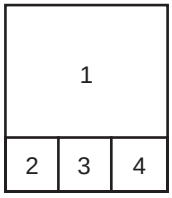
Volume 1

The CICHLIDS yearbook

Ad Konings (Ed.)

CICHLID PRESS



Cover photographs:
1 - *Benthochromis tricoti*, Lake Tanganyika, Zambia.
2 - *"Cichlasoma" labridens*, Media Luna, Mexico.
3 - *Symphysodon aequifasciatus*, variety.
4 - *Otopharynx lithobates*, Zimbawe Rock, Lake Malawi, Malawi.

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The CICHLIDS yearbook

Ad Konings (Editor)

Fascination with cichlids has taken many aquarists to the point where they go and observe these wonderful fishes in the natural habitat. The hunger for more knowledge about the cichlids' behavior and distribution, and especially for more new species has led to the introduction of an overwhelming array of previously unknown species and varieties. The speed with which new species are discovered or re-discovered is sometimes too great to give a newcomer a chance to establish itself in the hobby. We, the authors of the yearbook, want to give a chance to those species which are new or unknown and which deserve a wide distribution among hobbyists. Starting with this yearbook every year the newest, the most important, the most interesting and, not least, the most beautiful cichlids will be introduced to the hobbyist. All (re-)introductions will be accompanied by a color picture and the currently known information. Such information can only be supplied by aquarists (or scientists) who are specialists in their fields. Many authors have contributed to the first edition of the cichlid yearbook. They will be introduced by the editor.

The yearbook starts with the section "Tanganyikan Cichlids". René Krüter, who is importer of Tanganyikan cichlids (Krüter Tropicals, Holland), has made several expeditions to Lake Tanganyika. He reports on his observations of *Benthochromis tricoti* and some other species.

The second section, "Malawian Cichlids" is highlighted by an article written by Dr. Ethelwynn Trewavas. She is the world's most renowned cichlid-ichthyologist and has worked for more than 60 years on Malawi cichlids.

Photographer, diver and naturalist Mark Smith (Fountain Valley, California) reflects his vivid interest in cichlids in the various articles he has contributed to the yearbook. Peter Baasch (Freiburg, Germany) has bred several Malawi cichlids for the first time in captivity. He reports on a beautiful predator from the lake.

Victoria cichlids deserve a much better appreciation among aquarists than has been the case up to now. Laif DeMason, who imports the widest variety of cichlids from all over the world (Old World Exotic Fish, Miami, Florida), has made several expeditions to Lake Victoria and knows these fish from first hand. His contribution deals with beautiful and new discoveries.

The cichlids of West Africa are totally different from the previous groups. Specialist Roland Numrich (Mimbon Aquarium, Köln, Germany) has made many expeditions to this part of the world and has caught, bred and raised many of the newer finds. His article describes two new species of *Chromidotilapia*.

The section "Central American Cichlids" starts with an excellent article by Juan Miguel Artigas Azas (San Luis Potosí, Mexico), who has more than 15 years experience of the natural habitats of Mexican cichlids. On one of his countless expeditions he re-discovered *Paraneetroplus nebuliferum*, which had been elusive since its original description in 1860.

Willem Heijns (Stiphout, Netherlands) is editor of the periodical of the Dutch Cichlid Association and has kept and bred almost every Central American cichlid. He has contributed several fine reports on the latest developments.

The section "South American Cichlids" has been written by two esteemed specialists, Ron Bernard (Rotterdam, Netherlands) and Frank Warzel (Mainz, Germany). Ron has written many articles dealing with South American cichlids and has collected cichlids in Peru. Frank is super-specialized on *Crenicichla* and knows more about the pike cichlids than anybody else.

Gerard Tijsseling (Gouda, Netherlands) and John Szwechlowicz (Holton-Le-Clay, UK) provide us with valuable tips on how to better enjoy and breed cichlids.

The yearbook ends with a literature section where a few very important publications, related to cichlids, are discussed. Nobody else could do this better than the two authors Martin Geerts (Swalmen, Netherlands) and Lee Finley (Pascoag, Rhode Island). Martin is the ichthyological conscience of the Dutch Cichlid Association and Lee that of the American Cichlid Association.

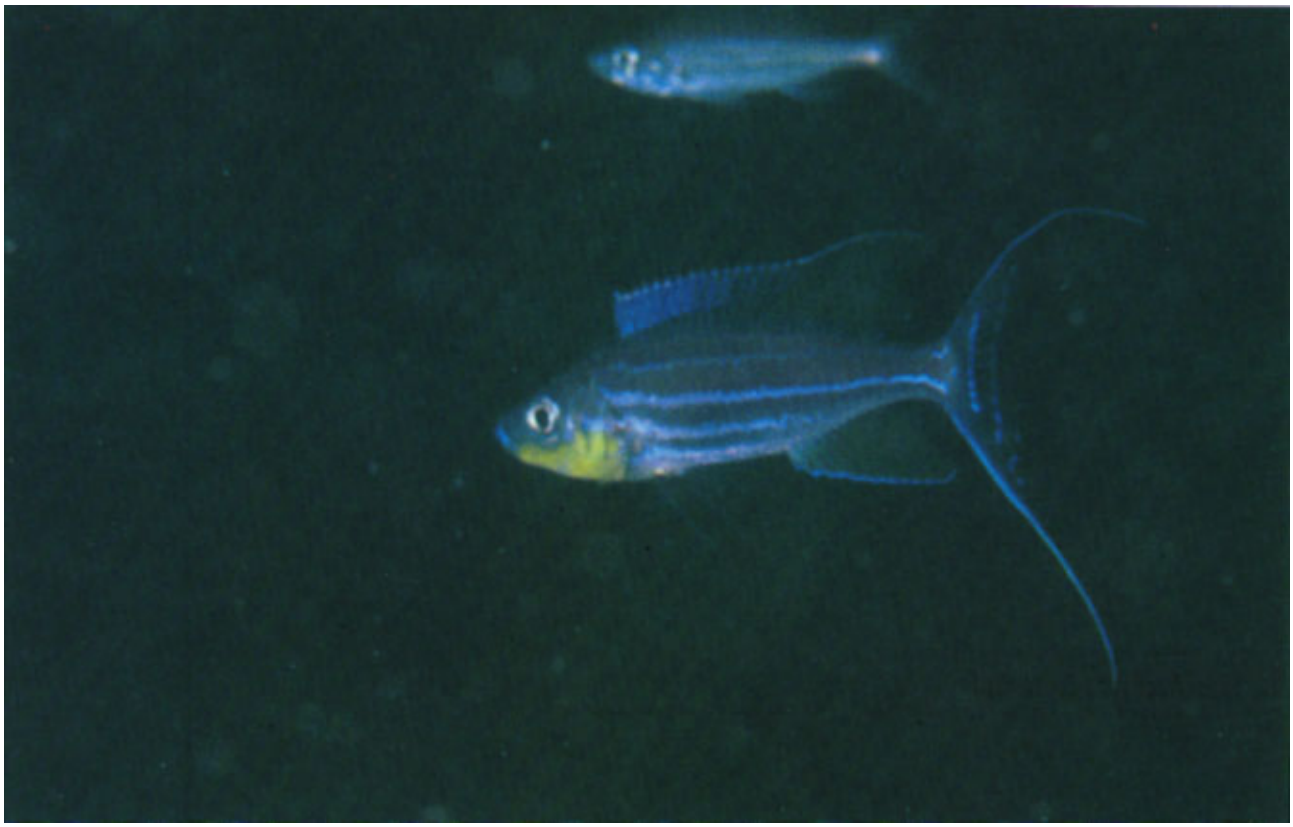
This fantastic team of authors provides for an authoritative treatment of the latest developments in the cichlid-keeping hobby.

Your editor

TANGANYIKAN CICHLIDS

The giant featherfin

René Krüter



A courting male *Benthochromis tricoti*, taken in Zambian waters by René Krüter.

In 1948 Poll described *Benthochromis tricoti* as *Haplotaxodon tricoti*, but later, in 1984, he split the two different populations, which he originally thought belonged to one species, into two species: *Haplotaxodon tricoti* and *H. melanoides*. Two years later he gave these two species their own genus, *Benthochromis*.

The name *Benthochromis* alludes to the assumption that the species of this genus live at deep levels. Benthos is Greek for "depth". *B. tricoti* differs from *B. melanoides* by its larger maximum size which is about 20 cm; *B. melanoides* remains about 3 cm smaller. Also *B. tricoti*, at least in males, has longitudinal stripes on the body. *B. melanoides* has a number of black blotches on the head. The females of both species have an overall silvery-gray coloration.

The food of *B. tricoti* consists of small invertebrates, such as crustaceans and zooplankton. Although it attains a considerable size *B. tricoti* is not a piscivore.

B. tricoti is mainly found in the southern part of

Lake Tanganyika. It is abundant in the deep to very deep layers. Several investigations, including those done by the Zambian Fisheries, revealed that the densest populations were to be found between 100 and 150 meters deep. Another species which is abundant at these levels is *Cyphotilapia frontosa*.

Normally I found *B. tricoti* where the rock formations on shore descended at a steep angle. I have never found this species in water shallower than 35 meters and at this level usually no more than a few solitary individuals. At 65 meters I found many more individuals, including several territorial males. The population density between 100 and 150 meters may be so high that many escape to higher levels or they may migrate to higher levels to spawn. Unfortunately it is impossible, with the available diving equipment, to descend to deeper levels in safety.

Sexually active males try to obtain a territory on top of a conspicuous rock and defend this, like *Ophthalmotilapia ventralis*, against conspecifics. I have, however, never found sand in these territories. The bare rock is defended against rivals. During territorial disputes males show their finest coloration; the spectacle of fighting and courting *B. tricoti* is one of the most fascinating splendors of the lake.

The courting behavior is very characteristic. As soon as a female approaches the breeding colony, she is surrounded by a few males. Each of them tries to lead her — while swaying his body heavily — to his rock. When the male arrives at the rock he takes a peculiar posture. With all fins erect the male *Benthochromis* puts himself in an oblique, head-up position. The dorsal fin is fully erected so that the first few spines point forward. Also the mouth is opened completely and the buccal sac is inflated. The male remains in this position for a few seconds showing his best to the female. Sometimes a weak vibration enhances the display.

Unfortunately I have never witnessed a spawning. The size of the fry in the mouth of some females is remarkable. Sometimes the fry had a length between 3 and 4 cm. This may indicate that the larvae and fry feed inside the female's mouth. If they feed within the mouth the female has to eat appro-

When courting, *Benthochromis tricoti* has its mouth wide open. This is also seen in species of *Cyprichromis.*

A male *Benthochromis tricoti* displaying.

A male *Benthochromis tricoti* leading a female (not visible) to its nest.

priate food, or she must release the fry from time to time to let them eat by themselves. This may further indicate that the female takes care of the fry even after they have been released for the first time. Successful breeding in captivity may give an answer to these questions.

B. tricoti is an ideal aquarium resident. It is neither aggressive nor predatory. Despite its relatively large dimensions, *B. tricoti* does not require an enormous aquarium. After a relatively short acclimatization period males regain their splendid coloration. This in contrast to e.g. *Cunningtonia* and *Cyathopharynx*, who need a long period of acclimatization before full coloration returns.

B. tricoti is one of the most difficult to catch fish in Lake Tanganyika. The main reason is the depth of their preferred habitat. At just a few known locations they can be found at depths of less than 40 meters. Yet 40 meters is rather deep for a Scuba diver. If we want to collect fish as well we encounter some problems. A method has to be developed to bring these fish to the surface alive. It is fatal to take a cichlid straight from these depths to the surface. The closed swim-bladder, which is filled with air, will expand drastically because of the decreased pressure at the surface and may even burst. The other internal organs will be forced out via the anus and throat, which leads to the inevitable death of the fish. That is why cichlids from these depths have to be decompressed very carefully, in order to give the blood enough time to absorb the excess air from the bladder. The time it takes to surface *B. tricoti*, caught at 35 meters, is five days.

I have noticed that fish can voluntarily alter their depth range much quicker than when they are forced to do it. My observation is that decompression takes much longer when a fish is brought to the surface against its will.

Another problem with *B. tricoti* is the females. When we descend to a depth of 40 meters all *Benthochromis* will be scared away. The territorial males will return after a while, but of the females no sign at all. The females seem to stay in small schools far away from anything dangerous. The few females that have been caught up to now got accidentally stuck in the net.

Personally speaking, I think *B. tricoti* is one of the most beautiful aquarium fishes. It has a very interesting behavior and I hope to solve a few of its mysteries on my future trips to the lake.

Three beautiful sanddwelling cichlids

Ad Konings

A male *Enantiopus* sp. "Kilesa" courting a female.

The cichlids from Lake Tanganyika are well-known for their diverse behavior and enjoy a wide interest among hobbyists. Of particular interest are the so-called sand-cichlids. These fish, mainly of the genus *Xenotilapia*, live over the open sandfloor of the lake. To protect them against predators their bodies are silvery or sand colored and they live in large schools, which gives protection to the individual. During the breeding season the males of at least three sand dwelling species acquire a beautiful and conspicuous breeding dress. One of these species, *Enantiopus* sp. "Kilesa" has not been described yet; the other two species are *Enantiopus melanogenys* and *Xenotilapia ochrogenys*. The latter two species have been observed in the natural habitat in Burundi, Tanzanian, and Zambian waters, but are reportedly also present along the western coast of the lake (Poll, 1956). *E.* sp. "Kilesa" was exported from Zaire, probably from a location named Kalumbie.

E. melanogenys was described by Boulenger in 1898 as *Ectodus melanogenys*. A few years later, in 1906, the same author placed it in *Enantiopus*. Poll placed this cichlid in *Xenotilapia* (1951) and back in *Enantiopus* (1986). *X. ochrogenys* was described as *Enantiopus ochrogenys* by Boulenger in 1914 and placed – by Poll (1946) – in *Xenotilapia*.

Greenwood (1978) demonstrated clearly that both these species possess different anatomical features which means that they are unlikely to belong to the same genus.

E. melanogenys and *E.* sp. "Kilesa" are very slender, elongated cichlids with a long snout. *E.* sp. "Kilesa" differs from *E. melanogenys* by the shorter lower jaw (see photos). All known species of the genus *Xenotilapia* have slender bodies but rounded heads. Their snout profiles descend steeply. The two species of *Enantiopus* reach a maximum size of about 16 cm; the maximum size of *X. ochrogenys* is about 12 cm.

There are no distinct geographical races known for *E. melanogenys* nor for *E.* sp. "Kilesa". The populations of *X. ochrogenys* along the coast of Burundi and Tanzania do not vary – regarding male coloration – but in Cameron Bay, Zambia, another variety (or species) has been observed. The so-called "Ndole Ochrogenys" differs from the widespread variant of *X. ochrogenys* by prominent black spots on the flanks and by the larger maximum size – approximately 14 cm.

