Xiphophorus variatus</i>	Black Helmet-Hi-Fin Variatus Platy	3
33	1/65	<i>Xiphophorus helleri</i> x <i>Xiphophorus variatus</i>	Delta Topsail Variatus	3
111	12/68	<i>Xiphophorus maculatus</i>	Pearl Albino Platy	8
112	12/68	<i>Xiphophorus maculatus</i>	Bleeding Heart Wag Topsail Platy	8

Below are listed all supplements included in Book No. 13.

177	1/73	<i>Ancistrus triradiatus</i>	Branched Bristle-Nose
173	1/73	<i>Austrofundulus transversalis</i>	Venezuelan Killifish
175	12/72	<i>Bacopa amplexicaudis</i>	Bacopa
176	1/73	<i>Chaeta chaeta</i>	Frogmouth Catfish
172	10/72	<i>Cryptocoryne nevillei</i>	Cryptocoryne
168	7/72	<i>Gobius jonklaasi</i>	Mountain Goby
174	11/72	<i>Parapocryptes serperaster</i>	Slim Mudskipper
170	9/72	<i>Rasbora dorsocellata</i>	Hi-Spot Rasbora
171	9/72	<i>Rasbora kalochroma</i>	Big-Spot Rasbora
178	2/73	<i>Rivulus holmiae</i>	Golden-Tailed Rivulus
169	8/72	<i>Sagittaria subulata</i>	Sagittaria

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INDEX TO EXOTIC MARINE FISHES SUPPLEMENTS

Following is a listing of the 32 supplements to *Exotic Marine Fishes* (looseleaf) made available to date. *Exotic Marine Fishes* supplements No. 1 through No. 16 were included as monthly inserts in *Tropical Fish Hobbyist*; supplements No. 17 through No. 32 (Book 2) were not. This listing is set up the same way as the preceding listing for supplements to *Exotic Tropical Fishes*.

No.	Date	Scientific Name	Popular Name	Book No.
6	5/71	<i>Acanthurus glaucopareus</i>	Golden-Rimmed Surgeon	1
18	—	<i>Acanthurus sohal</i>	Zebra Surgeon	2
8	6/71	<i>Anypserodon leucogrammicus</i>	Red-Spotted Grouper	1
26	—	<i>Apogon novaeguinae</i>	Golden Cardinalfish	2
25	—	<i>Arosetta asur</i>	Asfur	2
19	—	<i>Centropyge vroliki</i>	Pearly-Scaled Angelfish	2
11	8/71	<i>Chaetodon argentatus</i>	Black and White Butterflyfish	1
12	8/71	<i>Chaetodon fasciatus</i>	Diagonal-lined Butterflyfish	1
31	—	<i>Chaetodon leucopleura</i>	Yellow-Finned Butterflyfish	2
14	9/71	<i>Chaetodon mesoleucus</i>	Red Sea Butterflyfish	1
2	3/71	<i>Chaetodon plebius</i>	Coral Butterflyfish	1
1	3/71	<i>Chaetodon semilarvatus</i>	Golden Butterflyfish	1
13	9/71	<i>Chaetodontoplus melanotosoma</i>	Black Velvet Angelfish	1
15	10/71	<i>Chaetodontoplus mesoleucus</i>	Vermiculated Angelfish	1

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Lianerella fasciatus (Harlequin Tuskfish) photographed at Marine World by Wm. Siegrist

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Photo by Klaus Paysan

salts FROM THE seven seas

by Warren E. Burgess

While SCUBA diving off a small volcanic island, Molokini in the Hawaiian Islands, I was startled to

see a small angelfish of the genus *Centropyge* pop up out of the coral to give me the once-over. I had been studying these fishes for quite some time and knew just about every species by sight. But this one was different. I quickly set about collecting some specimens, since with SCUBA gear time is very important. Before the air ran out in my tank there were a half a dozen of these beauties in my holding container. While collecting them it was very noticeable that these small fish were not at all rare in this area. A true find! I was already thinking of new names to call this species when my reason started to overcome my excitement. Back aboard the ship, I took a good long look at these specimens and remembered that there was another species (*Centropyge fisheri*) of the genus *Centropyge* recorded from the Hawaiian Islands. I was almost sure now that that is what I had. What a disappointment! But it wasn't all that bad, since *Centropyge fisheri* was known from very few specimens, and in an

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Tropical Fish Hobbyist

hour's collecting I had almost doubled the world's supply of this fish... and in such shallow water. The original specimens had been dredged from another part of the Hawaiian Islands in waters about 25-35 fathoms deep. My collecting had been done in about only 60 feet. The new specimens had survived the trip to the surface without mishap. A *Centropyge posteri* also collected in slightly shallower water but in the same area suffered the bends and was released to return to the bottom, where the pressures were more suitable.

The fish were maintained alive on the boat, and all six arrived safely back at the Hawaii Institute

of Marine Biology, where they were placed in a 100-gallon circulating water aquarium. Two of the specimens were given to the Bernice P. Bishop Museum, one of which was photographed by my PhD committee chairman, Dr. John E. Randall. The others were kept in the aquarium for observation but unfortunately disappeared while I was away to Eniwetok with Dr. Randall. Until that time, the species had been considered very rare. Once rediscovered, however, the word got out and every skin and scuba diver seemed to be looking for *Centropyge fisheri*. Soon one or two specimens were taken on Oahu and a few more were added to the collection. Careful comparison with the original description of the species by Snyder confirmed its identification. The specimens in Oahu were all taken in relatively deep water, that is around 90 feet or deeper, but they were there.

All this goes to show that a species that is considered rare or

found only in deep water, or both, may be just as common as many other fishes. A species, for example, may be plentiful in one area but almost nonexistent in another. Two divers each exploring one of these regions would necessarily come up with widely divergent views about the relative abundance of this fish.

To cite another example, my friend Jerry Allen and I dove in the waters around Johnston Atoll (TFH Aug. 1971) searching for various fishes. I was interested in obtaining specimens of the black or Thompson's butterflyfish *Hemitaurichthys thompsoni* which had been reported as being common in that area. After a week of day-long diving, however, the only individual of this species seen was by Jerry among a school of brown surgeonfishes. Incidentally, the individual of *Hemitaurichthys thompsoni* may not have been noticed were it not for the fact that we were searching for it and Jerry had a quick eye. We dove repeatedly in the areas pinpointed by previous scientific

trips where this fish was seen in abundance. But no luck! About a month later Dr. Randall went to Johnston on another project but knew of my desire for more of these fish (for dissection and osteological work). He returned with specimens and reported that they were quite common and that he could get any number I wanted.

Apparently, then, timing is just as important as the place when the abundance of certain species is estimated.

So when you see conflicting reports about whether a fish is rare or common, remember my experiences noted above and do not criticize too harshly before all the facts are known.

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YOUR FISHES' HEALTH

by Roger Lee Herman, Ph.D.

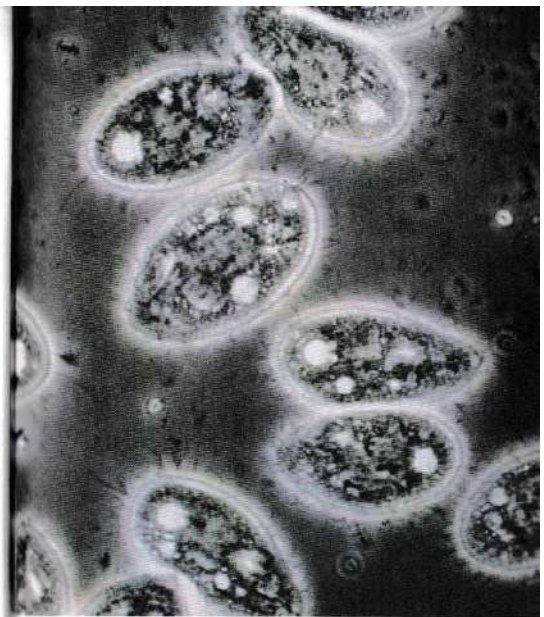
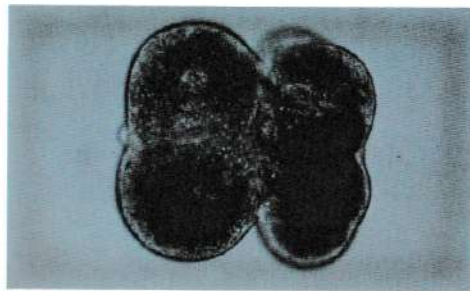
Ichthyophthirius Revisited

The February, 1969 issue of this magazine carried my column on "Ich." At that time, I described the life cycle of this parasite and discussed the treatments which could be used to combat infestation. Several recent articles have again brought this all-too-common parasite to mind. *Ichthyophthirius multifiliis* is the scientific name of

the large protozoan better known as "Ich," the cause of white spot disease.

Parasitologists often speak of host specificity, meaning that a parasite is found on or in only one or a few types of animals. *Ichthyophthirius* does not seem to have any host specificity. It has probably attacked every fresh-water species of fish kept in an aquarium. It can also be found on wild fish and has

Ichthyophthirius individual dividing into four separate organisms. Photo by Dr. Reichenbach-Klinke.



Swarming young ich parasites; these parasites will soon seek to fasten themselves to hosts. Photo by Dr. Reichenbach-Klinke.

even been known to cause large fish kills in lakes. This parasite offers another example of the spread of parasites caused by the transport of infested fish. Dr. Paperna recently reported the occurrence of *Ichthyophthirius* on fish from a fish farm

in Uganda (Africa). Previous surveys had not found this parasite on any native fish. It is probably a case of introduction via imported fish which were carrying the organism but not showing signs of disease.

Dr. Paperna noted that although the native *Tilapia* became heavily infested, they did not die from the disease. This capacity to survive severe infestations makes these fishes a serious threat in the further spread of the disease, because survivors of any disease are often carriers of the disease organisms. Dr. Paperna also found that female guppies were more heavily parasitized than the males. This may, of course, be only a function of size.

Dr. Cross of the Salmon and Freshwater Fisheries Laboratory in London, England has published a very nice review of the control methods for *Ichthyophthirius*. He has included such methods as the use of rotted soil, which seems to have worked only once, and mercury compounds, which in this day and age would seem to be verboten, as well as the more common compounds such as formalin and acriflavine.

His laboratory has used Chloramine-T (sodium paratoluene sulphochloramide) for over three years. They consider it to be superior to other chemical methods of control. The danger to fish is greater than that posed by methylene blue, but the efficacy is better. It is safer than malachite green. They caution that the pH and water hardness must be known to properly use Chloramine-T. Unfortunately, Dr. Cross does not give details of the treatment method in his review. He does

indicate that the technique will be published elsewhere. We hope it will be soon.

Raising the temperature has been suggested by some authors as a means of killing Ich and as an aid with chemical treatments. In fish culture ponds, Ich is occasionally found even in the hottest months of the year. It has been noted, however, that when oxygen levels are very low (1-2ppm) Ich does not occur. Warm water cannot hold high concentrations of oxygen or other gases. Perhaps it is not temperature but rather oxygen starvation which kills Ich when the water temperature is raised.

We have known for some time that the life cycle of *Ichthyophthirius* is dependent on water temperature: warmer water, shorter life cycle. But it has also been found that the size of the parasite varies with water temperature. The shortened life cycle found with higher temperature results in smaller adult organisms. Apparently, they mature faster than they grow.