These sanddwelling cichlids forage in large schools in rather shallow water. The maximum depth recorded for *E. melanogenys* is 40 m but most

A male *Enantiopus melanogenys* defending its territory.

specimens are seen in depths of less than 10m. When not breeding males have the same sandy, silvery coloration as females. It gives them optimum camouflage on the sandy bottom. Most individuals of one school remain together in the same school throughout their lives. A school is probably formed at the moment of the simultanuous release by the mouthbrooding females. The youngsters grow and breed together until they die after about three years.

All three species are mouthbrooders in which only the female incubates the eggs and larvae. Breeding has been observed throughout the year but the highest activity takes place during the rainy season – from December until May. During the rest of the year most of the schools move around and forage in different areas. *X. ochrogenys* normally occurs in small schools of up to 30 members, but the schools of the two *Enantiopus* may number in the hundreds. Because there are so many fish in one school together they do not have to seek shelter when they want to breed, as many other sand-dwelling cichlids do. Since most members of the school have the same age they all attain their reproductive phase at about the same time. It seems that *X. ochrogenys* has attached itself to the breed-

The lower jaw is shorter in *E.* sp. “Kilesa” (above) than in

A male *Xenotilapia ochrogenys* from the Ndole Bay population.

The territory of *E. melanogenys* is flat (above) whereas

ing colonies of the *Enantiopus* since they are usually found breeding together.

During the breeding season males defend their territories and try to persuade females to spawn in their nests. The actual breeding may take place in bouts which would last for less than a week. During this period the fish do not eat but concentrate on spawning. The season begins when the males start staking out their territories in the sand. A male *E. melanogenys* digs a flat, saucer-shaped territory with a diameter of about 60 cm. In the center of the territory, he digs a small pit with a diameter of about 15 cm. This will be the nest in which the spawning will take place. The territory of *X. ochrogenys* is rather peculiar; it consists of three to eight turrets built by heaping sand. They are put in a circle around the spawning-site which is a round, saucer-shaped pit with a diameter of approximately 10 cm. The territory of *E.* sp. "Kilesa" is a very interesting "mixture" of the former two types. In an aquarium, a male will occupy a large area in which he makes several nests! These nests are shallow pits with a diameter of about 15 cm. Around these nests the male heaps sand turrets all over its territory, sometimes more than 20. A spawning usually takes place

in a single nest but next time they may spawn in another.

The nests of these sanddwelling cichlids are meticulously cleared of small pebbles which are larger than the prevailing sandgrains. The reason why males take the trouble to remove larger grains is obvious: the female will not then mistake a tiny pebble for an egg when she collects them during spawning. On an evenly structured sand-nest the eggs are more conspicuous and can be collected faster.

When the arena is ready the male starts courting. Here we notice some differences between *Enantiopus* and *Xenotilapia*. A male *X. ochrogenys* attracts a female to the nest with its fins fully extended, except the first part of the dorsal fin which is just half-extended. A male *Enantiopus* attracts females in a most peculiar fashion. Rivals are chased with all fins erect, but females are seduced to the nest with all fins down! The only thing extended is the buccal cavity as in *Xenotilapia*. Furthermore the male lies almost completely on its side when attracting the other sex. When more than one male is around the female is not chased when she ignores the courtship of a male. As a female passes over the different territories we see the males, one by one, lying on their sides and trying to seduce her. The males, however, stay in their territories.

When a female is ready to spawn she responds to the display of the male. As soon as she enters the nest, the male circles around her with fins erect – in *Enantiopus* as well as *Xenotilapia*. Males are so excited that they first chase all other fish away from the nest. Meanwhile, the female remains motionless in the nest. After clearing the site of intruders, the male enters the nest with fins erect and buccal cavity extended. He gently pushes the female in the hind part of her body and so encourages her to start circling around. During circling the male vibrates his extended buccal cavity. After two to three uninterrupted rounds, the female suddenly slows down and lay some eggs. The male too stops circling and waits impatiently for the female to move from the site and leave the eggs to be fertilized. One to eight two-millimeter long eggs are deposited at a time. As soon as the female moves forward the male shoots over the eggs and releases its milt. The eggs are thus fertilized outside the female's mouth. At the end of the spawning cycle the female will not release any more eggs, but the ritual goes on long after that. Every time she moves forward the male shoots like an arrow over the barren sand. Sometimes a male can be so excited that it shoots over the female when she does not move fast enough.

The batch sizes vary between 30 and 80 eggs for the two species of *Enantiopus* and between 10 and 40 for *X. ochrogenys*. A male may spawn with two females on one day. In a short period all females are gravid. After three weeks the fry are released and are rather small. In one year they are mature and might spawn in the next breeding season.

During spawning, in captivity, the pair is frequently disturbed by other fish. The male spends much time chasing away intruders. It is possible that the female gets upset by these frequent interruptions and she may need a break for half an hour. Once I observed that the female continued spawning with another male, after such a break. On another occasion I noticed that a badly disturbed pair of *E. melanogenys* quit spawning and that the female spat out the few eggs some hours later. The next day she continued spawning with the same male.

E. melanogenys, *E.* sp. "Kilesa" and *X. ochrogenys* are great residents for the Tanganyika aquarium. We should not mix them with large or rough fish which will very likely damage the somewhat fragile females. If we want to enjoy the spectacular view of a male in full color, we must give him a rival. Two or more males enhance each other's activity and bring out the best colors. If only one male is kept, with several females, spawning takes place but usually without the sparkling colors of the male.

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Neolamprologus sp. "Cygnus"

Ad Konings

At a size of about 2 cm, a juvenile *Neolamprologus* sp. "Cygnus" shows its best coloration.

In spring 1988, Walter Dieckhoff discovered a new Lamprologine along the Tanzanian coast, near Ikola. He managed to collect five specimens alive but eventually only two survived the strenuous trip to Europe. These two fish happened to be a male and female. In a bare tank they didn't look much different from a variant of *Neolamprologus brichardi*, but Walter assured me that they behave differently. He noticed that the Cygnus, as I named them later, live in pairs or solitary and not as gregariously living pairs which is known for *N. brichardi*. Walter further observed that the Cygnus remains close to the rocks—a little like *N. furcifer*—and that they have a dark blue-brown coloration with conspicuous blue eyes. I was fortunate to get this pair. I first placed them in a large tank with other fish in order to get them acclimatized to the type of water and to each other. The male and female harmonized well together and I decided to put them together in a small breeding tank (50 litre) which was decorated with rocks and a flower pot. Even at their relatively large size of about 9 cm the pair did well. After about two months I noticed the first fry. There were three in total. With Cygnus it is not the quantity but the quality that counts. These three babies were the most gorgeous lamprologus I had ever seen. The yellow-orange fins and patches on the head were absolutely unique. About two weeks later the pair spawned again – only one youngster made it to the free swimming stage. The pair kept on spawning about every fortnight for more than a year. The broods, however, never contained more than 16 fry. In females the yellow coloration on the head remains much longer than in males but is lost – except for a faint tinge – at a size of about 5.5 cm. Tankraised Cygnus have larger nests, even at a smaller adult size. When kept in a dimly lit tank, a pair with 20 mini-butterflies is an unforgettable sight.

A wildcaught male *Neolamprologus* sp. "Cygnus".

Altolamprologus calvus (Poll, 1978)

Ad Konings

A wildcaught male *Altolamprologus calvus* from Chilange Rocks, Zambia.

Altolamprologus calvus is a small predator cichlid which lives in the southwestern part of the lake. Its maximum size is about 15 cm, but most adult individuals measure between 7 and 10 cm for females and between 10 and 13 cm for males. The female – at the same age as the male – is considerably smaller than the male.

Three different geographical variants are known for *A. calvus*. The holotype is from the population with the deepest black coloration which is found in the southern part of the Zairean coast and in Cameron Bay. The White Calvus occurs around Cape Chaitika which is probably the most eastern population. Here it shares the habitat with the Yellow race of *Altolamprologus compressiceps*.

In 1988 René Krüter discovered a completely yellow race of *A. calvus* at Chilange Rocks. This location lies between those of the black and the white populations. Since then the Yellow Calvus has become a valuable addition to the Tanganyika aquarium.

The best way to keep *Altolamprologus* in a tank is to restrict oneself to one pair only. At a size of about 5 cm the Calvus can be sexed by inspecting the vents. To be sure you should check several specimens to get the idea how a female and male should look. Females, which are much smaller than males, have a distinctly broader genital papilla than males. The larger the fish the easier it becomes to "vent" them. The chosen pair are best put together with other fish in a community aquarium. You can keep either *A. calvus* or *A. compressiceps* in one tank but avoid having both species together.

When *A. calvus* is not breeding, it does not show any territoriality. Breeding starts when a female starts guarding an empty shell. Females have been observed breeding in a shell in the lake as well. It is important to use a small shell. I have spawned several pairs of *A. calvus* on a monthly basis using an empty *Lanistes nyassanus* shell. This is the snail from Lake Malawi. In their natural habitat, *A. calvus* normally choses a small pocket in a rock, especially when the female is to big to fit in a *Neothauma* shell. The male should not be able to enter the shell.

During spawning, when the female sticks her eggs to the inside of the shell, the male will be over the entrance of the shell and discharges its milt. The best sign that the pair have spawned is the observation that the female stays, most of the time, inside the shell. The male will be territorial now and defend the shell with great vigor. About two weeks after spawning the first fry appear in the opening of the shell.

Neolamprologus sexfasciatus (Trewavas & Poll, 1952)

Ad Konings

A wildcaught female *Neolamprologus sexfasciatus* from an unknown location in Zaire.

Neolamprologus sexfasciatus occurs in the southern half of Lake Tanganyika. It is mainly found, in shallow water, in the intermediate biotope where sand is present between the small heaps of rocks. *N. sexfasciatus* occurs solitary or in pairs. Breeding pairs normally have youngsters which they defend until they produce the next spawn. Sometimes juveniles of a size larger than 3 cm are still guarded by the parents.

Three different geographical races are known. The holotype was collected on the Zairean coast and probably looked like the fish in the picture above. The first variety that was exported came from Zambia (see photo). It occurs along the entire Zambian coast except for the eastern part near the Tanzanian border. The populations along the Tanzanian coast are completely yellow and have been exported several times.

The Golden Sexfasciatus, as this race is called, has been successfully bred in captivity but the Blue Sexfasciatus from Zambia never.

In behavior (as far as one can judge from observations in the aquarium) there is a difference between these two races too. The Blue Sexfasciatus shows a much more piscivorous appetite than the Golden variant. The former cannot be kept with fishes smaller than 5 cm! The race from Zaire seems to have a similar behavior to the Golden Sexfasciatus.

Neolamprologus sexfasciatus from Zambia.

It is impossible to keep more than one pair in an aquarium. In very large tanks (more than 750 liter) two or three females might do well, but usually they quarrel among each other.

N. sexfasciatus is a cave-brooder and we therefore have to supply the pair with some caves. The best way to proceed is to let the female adapt to her new environment first. When she is acclimatized then the male can be introduced.

Neolamprologus leloupi (Poll, 1948)

Ad Konings

A female *Neolamprologus leloupi* showing a defensive posture.

Neolamprologus leloupi was described by Poll (in 1948) from a single specimen which was collected a little north of Moba, on the Zairean coast. Thirty years later, the same author described *Neolamprologus caudopunctatus*, a cichlid from the Zambian coast. This fish closely matches *N. leloupi* in anatomical features but lacks the distinct black margin in the tail fin. In 1988 Walter Dieckhoff discovered two other populations of Leloupi-like cichlids on the Tanzanian coast. One of these cannot be distinguished from the holotype of *N. leloupi*. The other one closely resembles the Zambian *N. caudopunctatus*.

Pierre Brichard (1989) concludes in his monumental book that *N. leloupi* occurs in different geographical populations and that *N. caudopunctatus* should be regarded as a synonym for *N. leloupi*.

Recently Janicki imported another variant from the shores of Zaire. A female of this race is shown in the picture above. The trade name, under which I acquired these pretty fish, is "Red Fin Caudopunctatus". I think that Brichard's opinion will be accepted by most taxonomists, so we should call this little cichlid *Neolamprologus leloupi*.

N. leloupi lives in the intermediate habitat, where rocks lie scattered over a sandy bottom. In Zambian waters it is one of the most abundant cichlids in this biotope. Schools of hundreds of individuals are a common sight.

In the aquarium, *N. leloupi* behaves rather peacefully as long as we keep just one pair. Most of the male's aggression is directed towards conspecific males. It can be kept with very small fish too. *N. leloupi* is mature at an age of about one year and may spawn at a size of about 4.5cm. Although it has been observed spawning in an empty *Neothauma* shell, the pair prefers something larger than that. If no cave is present they will start digging one under a stone. During the process the entrance to the cave is concealed by a wall of sand (or gravel). If we provide the pair with a small flowerpot, with its bottom removed and placed upsidedown in the sand, we can chose the position of their territory. They will readily accept the pot and try to conceal it by throwing sand against it. The result is a heap of sand with only the top of the pot sticking out. The size of the territory depends on the size of the fish and the population density of the aquarium, but usually it is about 30 cm in diameter. Any intruder is chased from this area but youngsters (to a size of at least 2.5 cm) from a previous spawn are tolerated.

Neolamprologus mustax (Poll, 1978)

Ad Konings

A wildcaught *Neolamprologus mustax*, collected near Mpulungu, Zambia.

Neolamprologus mustax is not a common cichlid, either in the wild or in captivity. Its first introduction, in the mid-seventies, was hampered by a wrong identification and by the fact that a fake coloration was applied on a picture of the Cameron Bay variant, the so-called "Blue Mustax".

The first specimens exported to Europe were caught in Cameron Bay. The fish of this population have a grayish-yellow body color and yellow fins. But this race displayed mainly the rather dull gray color when held in dealer's tanks. Nevertheless, it was named "Blue Petricola". It was then still an undescribed species but some thought it could be *N. petricola*.

N. mustax is reported only from the southern part of the lake where it has been found in Zambian waters. It is a small, rock dwelling cichlid with a maximum size of approximately 9 cm. Several different populations are known. Most of them have fish with yellow fins. Some populations, like those at Cape Chaitika and near Mpulungu, have completely yellow or orange-yellow individuals. The name Mustax means beard which reflects the white coloration on the chin and lower part of the head and which is seen in all known populations.

In its habitat *N. mustax* is difficult to observe as it mainly lives in the dark cracks between the rocks. It is thus also difficult to collect which makes it a rather expensive Tanganyikan cichlid.

N. mustax belongs to a group of rock dwelling Lamprologines in which we also find the better known *N. leleupi*, *N. longior* and *N. cylindricus*. All of these species live solitary or in pairs when adult. They are rather intolerant of the presence of conspecifics. It is therefore difficult to accommodate several individuals in one aquarium. It is a good idea to acquire just one male and a female. If the tank is large enough (about 750 liters with lots of rockwork) both may be introduced at once but it is better to let the female acclimatize first.

If not properly fed or kept, *N. mustax* may lose its deep yellow-orange coloration. It needs a lot of carotene-rich food like *Cyclops*, *Mysis* or other algae-eating crustaceans. Besides a lot of shelter in the rockwork it needs clean water with a high pH, preferably above 8.0. The colors of *N. mustax* may fade initially but after treating it right, it will display the golden yellow as brightly as in the wild.

Greenwoodochromis christyi (Trewavas, 1953)

Ad Konings

A female *Greenwoodochromis christyi*, collected in Zambian waters.

Greenwoodochromis christyi was observed under water for the first time in 1988. Walter Dieckhoff found a few individuals in the Zambian part of the lake. He collected a few specimens of which only a female survived transportation back to Europe. One year later some *christyi* were exported by Chris Blighnaut in Mpulungu.

Greenwoodochromis christyi belongs to a group of Tanganyikan cichlids which have a coloration pattern consisting of a few horizontal rows of iridescent scales. A well-known cichlid from this group is *Limnochromis auritus*. Previously, all these cichlids were placed in the genus *Limnochromis*. The species involved are *L. auritus, L. abeelei, L. staneri, Greenwoodochromis christyi, G. bellcrossi* and *Gnathochromis permaxillaris* (see next page). The difference between the species in *Greenwoodochromis* and those that remain in *Limnochromis* is that the former have more than 48 scales in an horizontal row between the gill-cover and the tail. The species in *Limnochromis* have a maximum 40 scales in a row. In view of the recent revision of the Malawi cichlids, where the genera are distinguished mainly by their basic coloration pattern, it would not surprise me if all these species were placed back in their original genus in future.

The two species currently in *Greenwoodochromis* are distinguished from each other by the size of the eye and the shape of the mouth. *G. christyi* has a relatively smaller eye than *G. bellcrossi*. The latter also has a steeply inclined mouth, while that of *G. christyi* is only moderately inclined.

Greenwoodochromis christyi has been observed in the intermediate habitat at somewhat deeper levels. René Krüter found most individuals at a depth of 25 meters and deeper. Sometimes a pair was observed while guarding their offspring. Spawning has not been observed but it is probably similar to that of *L. auritus*. This means that *G. christyi* is a mouthbrooder where both female and male take care of their offspring.

Greenwoodochromis christyi has proven to be a rather difficult cichlid to keep in an aquarium. A single specimen can be kept, without problems, with other species of similar size but a “pair” need a very large tank. All their aggression is directed towards conspecifics. The solution to this problem could be to let the female adapt to the tank first.

Gnathochromis permaxillaris (David, 1936)

Ad Konings

Gnathochromis permaxillaris is probably the most interesting cichlid from Lake Tanganyika.

One of the most remarkable cichlids of Lake Tanganyika is *Gnathochromis permaxillaris*. Its most interesting features are the very large mouth which opens in a peculiar way (see photo on the backcover) and the shape of the upper lip. It is a rather large cichlid which is known to grow to a size over 18'cm.

Gnathochromis permaxillaris lives over muddy substrates and is usually found deeper than 40 meters. Although the enormous mouth may suggest otherwise, mostly very small organisms constitute the staple food of *G. permaxillaris*. These tiny invertebrates live close to the bottom, sometimes in the upper layer of the mud. The wide gape of *permaxillaris* spreads the inflow of water, going into the mouth when the gill covers are extended, over a relatively large area. This weakens the flow so that only small and light particles are carried in. The large cichlid has to "vacuum clean" the muddy bottom continuously in order to obtain enough material to live on.

The same feeding technique is observed in the aquarium where *G. permaxillaris* feeds predominantly from the bottom. It takes a while before it adapts to picking up food in mid-water.

Gnathochromis permaxillaris is now regularly exported from Zambia albeit in very small numbers. It seems to be a very fragile fish to collect but when acclimatized to the aquarium it proves to be a hardy and undemanding fish. A very welcome factor – completely in contrast to *Greenwoodochromis christyi* – is its remarkably peaceful attitude towards conspecifics.

The sexes can be identified by looking at the ventral apertures; the genital opening of the female is noticeably larger than that of the male. Unfortunately, there are usually not enough specimens to compare and two males or two females might hide in the same cave without showing any hostility towards each other.

Trematocara nigrifrons Boulenger, 1906

René Krüter

A male *Trematocara nigrifrons* collected in Zambian waters.

The cichlids of the genus *Trematocara* belong to the deepest living fishes of Lake Tanganyika. Representatives of this genus were frequently captured at a depth of 200 meters. It is assumed that these cichlids migrate freely between the very deep layers and the surface layers of the lake. Especially at night they move to shallower water. This means that a special construction of the swimbladder allows the fish to compensate for the enormous difference in pressure. During the daytime *Trematocara* lives in the depths probably together with its food. It is known that a small crustacean, a kind of shrimp, undergoes a diurnal vertical migration as well. Masses of this shrimp are found in shallow water at night.

Evolution has permitted *Trematocara nigrifrons* to follow these crustaceans during their daily migrations. This means that these cichlids live in permanent darkness. They have well developed adaptations to this circumstance; *T. nigrifrons* possesses a very large eye and an extremely sensitive lateral organ on the head with which it can register minute movements in the water. The sensory pore system, which is present on the head of other cichlids as well, is greatly enlarged on the head of *Trematocara*. The organ, which consists of pressure sensitive tubules, is visible as small "holes" below the eye. In the aquarium, I noticed that food is only accepted (greedily) when it moves. Frozen food must be stirred by other fishes before *T. nigrifrons* eats it. I have seen it hovering above the food on the sand, in a manner similar to *Aulonocara*, and waiting for a movement to occur.

Roger Bills, who is a researcher and collecter of Zambian fishes, managed to catch and ship ten specimens of *T. nigrifrons*. Unfortunately the fish proved to be very sensitive and, after one year, only three survived. Surprisingly I succeeded in breeding them. The male is considerably smaller than the female and, when excited, shows black and white edges to the fins and a black throat. Regrettably I did not observe the spawning; I first knew of it when I noticed the female with a mouthful of pale yellow eggs. After three weeks the fry were about 8 mm in size, when the female spat them out because of a stress caused by netting her out of the tank. The approximately 40 fry immediately ate *Artemia* and now, three months later, they are about 4 cm long and am I the proud owner of a school of *T. nigrifrons*.

T. nigrifrons is not a colorful addition to any aquarium but for a true Tanganyika fancier, who usually looks further than colors alone, it is a very interesting and elegant species.

Microdontochromis tenuidentatus (Poll, 1951)

Ad Konings

Two wildcaught specimens of *Microdontochromis tenuidentatus* of unknown sex.

The specimens depicted in the photograph above are only tentatively identified as *Microdontochromis tenuidentatus*. The holotype of this species shows, albeit in preserved condition, a horizontal, mid-lateral row of black spots. In some preserved specimens these spots appear as vertical bars. The cichlids in the picture above show only such pattern when they are excited. On the other hand, their morphology and their typical mouth strongly suggest that these fish are conspecific with *M. tenuidentatus*.

The holotype, together with about 50 other specimens, was collected in Zaïre near Vua. The fish in the picture were collected in Zambia in Cameron Bay, which is not far from Vua. Sporadically, Fishes of Burundi has exported some specimens which also matched *M. tenuidentatus* in coloration even when they were not excited. These were doubtless collected in Burundi waters.

It is known that Cameron Bay harbors some varieties (or even distinct species) which are not found at any other place in the lake, for example *Petrochromis trewavasae*, the so-called Tiger Nasutus or the Ndole Bay variety of *Xenotilapia ochrogenys*. It is therefore possible that the nondescript cichlid, when not excited, is a geographical variant of *M. tenuidentatus* which is only to be found in Cameron Bay.

Microdontochromis tenuidentatus is a maternal mouthbrooder. It has been bred in captivity by Volker Puttberg, Dinslaken, Germany. He noticed that the eggs were rather large and that a female broods only a few eggs at the time, although about 20 are deposited during a spawning. The male does not seem to make a nest or defend a territory. The eggs are brooded for about four weeks before the fry are released. During this period the female continues feeding like she has nothing in her mouth *not* to be swallowed.

In the lake *M. tenuidentatus* lives in large schools in very shallow water. Most of them are found in the vicinity of aquatic weeds. The mouth is quite protrusible and the upper arm of the upper jaw bulges the skin of the snout. The head is laterally compressed, which is an important characteristic of this species. It seems that *M. tenuidentatus* feeds from the plankton in the open water as well as from invertebrates which live among the weeds.

The teeth in the outer jaws are minute and look rather fragile. The lower pharyngeal bone is very thin and slenderly shaped. The teeth on this bone are minute and pointed. The diet of *M. tenuidentatus* must consists of very soft invertebrates and or tiny organisms.

Petrochromis, three new variants

Ad Konings

A Zairean race of *Petrochromis polyodon* which is named "Kaiser Petrochromis" in the trade.

Above: The "Red Texas Petrochromis"; below:

Cichlids from the genus *Petrochromis* are easily recognized by the structure of the mouth. The numerous teeth in the large jaws are permanently visible in most species. *Petrochromis orthognathus* is the only known species in the genus in which the teeth are less numerous and where the teeth are invisible when the mouth is closed. A cichlid with the trade name "Petrochromis Tricolor" was exported from Zambia. The specimen which I was able to have a closer look at showed just a few rows of teeth in the mouth. It could close the mouth completely, "hiding" all teeth. The coloration pattern closely matches that of *P. orthognathus*, i.e. a brown upper half of the body and a lighter lower half.

Petrochromis polyodon occurs in several differently colored populations of which at least five have been exported. The cichlid we have previously called *Petrochromis famula* is the *polyodon* race from Kigoma. *Petrochromis polyodon* is easily recognized by the short lower jaw and the generally brown coloration of the females. *Petrochromis macrognathus* also has a short lower jaw but its mouth is underslung.

The "Red Texas Petrochromis" is closely related to the "Texas Petrochromis" from the Tanzanian coast, but is collected on the Zairean side of the lake.

Tropheus moorii Boulenger, 1898

Ad Konings

A wildcaught male *Tropheus moorii*, probably from Vua, Zaïre.

Tropheus moorii from an unknown location in Zaïre.

Many different populations of *Tropheus moorii* are known and many more will be found in the future. The genus *Tropheus* consists of at least six species of which one is scientifically undescribed. This species, named *T.* sp. "Black" or—previously—*T.* sp. aff. *brichardi*, lives in the northern half of the lake, whereas *T. moorii* is restricted to the southern half. Although both species have been regarded as conspecific by several authors, Walter Dieckhoff discovered a locality where both species live sympatrically (Kibwesa, Tanzania).

In Zambia and along the lower half of the Zaïrean coast the populations of *T. moorii* can be split into two different groups. The holotype of *T. moorii* was collected near Mpulungu and belongs to the group of light-colored races which are further characterized by a colored region on the center of the body. In Cameron Bay and north of it, populations of the second group are found. This group consists of dark-colored races which also have a colored cheek. There is no location known where individuals of both groups live together which would have indicated that we are dealing with two different species.

Although there is a rather large difference, in coloration, between the two groups (see photographs), they probably belong to the same species. The two groups therefore represent two main geographical variants. The Kasaba Bay in Zambia might have separated these two groups for a long period of time and they might thus have developed, independently from each other, into the present races. The northern borderline between the two groups is not known but a dark-colored variant has allegedly been collected near Vua in Zaïre. Further north into Zaïre races of the light-colored group have been found. One of them is shown in the smaller picture.

Cyathopharynx furcifer (Boulenger,1898)

Ad Konings

This race of *Cyathopharynx furcifer* lives on the Ruziba reef in the northeastern part of the lake.

Cyathopharynx furcifer is a rather common and spectacularly colored cichlid from Lake Tanganyika. Males attain a total length of about 18 cm maximum; females, usually, are considerably smaller. *Cyathopharynx furcifer* lives mainly over sandy areas in shallow water. However, such sandy bays must be close to rocky shores. The reason why they prefer the rocks nearby is unknown because they predominantly feed from the sandy substrate.

The food consists of diatoms which are collected from the upper layer of the sediment on the sand or on the rocks. Large quantities of material are scooped up and processed through the long intestinal tract. While feeding, the faeces can be seen growing from the vent. A lot of the material swallowed is indigestible. This results in an easy passage of the food through the guts. We must keep this fact in mind when maintaining this cichlid in the aquarium. *Cyathopharynx furcifer* needs a lot of food but only a little meat.

In the lake, males congregate into large breeding colonies. Each male makes its own nest which is a kind of sand-castle with a diameter of approximately 50 cm. The nests are about 30 cm high. The different territories can be just two meters apart. Breeding colonies of *C. furcifer* are a spectacular sight; sometimes more than 100 colorful males are found together defending their nests. The females remain in large schools, normally close to the rocky coast.

Because *C. furcifer* seems to be dependent on areas with rocks, which are not present along the entire coast uninterruptedly, it has developed several geographical races. The Ruziba race, which is shown in the photo, was exported from Burundi a few years back.

When *C. furcifer* is collected the fishermen catch the most beautiful males. These males keep their colors for just a few weeks. Rarely do they regain their full palette of colors in captivity, even though they might spawn and produce offspring. Tankraised males, however, show their best colors when still small and usually keep them until something large or rough disturbs them in the aquarium. In the aquarium they need a large area with plain sand where they can build their nest. Only in very large tanks (over 750 liters) can we perhaps have more than one male in color. The presence of a second, smaller, male usually results in the most dominant male retaining his colors.

Xenotilapia flavipinnis Poll, 1985

Ad Konings

The yellow *Xenotilapia flavipinnis* from Nyanza Lac.

Xenotilapia flavipinnis is a common, sanddwelling cichlid which is found all round the lake. It is found predominantly over sand at depths between 1 and 30 meters. *X. flavipinnis* lives in schools. The largest schools are found in the very shallow water. Foraging schools may number over a hundred individuals. Like all other members of *Xenotilapia* it feeds by sifting the sand. The food consists mainly of soft-bodied invertebrates, like insect larvae.

It seems that *X. flavipinnis* has traditional foraging and breeding grounds and that it is thus restricted to certain areas. This has probably led to the existence of geographical races. Three of these races have been exported to date. The holotype belongs to the northern race of Magara, Burundi. The yellow variant from Nyanza Lac, Burundi, is shown in the picture. From Zambia a variant is frequently exported which shows a few rows of yellow scales on the flank.

Xenotilapia flavipinnis breeds in colonies but it is not a lek-breeder. Pairs separate from the school – the school splits up into many breeding pairs – and establish a rather large territory. Even though we speak of a breeding colony the pairs are usually more than two meters apart. For a small cichlid – the maximum size of *X. flavipinnis* is about 10 cm – this is a large territory. In order to avoid territorial disputes in the aquarium it is therefore best kept as a pair.