Despite the knowledge we have of *Ichthyophthirius* and the numerous means of controlling outbreaks of the disease, we still see it extending its range through the world both in the wild and in captivity. Certainly in the home aquarium there is no excuse for Ich to occur. The simple technique of quarantine and prophylactic treatment of all new arrivals would eliminate the introduction of Ich.

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"The Salt Water People"

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Photo by H. Hansen, Aquarium Berlin

A new scientific journal has recently appeared, and the very first issue contains an article of interest to cichlidophiles. The journal is called *Aquaculture*, is primarily geared to fishes and fisheries of food and economic importance, and costs \$26.30 per year (four issues). Some clubs might wish to subscribe. The address is: Elsevier Publishing Company, Journal Division, P.O. Box 211, Amsterdam, The Netherlands.

The article of interest is by R.G. Kirk (the man who originally discovered the redbellied *Nothobranchius*, *N. kirkii* Jubb, 1969), and is a review of *Tilapia* culture, with special reference to fish farming in the heated effluents of

power stations. First of all, aquarists must realize and appreciate that several species of *Tilapia* are cultivated throughout the world as food fish and are used in a number of places (including in the United States) as game fish, of the "pan fish" or "rough fish" category. Since I have never taken a *Tilapia* on a fly rod, I'm not frowning! Israel now produces large quantities of *Tilapia* as food fish, and even exports filets to the United States. In many parts of the world *Tilapia* culture is the difference between a healthy and a protein-starved population.

Tilapia culture is recommended in the heated effluents of power stations because the *Tilapia* seem to survive all kinds of environmental



Tilapia surrounded by fry. Oddly enough, the major problem involved with stocking *Tilapia* as potential food fishes is their fecundity: they reproduce in such number that the young, having to compete with one another for food, fail to approach the size of their parents and are of no use for either food or sport. Photo by H. Hansen, Aquarium Berlin.

insults. They can tolerate high temperatures and low temperatures down to about 48°F, and can be cheaply overwintered when the power station effluent drops into this range or below. They are very tolerant of low oxygen levels and pollution and can be tremendously crowded, so long as there is a reasonable flow rate of the water to

maintain growth. In fact, it is flow rate rather than space which determines growth, assuming that plenty of food is available. The fish eat almost anything, from comminuted grains to plankton to blue-green algae, and will clear their environment of clogging algae and water plants in short order. On a vegetable diet the juveniles (three

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months of age) consume 30-60% of their own weight per day; this rate of intake drops with age or with animal fare in the diet. It goes without saying that *Tilapia* can clean up a mucky area and thus also be a source of mosquito control. Because power stations use tremendous quantities of water for cooling purposes, many are built on the seacoast and use marine or brackish water. No problem for *Tilapia*! Several species can tolerate both full-strength sea water and hypersaline water as well, as in the bitter saline lakes of Egypt. And wherever one cultures *Tilapia*, as in rice fields or anywhere else, the cheapest available foods can be used and one still raises a heck of a lot of tonnage of *Tilapia*.

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February, 1973

The only problem that has arisen (and it has arisen many times) is that so many of the fry survive. This results in competition for food, and one ends up with a lakeful of tiny but mature *Tilapia*, too small to be of use either for fishing or for food. There are several ways people are getting around this problem. One way is monosex culture, where the normal spawns are isolated until a particular age at which most males are considerably larger than most females. At this time the sexes are separated, and only one sex is stocked. Another method is the use of hybrids; since most hybrids are males (almost 100%), and the hybrids grow faster and larger than

either parental species, this method has much to recommend it. The last method is the use of predators to keep the *Tilapia* population down, producing fewer but larger fish. In Africa our native black bass is used as a predator, but the Uganda Fisheries people have determined that the catfish *Bogrus docmac* is even better.

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Guppy Corner

Guppy Champion JERRY CAMERON

"GRAND OVER-ALL CHAMPION" - 1970
International Fancy Guppy Association
"GUPPY MAN OF THE YEAR" - 1970
Guppy Associates International
by Bob Maxwell

A devoted guppy hobbyist for the past 4 years, Jerry Cameron first became interested in guppies when he purchased some unwanted

tanks and assorted fish from his nephew to complement a community tank maintained by his daughter. Close examination of his purchase revealed some most unusual fish that his daughter explained were "fancy guppies." While one could probably find many fields of recreation that might seem more appropriate for a man of Jerry's size (some 6'4") who makes his living as a roofing contractor, Jerry became more and more interested as time went by.

Checking back with his nephew, Jerry found that he had bought the guppies from a breeder, one Tom Simmons, who lived right in the neighborhood. One thing led to another, and Jerry eventually became great friends with Tom, who slowly revealed some of his "secrets" that had earned for him the annual award of the International Fancy Guppy Association, "GRAND OVER-ALL CHAMPION". The purchase of a number of breeding pairs from Tom gave Jerry the foundation on which to embark on his own breeding program. Jerry

gives full credit to Tom Simmons and the late Dick Eisenmann for leading him along the right path; it was only with their help that he was able to perfect his breeding techniques to a point where he was able to raise a true "show quality" guppy.

During his first season of exhibiting his guppies in shows, Jerry was successful in winning the I.F.G.A. Worldwide Championship for the Black Class of guppies. This was a major accomplishment indeed for a new exhibitor competing against some of the "old timers."