Spawning occurs at any site in the territory. The site might change during one spawning. There is no visible nest constructed but it seems that the pair chooses a slight dip in the sand. A few days before the actual spawning, the male courts the female by positioning himself with all fins erect and the buccal cavity extended. The female answers in a similar way. Without much introductory behavior the female starts laying the eggs which are fertilized by the male while they are still on the sand. After the female has taken all the eggs in her mouth she stays with the male in the territory. After about 9 days the larvae are spat on the sand, in front of the male who picks them up immediately. The male carries the larvae for another 5 to 6 days before he releases the fry in the territory. The fry are tended by both parents – mostly by the male – for another week or two. A further spawning usually occurs within a month in the same territory.

Xenotilapia flavipinnis is a rather peaceful cichlid which is best kept with non-predatory cichlids in an aquarium with fine sand on the bottom.

Xenotilapia papilio Büscher, 1990

Ad Konings

Several geographical variants of *Xenotilapia papilio* occur in the southeastern part of Lake Tanganyika. This race is known as the "Sunflower Xenotilapia".

Xenotilapia papilio. This variant is known as "Chituta Bay Xenotilapia".

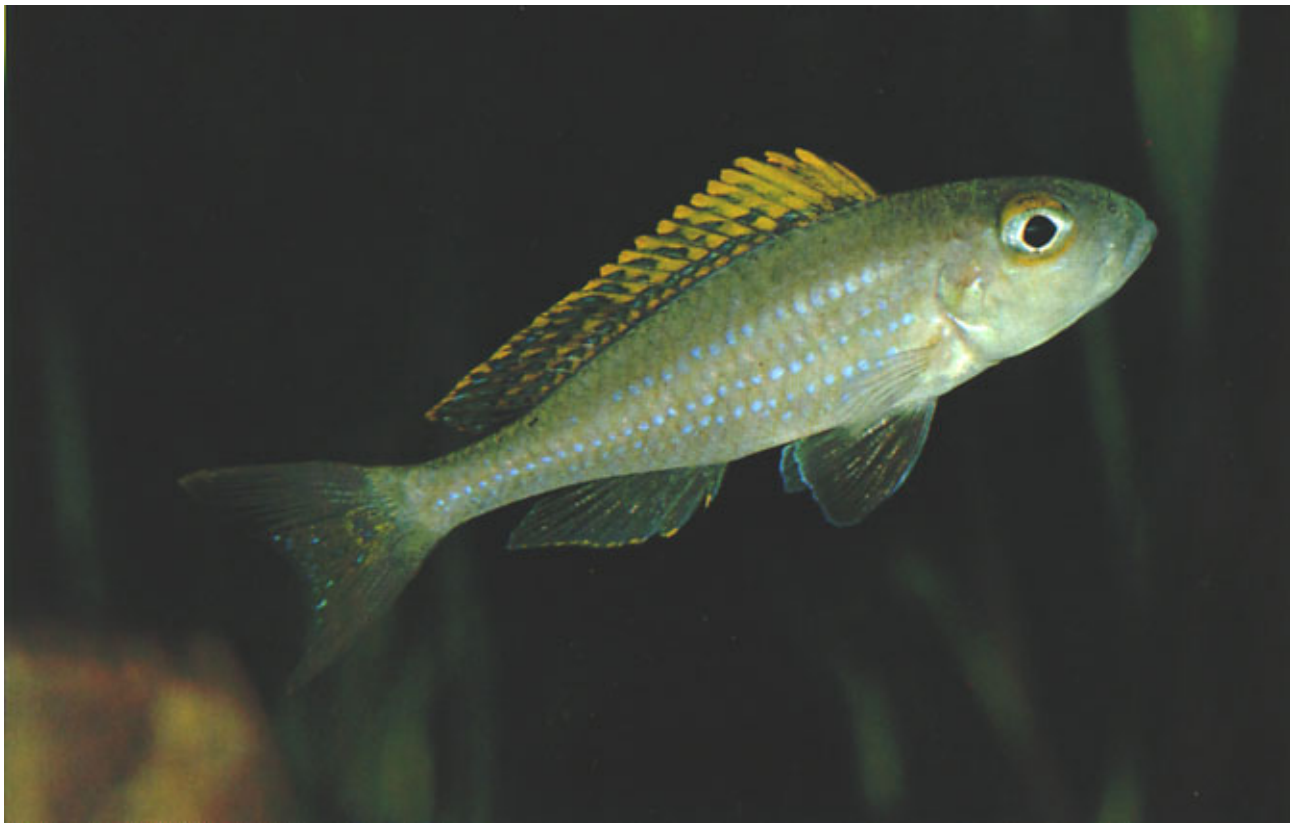
Xenotilapia papilio was described from a population 40 kilometers south of Moba on the Zairean coast. The two individuals shown on this page very likely belong to the same species and are thus geographical variants. *X. papilio* is a very small sanddwelling cichlid. Its maximum size lies around 8 cm. This very pretty species is mainly characterized by the underslung and tiny mouth. The teeth are bicuspid, which excludes them from the genus *Asprotilapia* which is characterized by tricuspid teeth. However, *X. papilio* closely resembles *A. leptura* and is also found sympatrically with the latter.

Xenotilapia papilio lives in shallow water but at some locations it may penetrate into depths of more then 30 meters. In the deeper areas is is commonly found in intermediate habitats, where sand and rocks are both present. In very shallow areas it occurs over pure sand. Large schools have never been observed. Usually pairs or small groups are sighted. Like *X. flavipinnis* it pairs off and defends a territory. Observations of aquarium populations show that once a pair is formed they stay together for several consecutive spawns. *Xenotilapia papilio* is best kept as a pair in a community tank as long as there are no predatory species accompanying them. They regard similar looking species, such as *X. flavipinnis*, as competitors which elicit frequent quarrels.

Spawning in *X. papilio* is preceded by fin-displays by both male and female. One or two days later the female deposits the eggs on a site somewhere in the territory. These are fertilized by the male while they are still on the sand. The female initially broods the eggs. The male takes the larvae after about 8 to 10 days. After less than a week the fry are released.

Xenotilapia sp. "Katete"

René Krüter



Xenotilapia sp. "Katete" lives at the deeper levels of the rocky habitat.

Xenotilapia sp. "Katete" looks similar to the recently described *X. papilio* but definitely is another species. It has a shorter snout, a larger eye, a differently shaped dorsal fin and a shallower caudal peduncle. The maximum length of *X.* sp. "Katete" lies around 7 cm, a little bit smaller than *X. papilio*. In contrast to latter species, the dorsal fin of *X.* sp. "Katete" is entirely orange in color. The spines of the anterior part are longer than those of the rest of the fin. The body has a faint blue hue caused by a few rows of blue-reflecting scales. Personally, I find this the most attractive species among the small, rock-dwelling *Xenotilapia*.

The village of Katete lies near the border between Zambia and Zaïre. In October 1988 we were looking there for a good spot to collect *Cyphotilapia frontosa*. While I was diving at 35 to 40 meters, I noticed *X.* sp. "Katete" but at first glance I thought it was *X. flavipinnis*. Realizing that that species is not commonly found at these depths I looked closer and recognized it from a picture from Horst Walter Dieckhoff in Ad Konings' book.

Xenotilapia sp. "Katete" inhabits the intermediate zone between sand and rocks, usually on a steeply sloping part of the coast. *C. frontosa* and *Neolamprologus buescheri* were among the other fishes of its habitat, which would be a bad combination for the aquarium.

With a lot of effort we could only collect a small number of these fragile cichlids of which just five survived the transport to my tank. They were three females and two males. There are no clear morphological differences between the sexes. Unfortunately, *X.* sp. "Katete" is very selective when it has to form pairs. I was unlucky that none of the five specimens really liked each other. As long as there had not been a spawning the pair seemed to be doing well; the other three "Katetes" were then "expelled" from the 1000 liter aquarium. These three were housed in a similar sized tank of my friend Willem Bastinck.

Xenotilapia sp. "Katete" is a biparental mouthbrooder, this means that the larvae are transferred to the male after the female has brooded them for about 10 days. The problem with my pair started when the male had taken the larvae in his mouth, because then the female started to demolish the male, who reacted by spitting out the larvae. Fortunately, Willem had more success and was able to save some of the larvae after the male had spat them out. Later, my pair also produced some fry which I was able to save from the female's aggression. Now, after three years, the aquaristic future of these beautiful cichlids looks a bit brighter.

Cyprichromis sp. “Leptosoma Jumbo”

Ad Konings

Cyprichromis sp. “Leptosoma Jumbo”, a morph of the Kampemba race.

Cyprichromis sp. “Leptosoma Jumbo”, a yellow-tailed morph from an unknown location in Zaïre.

Cyprichromis sp. "Leptosoma Jumbo", a morph from the Kampemba population.

C. sp. "Leptosoma Jumbo", a male of the yellow-tailed morph from the Zaïrean race.

The small cichlids from the open water in Lake Tanganyika belong mainly to the genus *Cyprichromis*. There are only two species described in this genus but at least two others are known. The main difference between these species lies in the color patterns of the males. They have gorgeous colors which are clearly seen in their natural environment. *Cyprichromis* is spread over the entire lake but only *C. microlepidotus* occurs in the northern part, north of Nyanza Lac. From observations in Zambian waters (Walter Dieckhoff; René Krüter, pers. comm.) it is known that several species of *Cyprichromis* may live in direct contact with each other.

Cyprichromis microlepidotus, which has a lake-wide distribution, is characterized by small scales. These are smaller than those from any other known species of the genus. It is also larger than *C. leptosoma*, which is a small and slenderly built cichlid. The latter species differs from *C.* sp. "Leptosoma Jumbo" by its shallow body and smaller adult size only. *C.* sp. "Leptosoma Jumbo" can grow to a size, at least under aquarium conditions, of approximately 12 cm whereas *C. leptosoma* rarely exceeds a length of 9 cm. The fourth species, *C.* sp. "Leptosoma Zebra", is recognized by its yellowish coloration – its lack of conspicuous colors – and by the broad vertical bars which are not permanently shown. *C. leptosoma* (Blue Flash, Isanga race), *C. microlepidotus*, (Yellow Zambia race), *C.* sp. "Leptosoma Jumbo" (Black Fin), *C.* sp. "Leptosoma Zebra" and *Paracyprichromis nigripinnis* (Blue Neon) have all been seen together in a small area in Chitutu Bay.

C. sp. "Leptosoma Jumbo" is a pleasant aquarium fish which normally shows its full colors. It is impossible to keep this species in pairs. Males actively defend a territory and need the presence of at least four other males to minimize the damage done to the weaker one. Males behave rather peacefully towards the females. In three breeding colonies, that I have kept over several years, I have never found a female killed by an aggressive male. Depending on the number of males in the aquarium, they will stake out their territories about 30 to 60 cm apart. The males stay in mid-water and relate the size of their premises to the distance from neighboring males. Females are continuously courted and attracted to the territory. When a female reacts to the male's invitation, the male bends its body and all its fins, except the ventrals, away from the female. The ventral fins, which have a large yellow spot, are held to the outside, in front of the female's mouth. Instinctively, the female snaps at the male's ventral fins. Since spawning takes place in mid-water, this action might indicate to the female the spot where she should deposit her eggs. The color of the spot in the ventral fin does not exactly match that of the egg. I have also observed males snapping at the presented fins of a more dominant male.

When a female is ready to spawn she remains inside the male's territory. Initially she will snap at the male's ventrals several times before she starts depositing the eggs. He might discharge his milt before the eggs are laid. At a certain moment the male positions himself over the female, all fins extended, and pushes her gently, with his fully opened mouth, on her head. The female releases one or a few eggs and immediately backs up to retrieve it. The sequence of release and backing up may be repeated several times before the female is led back, by the male, to the center of the territory. Then follow a number of "ventral-snappings" before the female discharges the next batch of eggs. The incubation period lasts about three weeks.

Paracyprichromis nigripinnis (Boulenger, 1901)

Ad Konings

Paracyprichromis nigripinnis from Chituta Bay is known as "Blue Neon Cyprichromis".

Of all the new imports of the last years, the "Blue Neon Cyprichromis" is the favorite of most Tanganyika cichlidists. It is a small and peaceful cichlid with a gorgeous coloration. The maximum size of *Paracyprichromis nigripinnis* is about 10 cm for aquarium specimens. Its shape closely resembles that of *P. brieni*, the other species of the genus. The difference lies mostly in their preferred habitat depth, although *P. nigripinnis* has a noticably larger eye (relatively seen). The latter is also found in deeper regions of the rocky coast than *P. brieni*, which lives in the upper 10 meters. The "Blue Neon Cyprichromis" is caught at a depth between 20 and 30 meters. In Chituta Bay it lives in large caves or in close vicinity of large boulders.

Paracyprichromis nigripinnis has a lake-wide distribution but not all populations have such an attractive pattern as the race shown in the photograph. René Krüter (pers. comm.) found two different populations in Chituta Bay. The difference between the two is the color of the dorsal fin, which is more red in the other race. Walter Dieckhoff found a race in Kigoma Bay which does not show the "neon" stripes.

Paracyprichromis nigripinnis and *P. brieni* were previously included in the genus *Cyprichromis* but because of the difference in the number and arrangement of the vertebrae they were placed in a new genus. Although the splitting-up might seem a matter of opinion, *P. nigripinnis* and *P. brieni* are probably not at all related to the species currently in *Cyprichromis*. In my opinion, they just show a remarkable case of parallel evolution, whereby species of two different ancestral origins have developed into similar looking species.

The most important distinction between these two genera, however, lies in their spawning behavior. The eggs of *Cyprichromis* are fertilized inside the female's mouth (see page 27) but those of *Paracyprichromis* are not.

Male *P. nigripinnis* defend a territory alongside a large rock or inside a cave. Females are not attracted to the nest by fin display but are sequestered from the school and then led to the male's territory. The female swims head-down, close to the substrate, and discharges the eggs. As the eggs pass by her head they are collected by the female. Meanwhile, the male stays above or beside the female and discharges – visible clouds of sperm are occasionally seen – its milt continuously. He fans the milt towards the falling eggs which are thus fertilized before the female picks them up.

MALAWIAN CICHLIDS

The blue sanddwellers

Ad Konings

Placidochromis phenochilus is a very conspicuous cichlid from the sand.

Of all the different biotopes Lake Malawi has to offer, the rocky regions have brought forth the greatest variety of colorful aquarium fishes. The much less explored sandy areas may still hide many beautiful species. Due to the openness of the sandy habitats it is difficult, and sometimes impossible, to collect some specimens. Since on the sand there is no place to hide, almost all species living there have a light, silvery-yellow coloration which camouflages them. Furthermore, the sanddwellers often live in schools which gives them a protection against predators.

In contrast to most sanddwellers, there is a group of conspicuously colored cichlids which usually live solitarily or in very small groups. This group consists of at least five different species. These have no ancestor in common and do not belong to the same genus. However, they have an important and peculiar part of their feeding behavior in common (see later).

The five conspicuously colored sanddwellers are *Cyrtocara moorii, Protomelas annectens, Otophar-*

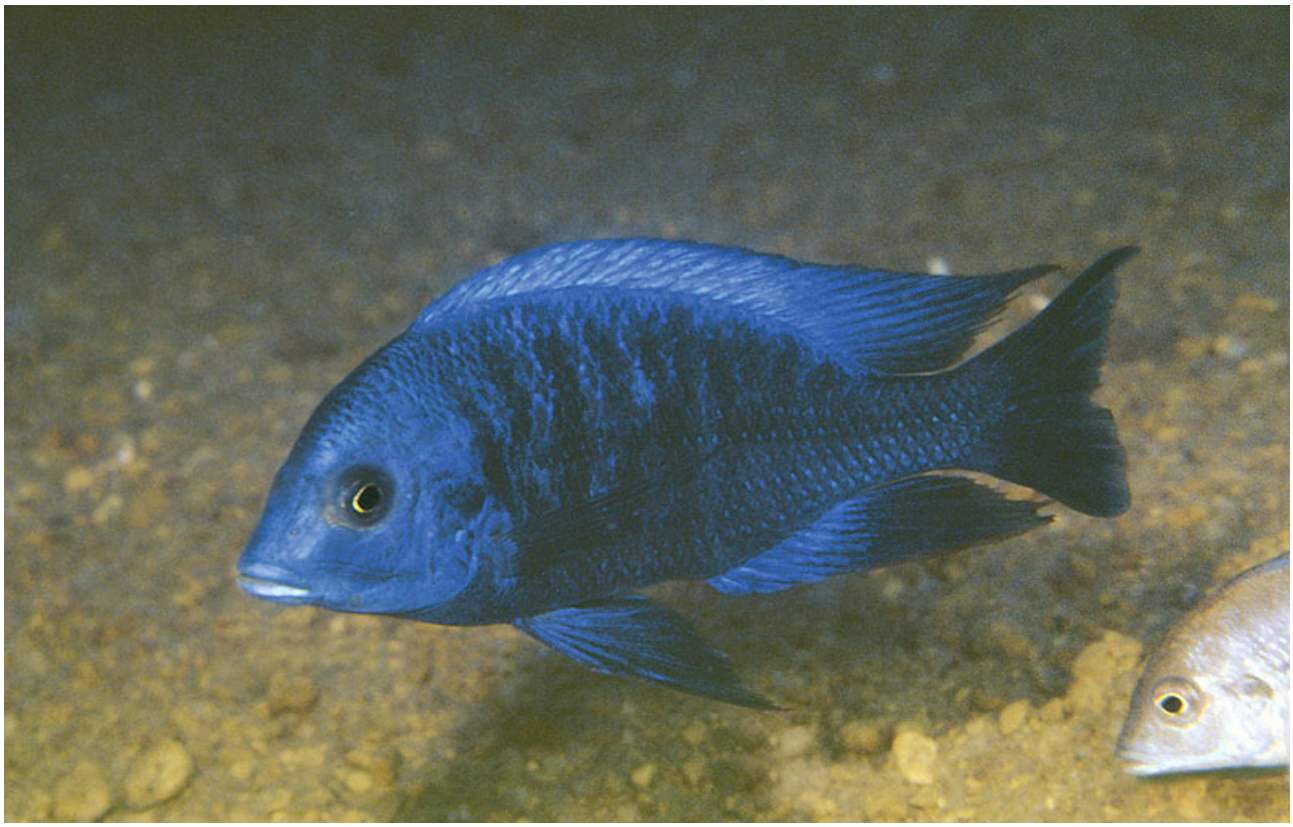
The distribution of *Placidochromis electra* is not restricted to Likoma Island. This specimen was pictured near Fort

ynx selenurus, *Placidochromis electra*, and *Placidochromis phenochilus*. The first three species have a lake-wide distribution. *P. electra* occurs around Likoma Island and probably all along the eastern shores, down to Fort Maguire. *P. phenochilus*, which seems to be closely related to *P. electra*, has been observed only in the northwestern part of the lake. I found it near Mdoka, Chesese, Chirwa Island, and between Selewa and Kasinda.

P. phenochilus is characterized by its white lips and blue body. Even juveniles of 6 cm length have the typical dark blue coloration. Its inclusion in *Placidochromis* is based on its close resemblance to *P. electra*. Of the about 25 individuals I have seen at several locations, not a single one showed its basic coloration pattern. The vertical barring, which is faintly present in most individuals, is not a diagnostic feature since species from several other genera show vertical bars – especially courting males – as well.

The five species of the group have a particular feeding strategy. They are attracted to stirred-up material and usually follow a large sand-sifting species like *Taeniolethrinops preaorbitalis*. The food of most sanddwelling species consists of invertebrates which live and hide in the sand. There are several ways to obtain these. *Lethrinops*-like species dig in the sand and sift it through the gills. Species of the genus *Aulonocara* detect their prey by "listening to the sand". Other species blow away the upper layer in order to reveal the hiding invertebrates. The five blue sanddwellers let other species do the work. *T. preaorbitalis* is a large cichlid and its continuous digging efforts create a lot of stirred-up material. Although it seems that the blue sanddwellers select their food from the clouds of material spilled through the gills of the large sand-sifter, they are actually more interested in searching the ploughed sand for exposed invertebrates.

Placidochromis electra with a digging *Taeniolethrinops preaorbitalis*.



A male *Protomelas annectens* is rarely seen in its full blue breeding coloration. Photo taken near Otter Point.

Protomelas annectens is the most frequently seen follower of *Taeniolethrinops preaorbitalis* (photo taken near Fort

These crawl back into the sand as soon as possible.

The intriguing question is, why are these sanddwelling species so conspicuously colored? Especially *P. phenochilus, O. selenurus* and to a somewhat lesser extent *C. moorii,* always show a distinct blue coloration. These three species seem to be mostly dependent on a large, sand-sifting host. The other two species are also found foraging on their own. It is therefore possible that their conspicuous colors might warn off other followers – especially other species – from joining their host. In sandy regions, cichlids commonly occur in groups or schools, often of mixed species and it would thus be normal for an individual to join such a group. The amount of food revealed by the ploughing activities of a large digger may not be sufficient for more than one adult follower. If the follower is highly dependent on the host, it may signal its position to the other species by taking on a territorial coloration. In particular individuals of the same species are wary of approaching an "occupied" host.

C. moorii and *O. selenurus* occur in very shallow water and are rarely found below depths of 10 meters. *P. phenochilus* and *P. electra* are usually observed in water deeper than 15 meters whereas *P. annectens* is found at any level.

The differences not only in the basic melanin patterns but also in breeding behavior point to different ancestral origins for these sanddwelling cichlids. The breeding behavior of *C. moorii* has been observed several times by different aquarists. They all noticed that as soon as the female had deposited some eggs they were fertilized by the male while they were still on the sand. The same sequence is also employed by *P. annectens*. Neither of the two species build a nest or any structure to indicate the spawning site. Although I have never observed any of these blue sanddwellers spawning in their natural environment, the courting behavior of the males indicates that spawning can take place at any site. Mouthbrooding and fry-guarding *C. moorii* and *P. annectens* have been observed on the open sand.

P. electra is kept and bred by many hobbyists. Spawning in the aquarium has revealed that the eggs are fertilized inside the female's mouth, as is the case in most other Malawian cichlids. *P. phenochilus* has yet not been exported as an aquarium fish. Because *P. phenochilus* resembles *P. electra* to a great extent it may have a similar breeding behavior, i.e. that the eggs are fertilized inside the female's mouth.

O. selenurus is infrequently exported as Haplochromis Nussae. All specimens are collected in Senga Bay. It has been bred in captivity (Baasch, pers. comm.) but details of the spawning sequence are not known yet. The juveniles show the genus-specific blotch pattern until they have reached a length of approximately 7 cm. *O. selenurus* is a very attractive and peaceful cichlid and makes a valuable addition to a Malawi community tank.

Otopharynx selenurus from Senga Bay

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Aulonocara auditor (Trewavas, 1935)

Ad Konings

A male *Aulonocara auditor* patrolling its territory.

In May 1989, Walter Dieckhoff and I visited the northern region of Lake Malawi, north of Chilumba for the first time. Our trip took us to the Songwe River which is the border between Malawi and Tanzania. It took us two days and several dives to conclude that there are no rocky reefs, coasts, or islets between the border and Ngara. The entire coast, here, consists of sandy and swampy beaches although small rocks may lie scattered on the beach and suggest that the area is rocky.

At Ngara, the most northerly rocky area in Malawian waters, an intermediate type of habitat supports a number of rock dwelling cichlids including *Aulonocara stuartgranti*, the race with the orange patch on the body. While diving there for the first time I noticed some elongated sand-colored cichlids which moved in small groups through the habitat. At first glance they seemed to be of the genus *Aulonocara*, a species of the sand dwelling group. They were rather shy and I could take only two photographs. At that time I did not see any individual with male coloration, which could be a further indication that it belonged to the sand dwelling group of *Aulonocara*. Of course I was eager to have some specimens for a closer examination and asked Saulos Mwale, our boat leader and an extremely skilled fisherman, to catch a few. Saulos needs only two words to describe the desired fish and he will catch it for you, usually much better colored specimens than the ones you had seen. Unfortunately, he could not find individuals with breeding coloration which plainly meant they were not there. However, two specimens were preserved and they later turned out to be *A. auditor*.

At the next location where we dived, at Mdoka, I found the same species again, but again no breeding males. Further south, none of us saw *A. auditor* again.

Gary Kratochvil and I went back to the same places in December 1990, where I found *A. auditor* in breeding coloration. In contrast to the few individuals I had seen in May 1989, we now observed hundreds of them in large schools. Males in full breeding coloration, however, were rare. Most individuals of this species of *Aulonocara* were found below 15 meters of depth. The few territorial males were found at about 20 m, at the deepest part of the coast where rocks were still present.

The territorial behavior of the males resembles closely that of the so-called Chitande Type *Aulonocara*; *A. auditor* might therefore belong to that group of the genus as well. Males in breeding coloration

Aulonocara ethelwynnae is found sympatrically with *Aulonocara auditor*.

Aulonocara auditor occurs in schools over sand near rocks.

Aulonocara stuartgranti photographed at Mdoka.

"defend" their territories with little effort. Other species and females are tolerated at all times within the boundaries of the territory. Competing males are "chased" by raising the dorsal fin and obstructing their way. Under natural circumstances, I have never observed fights, neither in *A. auditor* nor in Chitande Type *Aulonocara*. In the aquarium, however, fights may occur. Territorial males live rather far apart in the wild and remain very static.

The territory of a male *A. auditor* usually lies on the sand between some stones or rocks. They were found only at the edge of the rocky habitat. Females occur in large schools and forage over the sand. Within such schools males with faint breeding colors were observed. These males, sometimes showed intolerance towards each other and "chased" each other from the feeding site. No territories were defended within the schools although the school and its members remained rather static.

Other species of *Aulonocara* were found in the schools together with *A. auditor*. Besides two different sand dwelling species, *A. rostratum* and *A.*

sp. “Jumbo Blue”, foraging individuals of *A. ethelwynnae* (Northern or Chitande Aulonocara) were also seen.

Ngara and Mdoka are the only two locations where two different species of the Chitande Type *Aulonocara* group are sympatric. Notwithstanding the observation that *A. auditor* has a similar behavior and habitat preference, it is morphologically clearly different from *A. ethelwynnae*. The snout of *A. auditor* is considerably longer than that of all other known species of the Chitande Type *Aulonocara*. In all the other species the snout profile is rounded whereas it is straight in *A. auditor*. This might mean that *A. auditor* is able to poke its snout deeper in the substrate than *A. ethelwynnae* and thus feed from a different population of invertebrates. Personally I think that food is abundant in their environment and that those two species are not competing with each other for food. The structure of the teeth in the jaws looks similar in all Chitande Type *Aulonocara*; *A. auditor* is no exception. The four to six rows of teeth stand in a relatively wide band anteriorly and become a single row on the sides of the jaw. The flat lower jaw, with its teeth, is somewhat reminiscent of that of several *Lethrinops* species. *A. auditor* may be more of a sand dwelling species than any other Chitande Type *Aulonocara*. Territorial males of the other species in this group are found throughout the year; they don’t seem to have a particular breeding season. One exception might be *A.* sp. “Chitande Type Kande” breeding males of which were rare in June 1989. In December 1990, this species was abundantly present around Kande Island and many territorial males could be observed.

At Kande Island, *A.* sp. “Chitande Type Kande” shares the habitat with several other species of the genus. Two of them, *A. kandeensis* and *A. steveni*, are found in its immediate vicinity. It might thus be possible that *A. auditor* and *A.* sp. “Chitande Type Kande” breed mainly at a time when other species of *Aulonocara* decrease their breeding activities. These two species might be unsuccessful in obtaining a territory when the other species are still at the peak of their breeding season.

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Aulonocara sp. “Chitande Type Kande”.

The genus *Tyrannochromis* Eccles & Trewavas, 1989

Dr. Ethelwynn Trewavas

A beautiful male *Tyrannochromis macrostoma* in breeding coloration. Photo by Stuart Grant.

Abstract

The dark-bellied piscivorous cichlid of Lake Malawi is *Tyrannochromis macrostoma* (Regan), as it was identified by Lewis *et al.* (1986: 39), who placed it provisionally in the genus *Cyrtocara*. The darker lower half of the head and body is usual for adults of this species in the lake, but is masked by the blue colour of breeding males and may be lost in unfavourable circumstances. It is thus rarely seen in captive or preserved fishes.

The name *T. nigriventer* Eccles belongs to a different species, related to *Nimbochromis fuscotaeniatus*.

The names *T. maculiceps* (Ahl) and *T. polyodon* (Trewavas) may be synonyms of *T. macrostoma* but this is not yet proved.

Introduction

Our friend Ad Konings, to whom we owe so much for his books on the home life of the cichlids of Lakes Tanganyika and Malawi, has contributed to the solution of the problem of the specific identity of the predator known as "Dark-belly" or "Schwarzbauch". But in his article (Cichlidae (BCA) Vol. 11, no. 3) he has made some conflicting statements that need clarification.

Konings writes (*Cichlidae* 11 (3): p. 73) "The so-called Black-belly is thus correctly named *T. macrostoma*". But two paragraphs later "the species currently known as *T. macrostoma* should be correctly named *T. nigriventer*".

These are apparently mutually contradictory statements. In two publications that may be considered "current", namely Lewis *et al.* (1986; p. 39) and Eccles & Trewavas (1989, p. 97. fig. 43), the name *macrostoma* is correctly used for the species to which Regan gave that name in 1922. Konings now tells me that by "currently" he meant "currently in the aquaristic trade". Also in Konings' books, 1989, 1990, *macrostoma* has been incorrectly used for *nigriventer*. This is important for us to know because all the ecological information we have about *T. nigriventer* is found in Konings' books under the name *macrostoma*. While the true *macrostoma* is there treated under the name *T. maculiceps*, which may be a synonym of *T. macrostoma*, or at least the name of a closely related species or subspecies.

To explain how this confusion came about let me relate the following, which also shows the value of cooperation between field naturalists, aquarists and taxonomists.