Jerry has turned over most of his basement to his guppies, with racks holding some 120 tanks,

brine shrimp hatchers, and tropical shelves. Jerry does admit receiving much help and encouragement from his wife "Pudge." When Jerry finds that his business will keep him from attending a show, a bit of friendly persuasion assures that "Pudge" will make it in his place. One of the important shows was being held in California, and "Pudge" suddenly found herself and Jerry guppies on a plane headed for Los Angeles. "Pudge" won't admit publicly, but she hasn't been reluctant to help clean filters since Jerry recommends that people starting off in the hobby make sure that they start with a well-established strain of guppies. He recom-

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mends visiting a guppy show and talking with the exhibitors, examining the many entries to find just what you want, and then making arrangements to procure them from the breeder. He says that every I.F.G.A. sanctioned show has many, many breeders in attendance and that this is the only way to meet them. You can at the same time make arrangements to visit them and swap some guppy talk for an hour or two.

Jerry claims, and has the awards to prove it, that only a varied diet of both live and dry food, meticulous tank care, and a heck of a lot of good luck will really result in good show quality guppies. Neglect has led to the downfall of



Jerry Cameron's World-Wide Champion multicolor strain. Photo by Midge Hill.



One of Jerry Cameron's World-Wide Champion A.O.C. strain. Photo by Midge Hill.

stretching from coast to coast and in many foreign lands, all guppy breeders brought together by a common cause.

Along with winning the "GRAND OVER-ALL CHAMPIONSHIP" in 1970, Jerry won the Class Championships in the Multi-Color, A.O.C., and the Black Class. Unfortunately for the hobby, Jerry has found it necessary to curtail his show activities during the current season because of heavy business commitments, but he looks forward to competing again in the near future.

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many a tank of exceptional fish when only a few minutes extra care would have resulted in a good number of show winners.

Jerry credits his activities in guppy shows to the establishment of a long list of friends in the hobby, a group that represents individuals from all walks of life

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Fish Behavior
by Dr. Richard D. Olson

Photo by R. Zukal

Many requests have come in for a detailed description of the basic spawning sequence followed by cichlids, particularly substrate spawners. Let me preface the description by saying that no single standardized pattern exists, but rather a general pattern exists that varies as a function of fish, water conditions, etc. Accordingly, the following is meant only as a general set of guidelines on what to expect and/or look for with most substrate-spawning cichlids.

Typically, spawning begins with the female entering the male's territory. The male erects his fins, intensifies his color, and advances toward the female. If the female is not ready to spawn she will flee the area. If ready, however, she

approaches the male; both members will display and, depending on the species involved, engage in mouth fighting. The female's behavior at this point is essentially the same as the male's, although usually not quite as intense.

When the male finally accepts the female, the first reaction that appears is a slight jerking of the head and the body (Baerends and Baerends-Van Roon, 1950). This stage is typically termed quivering. While this behavior initially occurs throughout the aquarium, it ultimately becomes restricted to the substrate where the spawning will occur. Usually this will be a stone, the glass wall, a flowerpot, etc.

At this point one member of the pair will begin nipping at the sub-

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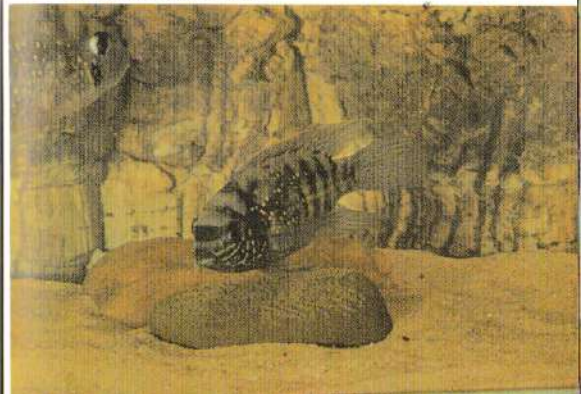
Spawning among the substrate-breeding cichlids usually is initiated by the male's advancing upon a female that has entered his territory. Photo of male (left) and female *Nannacara taenia* by Harald Schultz.

Once the female has signified to the male her readiness to spawn, the male displays before her, the display usually consisting of an expansion of the finnage and heightening of the color, as seen in the male of the *Apistogramma* species shown here. Photo by Dr. Karl Knaack.



Cleaning the spawning site is another part of the basic ritual of substrate-spawning cichlids; although sometimes all of the cleaning work may be done by only one member of the spawning pair, both parent fish usually cooperate in the task, as this pair of *Apistogramma ramirezi* is doing. Photo by Ing. H. J. Richter, Leipzig, DDR.

Fanning of the eggs is one of the last of the standard behavioral rituals participated in by substrate-spawning cichlids. Photo of *Aequidens puicher* by Ruda Zukal.



strate in an attempt to clean it and is usually joined by the other member. Soon this behavior dominates, and the substrate is cleaned of foreign particles. Once the substrate is cleaned, either member may initiate the next step in the sequence, which is skimming. Skimming involves both members swimming over the substrate where the spawning will occur as though they were actually laying and/or fertilizing eggs. I have also seen this called pseudo-spawning.

Once skimming has been completed, spawning will soon begin. After the female has laid the first row of eggs, the male swims over the substrate and fertilizes them. The exact number of eggs laid on each pass is highly variable, and literature dealing with the species being observed should be consulted for an estimate. Spawning continues as the members alternately lay and fertilize the eggs.

After the eggs have all been deposited and fertilized, the parents often take turns fanning the eggs with their pectoral fins. Eggs typically hatch in 72 hours. At this time the fry are typically held down on the substrate but level off in 24-48 hours. At this time they still cannot swim but can move slightly and even rise off the substrate momentarily. Such behavior has been termed bouncing (Olson, 1971).

Usually 72 hours after hatching the young are free-swimming and stay in a dense group (termed a

"cloud") around one or both parents. The size of the cloud expands daily, and most parents leave their young after 20-30 days.