A male *Tyrannochromis nigriventer* in breeding coloration.

History of the identification of "Dark-belly"

The type species of the genus *Tyrannochromis* is *T. macrostoma*, first described by Regan (1922) in the genus *Haplochromis* on the basis of one specimen of 22.5 cm standard length (26 cm total length). Regan's figure is reproduced as fig. 43 in our book (Eccles & Trewavas, 1989). The Christy collection contained five other specimens of 12-20'cm total length. All these have white flanks below the mid-lateral black stripe and the markings above this stripe stand out on a pale background. Dr. Digby Lewis and his collaborators (1986; p. 39) have a striking photograph of a fish labelled *Cyrtocara macrostoma* with all the lower part of the flank black or dark brown, and their text remarks on this peculiarity.

Could this be the same species as our white-bellied museum specimens? We had verbal reports of the ability of this predator to change colour, but with no details about the conditions in which this might occur.

Then, when our book was nearly finished, Eccles found in the Museum a specimen that had been wrongly catalogued as *H. polyodon*. Its lower flanks were tinged brown. Here, he thought, is our "Dark-belly", and as it was not either of the named species of *Tyrannochromis* he described it as a "new species" with the name *T. nigriventer*, which means "black-belly". The photograph of this fish is fig. 47 of our book (Eccles & Trewavas, 1989). The chief measurable difference between this fish and the other species of *Tyrannochromis* is the short upper arm of the upper jaw (premaxillary pedicel). In *T. nigriventer* this is less than one third of the length of the head. In the other species it is very long, more than one third of the length of the head, enabling the fish to protrude its mouth as a long funnel without dislocating its jaws. The photograph on p. 6 of Konings (1990a) shows the mouth protruded, but not to its full extent. (This fish is a male in which the overall blue colour masks the adult pattern, of which the only indication consists of a black mark on each scale, more prominent as the ventral surface is approached, giving the flanks a soiled appearance).

The paragraphs on p. 103 of Eccles & Trewavas on coloration and ecology apply to *T. macrostoma* and not to *T. nigriventer*.

So were Dr. Digby Lewis and his collaborators mistaken in identifying "Dark-belly" with *T. macrostoma*? This question was answered by our diving naturalists.

First, Andreas Spreinat of Göttingen caught and preserved some "Dark-bellies" and also some other predators. These he sent to the BMNH for our opinions.

Our book was then in the last stages, but after it was published Gordon Howes made some measurements for me. The pre-maxillary test showed that those labelled "Dark-belly" by Spreinat agreed with *T. macrostoma*. The others were a good match for *T. nigriventer*. Spreinat also found that in his photographs the ends of the premaxillary pedicels could be seen bulging the skin. His measurements of these, though naturally inexact, gave a similar result, "Dark-belly" having pedicels whose length went 2.0 to 2.6 times in the head length, whereas those of the other species, identified as *N. fuscotaeniatus*, went 3.5 to 3.75 times. The relationship between *N. fuscotaeniatus* and *T. nigriventer* will be mentioned below.

In November 1989 Ad Konings made a further visit to Lake Malawi and he too caught a number of "Dark-belly" and some of a species agreeing with *T. nigriventer*. The premaxillary test again pointed to *T. macrostoma* as the correct name for "Dark-belly".

Both divers confirmed that the dark belly is the usual live colour of adult, confident *T. macrostoma*, in the lake (except blue breeding males). Konings (1989; p. 129) has a photograph of a guarding female that is very dark except on the dorsal side, where the dorsal and dorso-lateral series of markings stand out clearly on a pale background. This photograph is captioned *T. maculiceps* but Konings now believes, probably correctly, that it is *T. macrostoma*. The adoption of black colouring when guarding young is reminiscent of the colour changes in the mbuna *Melanochromis auratus* and may well be a parallel phenomenon. Konings states (1990a; p. 179) that the dark colour is not always present in individuals transferred to a tank. Spreinat saw pale-bellied individuals that were "indisposed" (letter of 24-6-90). It is understandable that a fish being caught for the pot or for preservation in a museum is not merely "indisposed" but terrified. Hence our pale-bellied museum specimens.

The problem of the specific identify of "Dark-belly" is now therefore solved.

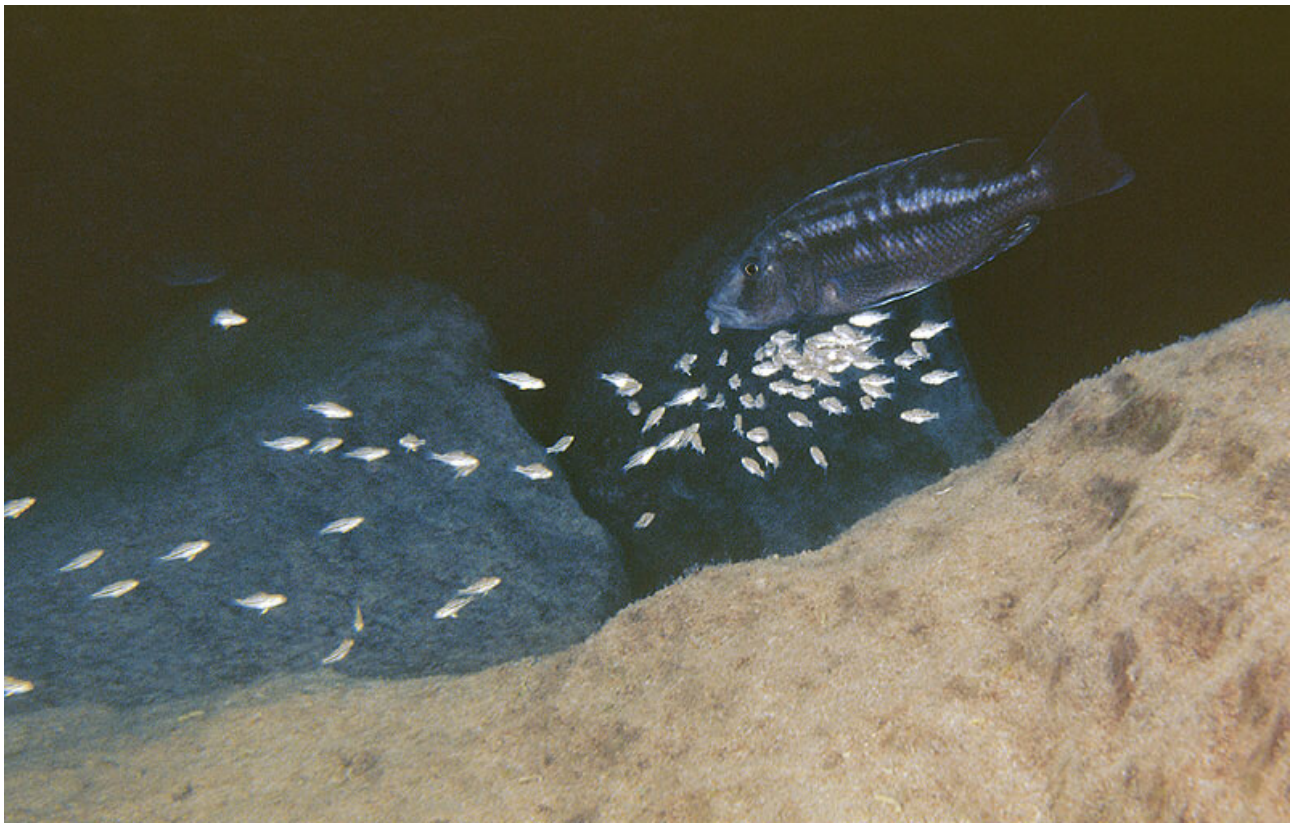
Konings touched on two other problems in the genus *Tyrannochromis*. The first is the validity of the two other nominal species, *T. polyodon* (Trewavas, 1935) and *T. maculiceps* (Ahl, 1927). Each of these was based on a single specimen. To synonymize *T. polyodon* it is necessary to show that the greater depth of its body comes within the range of variation of *T. macrostoma*. To synonymize *T. maculiceps* it must be shown that its narrow head and interorbital width, as well as possibly its wider band of teeth at any given size, all come within the range of a reasonable sample of *T. macrostoma* from the southern part of the lake. The type specimen of *T. maculiceps* was caught at the extreme northeastern part of the lake, a small fish of 163 mm standard length. Other specimens assigned to this species are from Chilumba and Nkhata Bay. It may be that this is a species or subspecies common in the north. Until these tests have been applied the validity of the names remains an open question.

A juvenile *Tyrannochromis macrostoma* photographed at Chitande Island. This specimen is identified by the fact that the tips of the premaxillary pedicels bulge the skin between the eyes. (Size approx. 8 cm TL.)

A juvenile *Tyrannochromis nigriventer* photographed at Chewere. The tips of the premaxillary pedicels bulge the skin clearly before the eyes. (Size approx. 10 cm TL)

The second problem is the relationship between *T. nigriventer* and *Nimbochromis fuscotaeniatus*. They resemble each other in proportions and dentition, but *N. fuscotaeniatus* has a pigment-pattern which is usually much less regular than in the figured holotype (Regan, 1922 and Eccles & Trewavas, 1989; fig. 79), forming irregular blotches as in other species of *Nimbochromis*. No such tendency to form blotches is seen in the holotype of *T. nigriventer*, in which the ventero-lateral brown patch is broader and continuous. Konings (1989; p. 222) remarks on the close resemblance between these two species.

Konings does not like to include *fuscotaeniatus* in



A female *Tyrannochromis nigriventer* defending her offspring. The photo was taken at Chinyankwazi Island. It shows that a guarding female *T. nigriventer* can adopt a rather dark coloration on the belly. This female was collected for positive identification.

Nimbochromis because of an alleged difference in breeding habits (Konings, 1989; p. 128). The eggs of *N. livingstonii* are fertilized on the substrate, then taken into the mouth (Konings, 1989; p. 219), whereas those of *fuscotaeniatus* are said to be fertilized in the maternal mouth. The reference for the latter statement is a paper by Dorenstouter (1982), but the identity of the fish in the photograph accompanying this paper is doubtful and the statement requires confirmation. There are other differences between *N. fuscotaeniatus* and typical species of *Nimbochromis* and the inclusion of *fuscotaeniatus* requires further consideration.

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Maravichromis (*Caprichromis*) *liemi* (McKaye & McKenzie, 1982)

Ad Konings

A male *Maravichromis (Caprichromis) liemi* in full breeding coloration photographed at Eccles Reef.

Maravichromis (C.) liemi was previously placed in *Caprichromis* Eccles & Trewavas (1989). The reason was that it had a strongly inclined mouth, a broad lower jaw and a specialized feeding behavior. Although it is functional to split large genera into a few smaller ones, monotypic or oligotypic genera should be avoided when possible. The peculiar structure of the mouth of *liemi* and *orthognathus* is related to the feeding behavior but other species in the lake also have similar mouth structures and comparable behavior. In the genus *Protomelas* there are several, undescribed species (e.g *P.* sp. "Paedophage") with a similar mouth structure, but none of these or other species like *Diplotaxodon greenwoodi*, have been put or will be put into a new genus or into *Caprichromis*. Personally I think the different mouth structure is insufficient justification for erecting a new genus for these two species.

M. (C.) liemi is reported to steal eggs and larvae from mouthbrooding females (McKaye & Kocher, *Animal Behav.* 31, 1983), specifically from *P. pleurotaenia*. The authors probably meant *Nyassachromis microcephalus* as *P. pleurotaenia* remains close to the bottom and mouthbrooding females are not found in schools.

I have observed *M. (C.) liemi* at many different locations all round the lake and it seems likely that their diet is not restricted to larvae and eggs alone. I have observed several times that *M. (C.) liemi* attacked male cichlids as well, preferably those with parasites (*Argulus*) on the throat region. It is therefore possible that *M. (C.) liemi* feeds also, or even primarily, on these parasitic invertebrates since fish with *Argulus* on their throat are very common.

M. (C.) liemi is normally found near rocks whereas *M. (C.) orthognathus* prefers the open sand. Breeding males congregate into colonies and construct a sandcastle nest (more than 1 m in diameter) against a rock. Mouthbrooding females stay in schools and probably release their fry in the rocky habitat.

A subadult *Maravichromis (Caprichromis) liemi.*

Sciaenochromis gracilis (Trewavas, 1935)

Peter Baasch

A courting male *Sciaenochromis gracilis* photographed in the author's aquarium.

Sciaenochromis gracilis was described from three specimens in the Christy collection. The total length of the largest specimen measured 217 mm. Some single specimens have been imported alive under trade names such as "Torpedo" or "Dark Line Torpedo". Recently, the export of *S. gracilis* has taken a more frequent character. This is certainly caused by the efforts of Stuart Grant to comply with the increased demand.

The distribution of this rare species seems to be restricted to the southern part of the lake. Observations about their feeding and breeding behavior and about their breeding coloration are not published yet.

The specific name (*gracilis* = slender) is aptly chosen. The narrowly pointed head with a slightly downward curved profile is a striking feature that reminds one of *Nimbochromis linni*. A band, consisting of small spots, runs diagonally from the nape to the upper part of the tail (peduncle). In this respect it could be mistaken for *S. spilostichus* or *Maravichromis formosus*. Maybe *gracilis* should be placed into *Maravichromis* as has been suggested before (Konings, 1989).

Its large mouth, its teeth and its shape presume a predatory lifestyle. The strong tail indicates a fast swimmer with ability to spurt.

Outside the breeding period *S. gracilis* is a lively swimmer. Every now and then they suddenly stop and move their eyes noticeably. Although *S. gracilis* behaves rather peacefully we should not house them in too small quarters. Their behavior changes during the breeding period. Then *S. gracilis* is able to spurt over large distances without apparent effort.

Courting is rather impetuous and intensive, but the female is not hurt. Males defend a territory and construct (in my tank) a crater nest with a diameter of about 50 cm. The eggs are very small and are fertilized inside the female's mouth. Since the eggs are small many fry can be expected. Females with a size of approximately 15 cm may release over 100 fry. Juveniles are, in comparison to other predators of similar size, very small and slim. They grow rather slowly, probably because they show the same behavior as the adults, i.e. they frequently stop moving and search the area with their eyes only. Food must then be brought into their mouths to let them eat! At a size of about 2-3 cm they defend small feeding territories and quarrel among themselves.

S. gracilis grows to a maximum size of about 25'cm and is in shape, coloration, and behavior a valuable addition to any large aquarium.

Otopharynx decorus (Trewavas, 1935)

Ad Konings

A male *Otopharynx decorus* taken at a depth of approximately 18 meters in Senga Bay.

Otopharynx decorus is a small to medium sized cichlid which is found predominantly over the open sandy bottoms of the lake. Its distribution encompasses probably the entire lake because specimens have been collected at Vua as well as in the southern part of the lake. The maximum size of *O. decorus* is about 18 cm (total length); females are only a little bit smaller than males.