The young remain in a school as they mature until aggression and territoriality ultimately produce independence, with males now developing their own territories. At this point the spawning cycle is ready to begin again.

References

Baerends, G. P., and Baerends-Van Roon, J. M. An introduction to the study of the ethology of cichlid fishes. *Behaviour*, 1950, Supplement No. 1, pp. 1-242.
Olson, R. D. Developmental characteristics of *Cichlasoma doriai*. *The Tropical Breeder*, 1971, pp. 5-6.

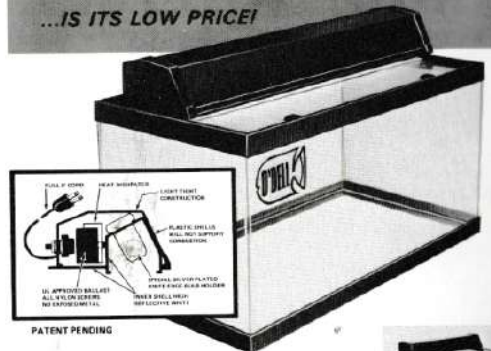
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Don't Risk Wading in the Tank

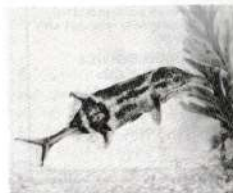
Q. 1. I have heard that stingrays do not live long in an aquarium and would like to know the average length of time they will survive.

2. Could you also give me a little information on feeding, habits, and breeding of the elephantnose mormyrid?

Jarrett Nellicks

Toronto, Ontario, Canada

A. 1. You do not specify as to whether marine or freshwater stingrays are the object of your inquiry. Freshwater stingrays belong in the family *Dasyatidae*, suborder *Myliobatoidea*, and reference to the genera *Paratrygon*, *Potamo-*



Gnathonemus tamandua. Photo by Dr. Herbert R. Axelrod.

trygon, and possibly *Eliposarus* will likely turn up information on the freshwater species of some interest to hobbyists. You will not

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find any data on average survival time in aquariums, however, as there is no average aquarium environment.

2. *Mormyrids of the genus Gnathonemus are commonly called elephant fishes or elephant-trunk fishes; G. clephas or G. petersi may be the species you refer to as elephantoise, but G. tamandua is a more likely candidate. Mormyrids are good community fishes,*

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not disturbing other fishes and seldom being disturbed by species that are inclined towards aggressive actions. They are not fussy about the quality of water but prefer that of an established aquarium and at about 75 to 80° temperature. Temperature lower than 75° can be dangerous and rapid cooling is liable to be fatal so care must be exercised when adding water to replace that evaporated. The usual live foods, particularly worms, are relished; dried foods of meaty origin are accepted, and there will be some feeding upon plant detritus. There have been no reported spawnings in aquariums.

Round Peg in Square Hole
Q. For several months I have been thinking of releasing my extra and unwanted stock of guppies into local canals and rock pits. But after reading the article in the April '72 issue of TFH about Florida becoming a zoo of imports, I'm not sure if I should. What harm can a guppy do? What would you advise?

Gerald Harris
Homestead, Florida
A. Guppies can establish a colony and perhaps entirely upset the ecology of a habitat. Everything has its place in nature, and when man in thoughtlessness adds or

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takes away an element he disturbs the balance of an environment and may set in motion a destructive sequence of changes. Destroy your unwanted guppies, give them away, or put them to use as food for larger fishes.

Sneaky Snipping Suggested
Q. I have had several bettas and have enjoyed each one, having no problems. However, I recently put a betta in a new community tank and a large angelfish damaged its fins. I began giving medication to heal the wounds but recall having read an article stating that trimming fins as close as possible would help them to grow back more naturally. My problem is How? I can't hold the betta under the water

while keeping its fins spread for clipping.

Priscilla M. Botkin
Utica, New York
A. The job may be accomplished best in stages, and very sharp scissors should be employed to assure swift, clean cutting. A fish would suffer no harm by being periodically removed from the water to make such cuts, particularly as concerns an anabantoid or other fish that has breathing apparatus to supplement its gills. But removal may not be necessary; with the fish in a small and shallow container to restrict its movement, trimming the fins can probably be managed without actually handling the fish. As a last resort, an anesthetic may be used.

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River Invaders Down Under
Q. About two weeks ago my brother and I caught ten scats from one-half to two inches long and three two-inch rock or mud cod in brackish river water near our home. They seem to be doing well in our freshwater tanks. What foods would be best for them? What temperature and quality of water shall we maintain? Would it be possible to keep these fishes in a community tank with guppies and small tropicals?

R. Collins
 Brisbane, Queensland, Australia
A. Your scats are probably *Scatophagus argus*; several of the groupers (family *Serranidae*, genus *Ephippichelus*) are commonly called rock cod. (*E. flavoceruleus*, *E. hexagonatus*, *E. merra*, *E. taovina*, etc.) Water at 74 to 78° tempera-

Scatophagus argus

Photo by Russ Zukal



ture, fairly hard and with a teaspoonful of salt per gallon is most suitable for such fishes. They will eat smaller fishes and are thus unsuitable for a community tank. The rock cod will accept almost any meaty food but prefers it in chunks, usually disdain to peck at small morsels. Generous amounts of vegetable matter such as lettuce or spinach should be provided for the scats.

Incognito as Eels
Q. I have had two spiny eels for a year, feeding them exclusively on tubifex and earthworms. They are now six inches long and I have several questions. What is their maximum size? What is the pre-

ferred pH, D.H., and water temperature for them? Can you tell me from the enclosed drawing what their Latin name is?