This sanddwelling species lives in small groups, usually numbering not more than 6 members. Solitary individuals are frequently observed, too. In December, when I made the observations, there was sometimes one male individual in the group that showed some of its breeding coloration. Territorial males have not been seen. Members of the genus *Otopharynx* usually spawn near rocks. It is therefore possible that *O. decorus* also spawns close to a rocky coast and that the males which I was able to observe were foraging and not breeding.

The feeding behavior of *O. decorus* is rather characteristic of an insectivorous cichlid. With its large eyes it carefully screens the sand. Only after it has located something interesting does it bite into the substrate. Its food consists mainly of invertebrates which hide in the sand. The teeth on the lower pharyngeal bone are somewhat enlarged in the center, which is a common feature in cichlids which live on crustaceans and insects. The feeding behavior closely resembles that of *Maravichromis* sp. "Double Spot" (see next page). Both species have a small mouth with which they selectively pick their food from the substrate. Both species are found sympatrically.

The neutral coloration pattern consists of three rather large blotches on the flank. These blotches are not always distinct. When observed in the somewhat subdued light at a depth of 20 meters, the spots are almost invisible. I have never seen them black as in *O. (Ctenopharynx) nitidus* with which it is commonly found sympatrically. The coloration of the body of *O. decorus* is like that of the sand – light beige.

Among the sanddwelling cichlids of the lake it is rather easily recognized by the combination of the small mouth and the size of the fish. When observed in its natural environment, its behavior will immediately allow an identification. Identification of aquarium or preserved specimens is simplified by the fact that *O. decorus* has a high number of soft rays in the dorsal fin, 13 or 14, whereas most other Haplochromines have less than 12. It has, furthermore, a high number of scales on the flanks, higher than any other known *Otopharynx*.

Maravichromis sp. "Double Spot"

Ad Konings

Maravichromis sp. "Double Spot" scrutinizes the sand for something edible (Fort Maguire).

Maravichromis sp. "Double Spot" is a rather small, sand-dwelling cichlid. Its maximum size is known to be less than 14 cm (total length). It has a rather wide distribution since it has been found on the east coast near Fort Maguire, as well as near Mdoka in the northern part of the lake, and near Chintheche. It has, however, never been seen in Senga Bay, although cichlids are frequently collected there.

M. sp. "Double Spot" is characterized by a diagonal row of three double-spots. In some specimens the spots are so large that they form a broad, almost solid black band. This feature helped me decide to put it in the genus *Maravichromis* and not in *Otopharynx*.

The "Double Spot" prefers the open sandy regions and is usually found at between 5 and 30 meters depth. Most individuals forage on their own, rarely two or three individuals are seen together. The coast near Fort Maguire is inhabited by a rather dense population, although they never forage in groups or schools. At the two other locations where I have seen *M.* sp. "Double Spot", only single individuals were found. The fish of the east coast population have a yellow coloration on the body and especially on the fins, whereas specimens from the other locations are more silvery and have colorless fins.

The mouth of *M.* sp. "Double Spot" is very small and is utilized to pick small invertebrates from the sand. The substrate is therefore scrutinized for anything edible. The characteristic posture of this cichlid is poised over the sand, visually screening the area in front of the head with its large, movable eyes. The fish swims from one place to the next and everywhere it halts and scrutinizes the sand. In this respect *M.* sp. "Double Spot" resembles *Otopharynx decorus*. The latter species also forages in small groups.

The specialized feeding behavior of *M.* sp. "Double Spot" might also be used for screening parasites and fungus on the body and fins of sick fish. Once I observed a female *Nyassachromis prostoma*, with a visible fungus in the dorsal fin, who presented the ailing fin by laying itself on the sand in front of a foraging "Double Spot". At the same moment a *M. labidodon* disturbed the scene, so I could not see whether *M.* sp. "Double Spot" would actually clean the *prostoma*'s fin or not. It is, however, likely that it does, otherwise the ailing fish would not present its fin in the way it did. The specific coloration pattern of the "Double Spot" is unique among the haplochromines of the lake and might function as a signal to other species that it is a "Cleaner".

Nyassachromis sp. "Mpanga"

Ad Konings

A courting male *Nyassachromis* sp. "Mpanga".

Mpanga Rocks belong to a ridge which runs from the mainland into the lake. It is about five kilometers off the coast near Chilumba. At the beginning of the rainy season, in December 1990, the water was very low and a rather large portion of the upper boulders was above water. I had dived here in May 1989 and I wanted to observe the cichlid population at another time of the year. After an one-hour dive in the upper 20 meters of the rocky habitat, which consists of huge boulders and large caves, I returned to the boat. Saulos Mwale had been diving as well and told me that he had been to the sand and collected some new fish. I had never realized that the sand was within reach and expected the rocks to plummet to depths beyond 60 meters. Saulos, without a depth gauge, estimated the depth of his new find at between 35 and 40 meters. It is remarkable how he always knows the exact depth, distance, and place without any technical device. When I dived for the sand, I found *Nyassachromis* sp. "Mpanga" at 36.4 meters! The sand at this site is rather coarse and virtually void of the typical sand-dwelling cichlids you may find at other places. A regular and strong current between the boulders of Mpanga Rocks may have taken away all the fine material and left the coarser. All species of *Nyassachromis* feed from the open water and not from the sand. For them the structure of the substrate is therefore of less importance.

A sand-turret nest of *Nyassachromis* sp. "Mpanga".

Breeding males congregate into large colonies and construct turret nests on the sandfloor. A photograph of a typical *Nyassachromis* nest is shown above. The dip on top of the cone is the spawning-site. Such a dip is rarely horizontally placed; usually it tilts to one end. In this way the females, which remain in schools in the open water, have a better view of the courting male when he displays in the nest.

Mouthbrooding females stay in schools and may release their broods simultaneously.

The size of adult *N.* sp. "Mpanga" ranges between 7 and 10 cm.

Otopharynx (*Ctenopharynx*) *nitidus* (Trewavas, 1935)

Ad Konings

A male *Otopharynx (Ctenopharynx) nitidus* in breeding coloration (Fort Maguire).

Otopharynx (C.) nitidus is a rather common sand-dwelling cichlid which is observed throughout the lake. The maximum size measures around 15 cm for males; females remain considerably smaller and were never seen larger than 10 cm.

The preferred habitat is the open sand at depths below 15 meters. *Otopharynx (C.) nitidus* is easily recognized by the three large blotches, the yellow coloration on the lower part of the body, and the very large mouth. The mouth, though large, is weakly built and is meant to scoop large amounts of the silty sediment which lies on the sand. The sediment is filtered for something edible, mainly invertebrates. In some areas large schools forage on the sand but mostly small groups of about five individuals are more common. On only one occasion have I seen males in breeding coloration (Fort Maguire; December 1990). The few males I had observed seemed to have a territory but a nest construction was not visible. *Otopharynx (C.) intermedius*, a closely related species but without the yellow coloration, builds a sand-castle nest on a rock. The *nitidus* male follows females over a relatively large distance.

At some locations *O. (C.) nitidus* forages in large schools, sometimes numbering over a hundred individuals.

Copadichromis sp. "Virginalis Gome"

Ad Konings

A male *Copadichromis* sp. "Virginalis Gome" at the entrance of its nest.

This is a characteristic nest of a Virginalis-type

When T. D. Iles described *Copadichromis virginalis* in 1960 he pointed to the fact that natives distinguished between the two morphs he regarded, at that time, as belonging to this species. The natives called the two morphs "Kaduna" and "Kajose". The holotype of *C. virginalis* is of the Kaduna morph. The differences between the two morphs are minimal. Kaduna has a smaller size, relatively larger eyes, and a deeper body and caudal peduncle than Kajose and has little or no yellow pigment on the body (females and non-breeding males) and usually 16 spines in the dorsal fin. Kajose usually has 17 dorsal spines and a yellowish coloration.

Since its description *C. virginalis* has only sporadically been observed in its natural environment, and this applies to both morphs. Now there is evidence that the two "morphs" represent two different species. In December 1990 a population of both these species was found at the same location but not in exactly the same habitat. The so-called "Fire-Crest Mloto" complies with the description of the Kaduna and may therefore be conspecific with *C. virginalis*. It is normally found, during the breeding period from August to November, at a depth of more than 30 m. At the same location, Gome Rock (close to the Mozambique border), a virtually identical species was observed. This species, for the time being termed *C.* sp. "Virginalis Gome" may be conspecific with the Kajose-Virginalis. It was found mainly at depths between 7 and 15'meters.

C. sp. "Virginalis Gome" is larger, about 15 cm maximum total length, than the "Fire-Crest Mloto", which has a maximum size of about 12 cm. The females have a light, yellowish-brown coloration on the body and differ also in size from the smaller and silvery colored females of *C. virginalis*.

The only noticeable difference between the males of both species is the red colored band in the dorsal fin of the "Fire-Crest Mloto". (cont. p. 47).

Copadichromis sp. "Virginalis Chitande"

Ad Konings

A male *Copadichromis* sp. "Virginalis Chitande" in full breeding coloration.

At a depth of 30 meters the red color appears as a black band in the dorsal of the "Fire-Crest" and females may distinguish the two species by the pattern in this fin. Theoretically females of both species may live in mixed schools but this was not observed. Males of *C.* sp. "Virginalis Gome" were found to build their nests in a gently sloping area of the coast whereas *C. virginalis* males constructed similar nests in the steeper part of the coast and at significantly deeper levels. Such a nest consists of a crescent-shaped wall of sand which is positioned under an overhanging rock or beneath a suspended part of a rock (see photo page 46). The nest is usually as big as or bigger than the rock. It is important that the rock forms the ceiling of the spawning-site. This type of nest is constructed by all *Copadichromis* which have a black male breeding coloration with a light colored flare on head and dorsal.

The assignment of the two species at Gome Rock to Kajose and Kaduna is relatively convincing; the situation may differ at places where only one Virginalis-type inhabits the biotope or where only one type has been found. This may be the case at Chitande Island. In November 1990 a population of a small Virginalis-like cichlid were inhabiting a wide depth-range of the rocky coast. This species, *C.* sp. "Virginalis Chitande", occurred at depths of between 5 and 30 meters. Males, with a maximum size of approximately 12 cm, have a dark-blue breeding coloration with a light-blue flare on the upper part of the body. Females have a silvery coloration (see photo above) and were found at rather deep levels (about 25 m). The morphological features of "Virginalis Chitande" indicate that it is conspecific with *C. virginalis* but the coloration (band in dorsal) and depth distribution does not agree with that of the "Fire-Crest Mloto". Closer examination is needed to assign "Virginalis Chitande" to one of the known species or to describe it as a new one.

A female *Copadichromis* sp "Virginalis Chitande".

"Diplotaxodon" sp. "Big Head"

Mark Smith

The author collected *"Diplotaxodon"* sp. "Big Head" near Fort Maguire. Photo Ad Konings.

This unusual cichlid was found on the east coast of Lake Malawi, just south of the Mozambique border, at such places as Nurungu and Fort Maguire. At first glance this cichlid appears to belong to the genus *Diplotaxodon*. For when first observed it was seen lying in a large pile of freshly caught *Diplotaxodon* species. After analyzing this cichlid in a more detailed fashion, it seems probable that it does not belong to the genus *Diplotaxodon*. Its appearance also reminds one of a *Rhamphochromis* species, although it is doubtful that it belongs to that genus either. Of the two genera, it definitely is more closely related to the genus *Diplotaxodon*. Since there are not any known cichlid genera in Lake Malawi that appear to be half-way between *Rhamphochromis* and *Diplotaxodon*, it seems probable that this cichlid represents a new genus of Malawi cichlid. Only more detailed scientific analysis will be able to determine to which it rightfully belongs. The head and mouth of this fish are enormous in comparison with the rest of its body. This, along with its large, highly visible teeth, would seem to indicate that this cichlid is piscivorous. The unpaired fins are reduced in size (except for the anal, which is unusually large for a piscivore), similar to that found in *Rhamphochromis*, presumably indicating that this fish is a fast swimmer.

"Diplotaxodon" sp. "Big Head" was caught on hook and line using the lake sardine, *Engraulicypris sardella*, as bait. They were caught several hundred meters offshore along with species of *Diplotaxodon*, *Alticorpus* and *Rhamphochromis*. Its large eyes and lack of significant coloration indicate that this fish is most likely to frequent deep water. The largest specimen observed was about 35 cm in total length. Very little else is known about this interesting looking discovery, and, like virtually all the cichlids in Lake Malawi, it undoubtedly is a mouthbrooder.

Lethrinops sp. "Christyi Fort Maguire"

Mark Smith

Lethrinops sp. "Christyi Fort Maguire" seems to be a very interesting species from the deep waters.

This fascinating *Lethrinops* species appears to be undescribed and I, therefore, gave it the non-scientific name "Christyi Fort Maguire". I found the specimen in the photograph at the bottom of a large stack of nets in a native fisherman's dug-out canoe. The locality was Fort Maguire, just south of the Mozambique border.

A method of fishing that some Malawian fishermen utilize is the draping of a large net, a so-called "Chirimila", down into the open waters between two canoes. The larger nets extend down to beyond 70 meters (220 feet). The nets in the canoe in which I found the new *Lethrinops* were quite lengthy and the cichlids caught sported a characteristic deep dwelling cichlid coloration of black vertical barring on a silvery gray body.