Matt Hamill
 Pacoima, California
A. You may expect them to attain a length of about eighteen inches. Water at 75 to 78° is recommended, and the quality of their water is not of great importance so long as it is clean. As you have been successful in keeping these fish for a year, it would seem reasonable to maintain conditions as they are, not become concerned about making changes to attain recommended specifications about water conditions. You have Mast-

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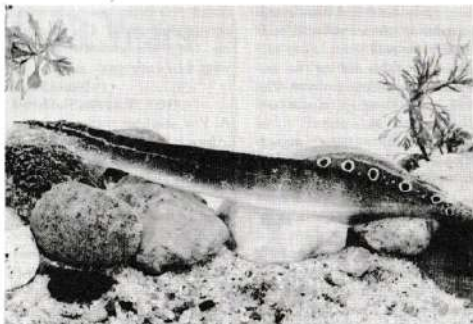
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Mastacembelus maculatus.

Photo by Milan Chvojka

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cmbebus maculatus. There are no reports of spawning in aquariums, but the spawning of Mastacembelus pancalus has been observed. This species scatters eggs at random about the substrate or on bottom-hugging plants (moss or algae) and it may well be that maculatus follows the same pattern.

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Q. We have been feeding goldfish to our three arowanas but as they and their appetites grow we are finding that such feeding is too expensive. We considered minnows as they would be considerably cheaper so asked two of our more knowledgeable local fish people. One said that he saw no reason why we should not use minnows; the other told us not to feed minnows because they carried flukes which could be transmitted to the arowanas if the minnows were not ingested immediately. May we please have your opinion? Guppies are too small for feeding; do you have any alternative to suggest?

(Mrs.) David L. Buell
 Akron, Ohio

A. There are many kinds of flukes and they are parasitical in and on many species of fishes; if minnows from local waters are hosts to flukes, other small fishes (otherwise suitable for feeding to the arowanas) would also be hosts. Perhaps by "minnows" you include all



Osteoglossum terreirai.

Photo by H. Hanson, Aquarium Berlin

such small fishes; in any case, we are inclined to agree with the first consultant but would consider the second one's admonition and take the precaution of offering only one minnow at a time and making certain that it is eaten immediately or is removed. If you are rearing guppies (too expensive to buy as arowana food), several mature ones will equal a goldfish in bulk. *Osteoglossum terreirai* is reported as individualistic in feeding habits; some refuse all but living fishes but others will accept substitutes. *Osteoglossum bicirrhosum* can be trained to eat meaty substitutes, even taking them when offered by hand.

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Q. I have managed to save about fifty fry from a recent brood of fantailed guppies. One of these fry is orange in color and generally resembles a female swordtail. Is this possible? Should I try to breed

this fish with guppies or with swordtails?

D. L. Whitehead
Pittsburgh, Pennsylvania

A. If it happened, it is obviously possible. But because a guppy resembles another species of fish does not make it that species. What you have is probably what is known as a sport, a mutation. Such out of the ordinary individuals occasionally turn up, and new strains are sometimes developed from such specimens. Breed it to its siblings to see if the genetic variance it exhibits may be passed on to some of its offspring. If so, matings among those that inherit the orange coloration will constitute a new stock. Whether or not your fish is attractive enough to make such a breeding program worth while must be determined by you. Swordtails are of another genus and are not involved.

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Itchy-Scratchy

Q. Our fish, of eight species, continue to playfully bump their abdomens on an ornamental bridge in the aquarium. Why?

Tony D'Angeli
Jacksonville, Florida

A. There is nothing playful in their actions; something is irritating them and they are seeking relief by brushing against the bridge in a scratching action. A parasite is the most likely cause, and the probable

one is the fish louse, Argulus. Removal with tweezers and painting the fish with Mercurochrome or hydrogen peroxide is one treatment. An effective medicinal bath may be prepared by adding a half grain of potassium permanganate to five gallons of water. This treatment must not be made in the aquarium, which must also be broken down and set up anew to eliminate the parasites. These measures are also effective against certain other parasites.

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On Africans Now Living Down Under

Q. Two months ago I was fortunate enough to receive a trio of fish which have been described as *Pelmatochromis dimidiatus* and also as *Nanochromis dimidiatus*. I have two questions.

1. Which of the two names is correct?

2. What information can you give on caring for and breeding this species? References to such information will be appreciated if space does not permit answering in full.

Rex W. Bytheway
Wollstonecraft, N.S.W., Australia

A. 1. The correct name is *Nanochromis dimidiatus*.

2. The information to be given here is from the TFH book *Exotic Tropical Fishes*; information on

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Nanochromis dimidiatus.
Photo by G. Sanft



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breeding of this and other species is available in another TFH publication, *Breeding Aquarium Fishes*, a 1967 work now being supplemented by a second volume on the subject. *N. dimidiatus* is a peaceful fish suitable for the community aquarium. Soft, slightly acid water at 75-80° temperature is suitable. Live foods, preferably those that sink, should be in the diet, but freeze-dried foods are accepted. Males attain a length of 3½ inches and females are an inch shorter. They are easily bred and an inverted flower pot with a notch out of the side for entrance will suit a spawning pair perfectly.

Invasion

Q. I have a 10-gallon tank housing about three dozen blue gourami fry. In it also are live *Daphnia* for them to feed upon, and I have recently noticed small creatures on the sides of the tank. They have light brown to nearly colorless bodies and move like snails in a gliding fashion. I would like to know if these are parasites or are otherwise harmful to young gouramis.

Bill Steely

Fort Thomas, Kentucky

A. It is possible that your invaders actually are snails. More likely, however, your crawling creatures

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are flatworms known as planarians or turbellarians. Such worms feed upon bacteria and debris and are harmless to free-swimming fishes, though they might eat fish eggs or fry that are not yet capable of swimming.

Mystery Killer

Q. I have a problem in keeping fancy guppies. A few days after I buy one it loses its balance and dies. What am I doing wrong? How often should filtering material be changed?

Ron Colvin

Dillsburg, Pennsylvania

A. Chilling, foul water, and swim bladder disease are among factors causing loss of equilibrium. As your losses have been at different times, disease is unlikely. Though you have given many details about your set-up, you fail to mention the size of the aquarium. Unless it is a rather large one, it is considerably overcrowded and prevention of water fouling would be a problem, and particularly dangerous with the resultant oxygen starvation. Guppies, however, are rather tolerant regarding water quality; if losses are restricted to guppies, this is probably not the factor involved, and chilling may well be your killer. When you buy guppies, get them home as expeditiously as possible and put them at once into water as warm or warmer than that in the dealer's tank. Discuss with your dealer the questions you posed about various filtering materials; changing or washing such material is best determined by appearance.

Genes Cannot Be Stunted

Q. If I bought a few baby cichlids that would attain large size in a large aquarium, would their growth be stunted by placing them in a small aquarium? If so: Would they still attain normal color; would they breed, and would their young grow to normal size if placed in roomier quarters?

Edward Koenig
Baltimore, Maryland

A. Most fishes fail to attain their wild state size when confined in hobbyists' aquariums. The smaller the aquarium, the more pronounced stunting is in many cases. Coloration is not affected, but the stunting of close confinement does prevent some species from reaching sexual maturity. The fry of stunted parents that do fully mature are genetically the same as unstunted specimens of their species and development depends entirely upon the environment in which they are placed.

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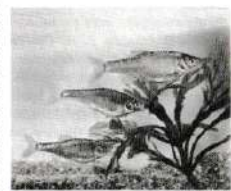
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Add to Too Short an Answer

In the February 1972 issue we responded to a letter from Leon Beasley, who reported observing a pile of brightly colored stones under spawning Georgia dace (Notropis hypselopterus) and wondered if these rocks functioned as a nest. We stated that this species generally spawns over or among fine-leaved plants. Perhaps a fuller answer should have been given, as a number of North American fishes do carry stones by mouth to construct piled rock nests and some



Notropis
Photo by Dr. Herbert R. Axelrod

other fishes, including Notropis coccoensis, N. rubellus, and sometimes N. cornutus, N. c. atramaculatus, and N. c. frontalis, expel their adhesive, demersal eggs over the upstream part of such nests. If the observed dace found no plant-grown spawning site in the area, it is entirely possible that they adopted the practice of some of their relatives and utilized a nest constructed by another species of fish.

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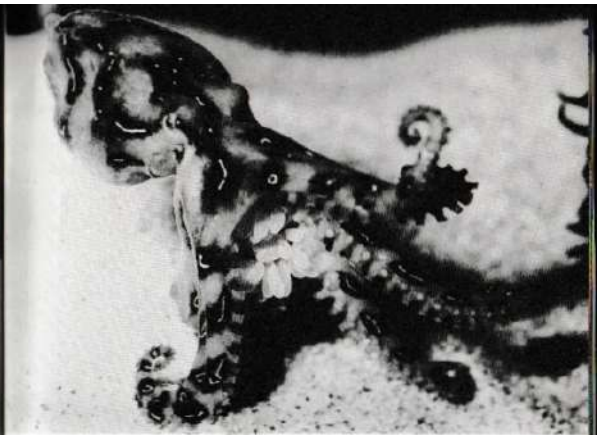
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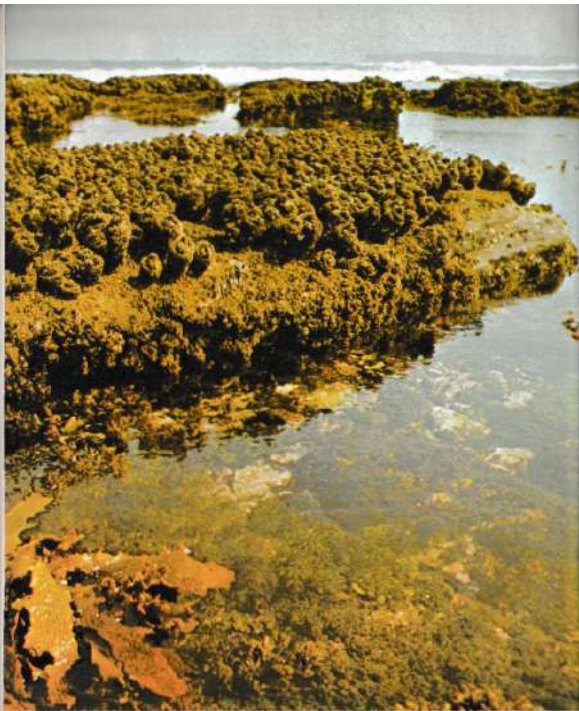


The female blue-ringed octopus carries her eggs around with her after they have been fertilized, in contrast to other octopus species, which attach them to a solid substrate. Here the rice-shaped eggs are visible at the junction formed by the octopus's arms. Photo by U. Erich Friese.

The Blue-ringed Octopus

by U. ERICH FRIESE

"Shortly after midday on June 21, 1967, three army recruits who had enlisted the previous day were walking along the rocks about 300 yards off Camp Cove beach, near Sydney (Australia). One of them, aged 23 years, found a purple-colored octopus; he placed it on the back of his left hand and showed it to his companions. He had it on his hand for some 10 minutes when he complained about feeling rather dizzy and found that he could not remove the creature, which was then pulled off and thrown out



The warmer temperate waters lying off the eastern coast of Australia are the home waters of one species of blue-ringed octopus, *Haplochlana maculosa*; shown here at low tide is a portion of such a region, with the exposed rocks covered by the sea squirt *Pyura stolonifera*. Photo by Keith Gillatt.

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to sea by one of his companions. Within a few minutes, the young man stated that he was unable to swallow and could not breathe through his mouth. By the time he had been carried back to the army camp, he was unconscious and had not been breathing for some time. Mouth-to-mouth resuscitation was applied, together with external cardiac massage. Treatment was continued while in transit to Prince Henry Hospital, Little Bay, Sydney. Despite intensive attempts at resuscitation, the victim failed to respond and was declared dead at 1:45 p.m., some 90 minutes after he had picked up the octopus.

"Post-mortem examination revealed no abnormalities, other than some degree of pulmonary congestion. Two minute faint bruises were seen on the second knuckle of the left hand, but no laceration of the skin could be seen. Examination of a section of the skin showed that the bruising lay in the dermal tissue only . . ." so reads the official account of a tragic encounter between an Australian beachgoer and a tiny but very dangerous invertebrate that occurs commonly throughout the south and southeast Pacific Ocean.

This potentially deadly animal is known as the blue-ringed octopus. There appear to be two slightly different species, both conforming to the characteristics of the genus *Hapalochlaena*. In the more subtropical and temperate waters of the eastern coast of Australia, the blue-ringed octopus is known as *Hapalochlaena maculosa*. The tropical waters of the lower latitudes are inhabited by a form known as *Hapalochlaena lunulata*, which seems to range from the northwest coast of Australia throughout the Indo-Malayan Archipelago.

The blue-ringed octopus is a small cephalopod which rarely exceeds 20 cm in length, measured from the tip of one arm across the body to the tip of an opposing arm. Along the eastern coast of Australia, this species obtains a maximum weight of about 100 grams. However, the average mature animal seems to be rarely heavier than about 40 grams. At rest, this octopus is of a rather variable, often motley, brownish color, with more or less pronounced dark brown to ochre bands over the body and the arms. There are a series of faint blue irregular circles superimposed upon these bands, hence the name "blue-ringed octopus." When the animal is being aggravated or disturbed, the colors darken rather dramatically, and the blue rings become an iridescent peacock-blue.

The blue-ringed octopus is common in the shallow inshore waters around Australia. A study made by the Australian Commonwealth Serum Laboratories showed that this animal occurred at 20 different holiday resorts around Port Phillip Bay, Victoria. The Taronga Aquarium in Sydney received within one year 12 blue-ringed octopuses, collected at various local beaches. In view of such high population density of this dangerous creature, the scarcity of reported bites from it is indeed surprising.

In its natural habitat, the blue-ringed octopus, essentially a nocturnal animal, seems to inhabit any of a number of hiding places, such as small caves, crevices, and under rocks. Empty beer cans and soda pop cans are favorite substitutes. This octopus is also seen rather frequently in clumps of camjerei (*Ascidia*), or sea squirts, along the eastern Australian coast line.

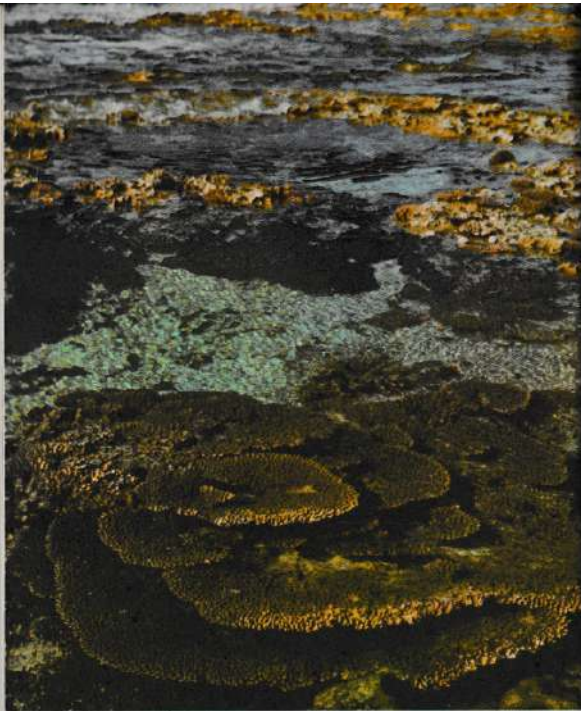
Like all other cephalopods, the blue-ringed octopus feeds on a variety of shrimps and crabs. Observations of captive specimens have shown two basic feeding patterns. If the animal had not been fed for some time and thus was hungry, a live crab offered as food was aggressively attacked. The octopus darted across the aquarium and descended upon the crab, biting



Blue-ringed octopus in motion. Photo by U. Erich Friese.

it with its beak and attempting to restrain the crab with its arms. The octopus began feeding as soon as the crab's movements had ceased and it had succumbed to the cephalopod's venom.

However, when an octopus in the experiments was well fed, it merely glided over to the crab, visibly squirted saliva into the water surrounding the prey, and then retreated a short distance away to watch and wait. Within a couple of minutes, the crab would go through a series of convulsions and become ataxic in its gait. Finally all movements would stop. When the crab was completely motionless, the octopus would approach again and begin feeding on it.



In the warmer Australian waters, which is for the most part those surrounding the northern part of the country, the native blue-ringed octopus species is *Hapalochlaena lunulata*. The northern Australian shoreline shown above, with partially exposed stony corals visible at low tide, provides many hiding places for small octopuses. Photo by Keith Gillett.

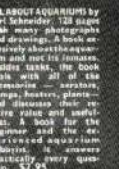
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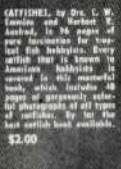
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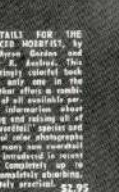
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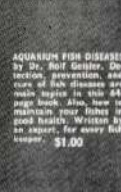
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