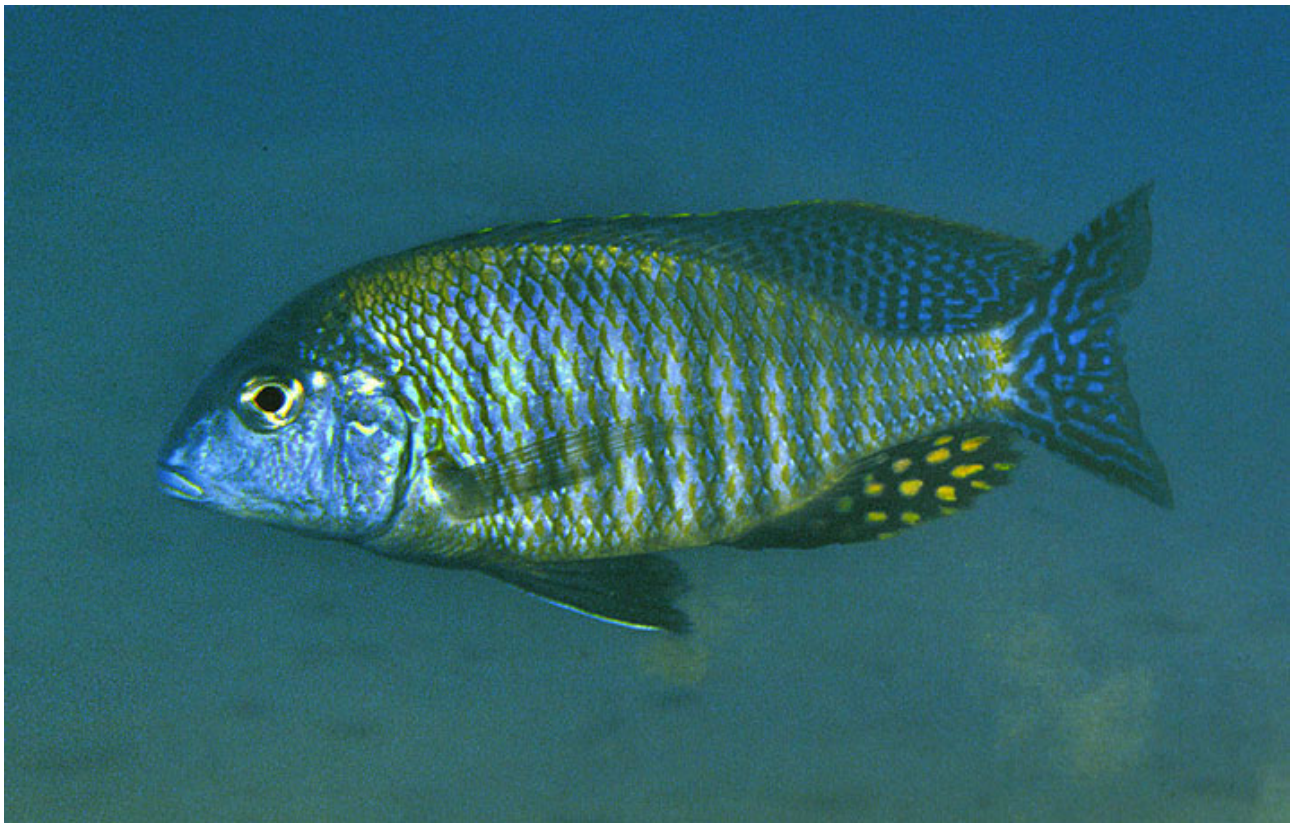
Lethrinops sp. "Christyi Fort Maguire" was caught along with *L. gossei* in the same net. The extreme slope of the upper head profile and pointed snout would seem to indicate that this deep dwelling *Lethrinops* pokes its snout into the muddy bottoms of its biotope in search of food.

Because of the metallic green coloration on the head and snout, it must be a male. It superficially resembles *L. christyi*; however, *L. christyi* has a more elongated snout than does this undescribed *Lethrinops*. It also seems closely related to *L. macracanthus*, although the snout of the latter does not protrude outward as much as does that of *L.* sp. "Christyi Fort Maguire". Other *Lethrinops*, such as *L. altus* and *L. mylodon*, also appear to be closely related to this undescribed species. The snout of *L. altus* is more elongate than that of this species while *L. mylodon*'s body is stouter.

Only one specimen, with an approximate length of 15 cm, was found in the fishermen's nets, so it is possible that the fish is either rather rare or is not normally found in the area and or depth at which it was caught. It was in any case remarkable that a species of *Lethrinops*, usually a bottom-dwelling cichlid, got into a net which is specifically used to catch "Utaka" and other open water cichlids. The net may have been dragged over the bottom because it is unlikely that a *Lethrinops* with such a mouth-structure lives in the open water. The length of the net and the lines was difficult to estimate but was certainly more than 70 meters.

Taeniolethrinops sp. "Furcicauda Ntekete"

Ad Konings



A breeding male *Taeniolethrinops* sp. "Furcicauda Ntekete" patrolling its territory over the sand.

The genus *Taeniolethrinops* is characterized by species which have a diagonal band on the body and have a *Lethrinops*-type mouth. If we regard *T. laticeps* as synonymous *T. praeorbitalis*, three species are known to belong to this genus. The *Lethrinops*-like cichlids are very difficult to distinguish from each other as they all have a similar body-shape and are silvery or sand-colored when not breeding. The best way to tell these cichlids apart, without dissecting specimens, is to wait till they are in their breeding period. Males usually acquire the most fantastic breeding colorations and can then be identified. The type of habitat and type of nest give further indications of identity. Before we know what breeding coloration belongs to which species we have to observe, photograph, and collect each species. A close examination of a few preserved specimens then tells us whether we are dealing with a scientifically known or with a new species. This procedure takes, of course, a lot of time because breeding in most *Lethrinops* and allied species occurs only at certain periods of the year.

In November 1990 we found several aquaristically unknown species clearly belonging to the *Lethrinops* group of sand-dwelling cichlids. The species which is shown in the picture above was found in very small numbers near a village called Ntekete on the east coast.

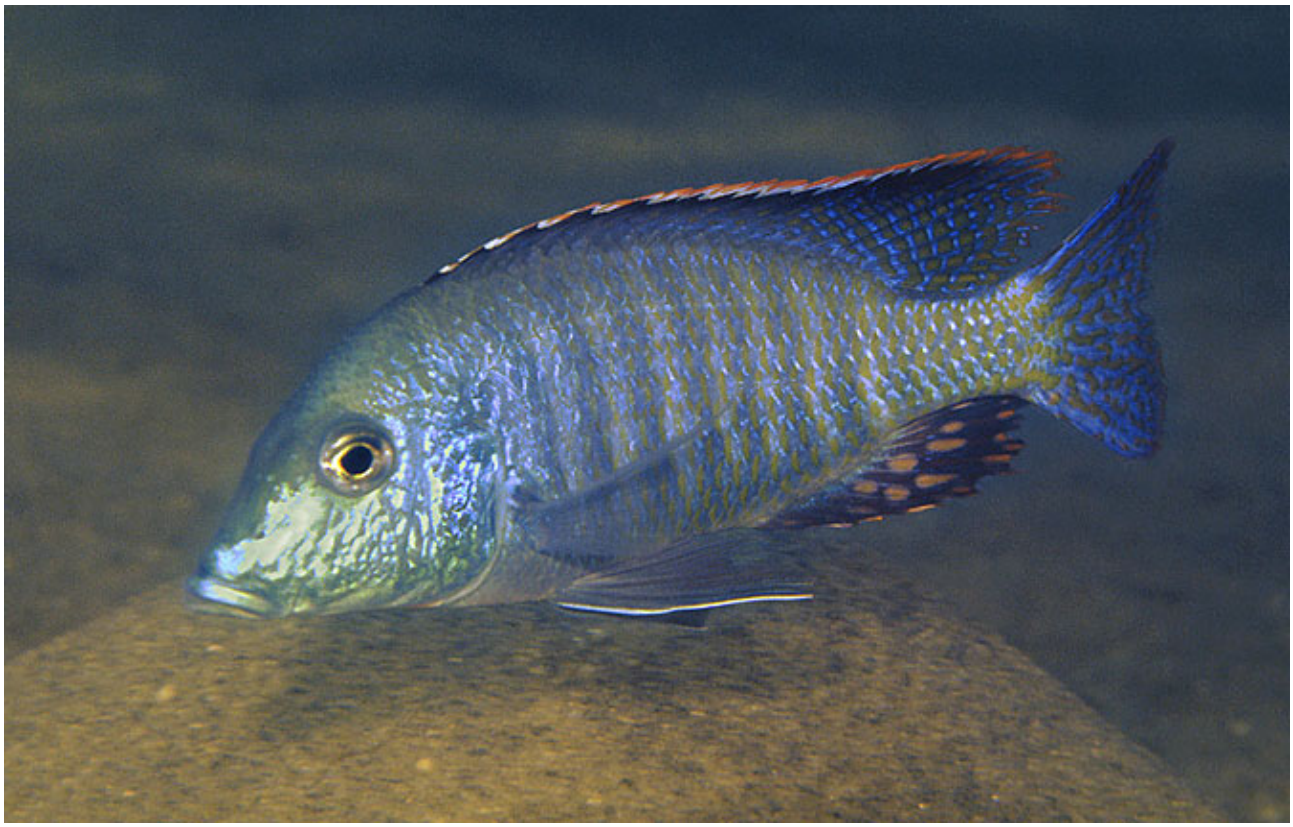
A female *Taeniolethrinops* sp. "Furcicauda Ntekete" (Ntekete, east coast).

A breeding male of *T.* sp. "Furcicauda Ntekete" constructs a large craternest (approx. 100 cm diameter) in the sand with an elevated rim around it. Two nests were seen built at a depth of about 15 meters. Females were found solitary, foraging on the sand in the vicinity of the male's nest.

The two specimens Saulos caught for me proved to belong to a new species. It has, however, some similarity to *T. furcicauda*, from which it differs by having a shorter snout and a larger eye. *T.* sp. "Furcicauda Ntekete" grows to a size of about 20 cm.

Lethrinops sp. "Longipinnis Ntekete"

Ad Konings



A male *Lethrinops* sp. "Longipinnis Ntekete" at its nest.

Above: The size of the nest with the turrets is enormous. Below: *L.* sp. "Longipinnis Ntekete" has a magnificent breeding coloration.

Lethrinops sp. "Longipinnis Ntekete" was only found in small numbers in shallow water on the east coast near the village of Ntekete. Breeding males were observed defending their peculiar nests in November 1990. Males, which have a maximum size of approximately 19 cm, construct a type of sand-castle nest which is unique among Malawian haplochromines. The nest consists of a large crater dug in the sandy bottom and an elevated wall made of five to eight large turrets. These turrets are about 30 cm high and about 50'cm wide at the base. The diameter of the complete nest is about two meters! Several of these nests were observed in 2 to 3 m of water. Females were solitary and foraged on the sand.

The only other Malawian species which builds turrets around the spawning-site is *L. auritus* (Lewis, 1980: J. Sci. Tech. Malawi; 1 (1); pp. 36-37). *L. auritus*, the smallest member of the genus, builds its nest in muddy environments and does not dig a crater but heaps small turrets in a circle around a centrally located heap, alongside which it digs a shallow pit for a spawning-site.

L. sp. "Longipinnis Ntekete" resembles *L. longipinnis* in appearance but has a longer snout, a shallower body, and shorter pectoral fins than this species, which is known only from the southern part of the lake.

Gephyrochromis

Ad Konings

Gephyrochromis sp. "Zebroides" has a very attractive coloration pattern.

The genus *Gephyrochromis* contains two scientifically described species and two undescribed ones. The described species are *G. moorii* and *G. lawsii*. *G. moorii* was exported from the lake in the late seventies and although it has the most beautiful coloration among the four species – especially the bright orange color on the throat – it never became a very popular cichlid. The reason may be that it is rather difficult to collect as it lives at deep levels. For reasons unknown to the author it is called "Sergeant" by the local fishermen. It is not known where the fish were collected but *G. moorii* has been observed near Msuli Point (Chintheche) at a depth of about 40 meters. Like the other species of the genus it lives over sand, preferably in areas which are covered with a layer of silt or mud.

G. lawsii has been observed in the bay near Ruarwe at a depth of about 25 m. They live in small groups and forage over the muddy floor of the bay. They have recently been exported from the Mbamba Bay, Tanzania. Another species of the genus is also found in the Mbamba Bay; it has been named *G.* sp. "Liuli" for the time being. It lives in rather shallow water and is sometimes caught in the nets of the fishermen on the beach (Peter Knabe, pers. comm.). This species has also been exported recently by Hans Fleischer, who collected it near Liuli.

The fourth species in the genus, *G.* sp. "Zebroides", is found on the east coast near Masinje and Fort Maguire but is also observed in the bay near Ruarwe. It has a remarkable color pattern, unlike that of the other three species. *G.* sp. "Zebroides" was observed at depths ranging from 7 to 30 meters. They occur in small groups or are solitary. Their foraging grounds are on the sand but breeding may take place in the rocky habitat. Some specimens were observed among the rocks and had a very dark coloration which almost obscured the regular pattern of bars. A distinction between males and females is not possible on the basis of coloration alone.

A male *Gephyrochromis* sp. "Liuli".

Pseudotropheus sp. "Zebra Charo"

Ad Konings

Pseudotropheus sp. "Zebra Charo" is a very common Mbuna at Charo.

The species in the *Pseudotropheus zebra* complex form a closely related group of rock-dwelling Mbuna. They provide the ichthyologists with many questions and more problems. *P. zebra*, of which the exact type-locality is unknown, is a polymorphic and variable species. In several populations there are so-called OB-morphs (orange-blotched, i.e. orange body color with black blotches of variable sizes) and O-morphs (with an entirely orange-colored body). Some populations differ from the holotype, which has distinct, dark vertical bars, by having no vertical bars at all. But such a population can also have OB- and O-morphs (e.g. the population at Jalo Reef; pers. obs.). Furthermore there are populations in which the males have a bright red dorsal fin. It is still questionable whether these red-dorsal populations belong to *P. zebra* or form another species because OB-morphs have never been found among them. Another species, *P.* sp. "Zebra Cobalt", lacks vertical bars on the body, lives sympatrically with *P. zebra* and also shows OB-polymorphism. How can one distinguish between a non-barred *P. zebra* population and the "Zebra Cobalt"?

The region with the most complicated community of *P. zebra* related species is that around the Maleri Islands in the southern part of the lake. Here, five distinct species inhabit the different rocky habitats. One of the species, *P.* sp. "Zebra Black Dorsal", is easily recognized by the black band in the dorsal fin. It resembles *P. heteropictus* from Thumbi West Island and might even be conspecific with this species.

At Charo and Kakusa we find no less than four species of the *P. zebra* complex. These two rocky coasts, which are about 7 km apart, are the only known habitats of *P.* sp. "Zebra Charo". This Zebra is easily recognized by the black band in the dorsal fin which could indicate some relationship with *P. heteropictus* from the south. The latter species, however, lives in the sediment-rich rocky biotopes as does *P.* sp. "Zebra Black Dorsal". *P.* sp. "Zebra Charo" lives in the sediment-free rocky regions and behaves more like a member of the genus *Cynotilapia*. It does not have unicuspid teeth, a prerequisite to belonging to that genus. Males are characterized by an orange-colored trailing edge in the dorsal fin. The population at Kakusa has less colorful males but clearly belongs to the same species.

P. sp. "Zebra Charo" shares the habitat with *P.* sp. "Zebra Cobalt" (Pearl variety), *P.* sp. "Zebra Goldbreast", and to a lesser extent with *P.* sp. "Zebra Gold", as this species is normally found at deeper levels of the biotope.

VICTORIAN CICHLIDS

Exciting new discoveries

Laif DeMason

"Haplochromis" sp. "Flameback" is one of the most colorful cichlids of Lake Victoria.

Recently, there have been several new cichlid imports from Lake Victoria. One of the most colorful imports is a haplochromine species, nicknamed "Flameback". Flameback haplochromines are found in shallow, near shore waters along the northern coast of Lake Victoria and have been reported along the south as well.

Males in breeding dress exhibit scarlet red from the forehead dorsally to the caudal peduncle, with a turquoise-blue coloration from the lateral line ventrally along the body to the belly region. There is faint darker blue barring along this body area.The anterior part of the dorsal fin is light gray becoming scarlet posteriorly along the soft rays. The caudal fin is scarlet, the anal fin orange, and both pelvic fins are jet black.

Females are mostly silvery gray-green with a faint pink sheen dorsally and yellow anal fins. The females are mouthbrooders with approximately 25 offspring per brood.

Unfortunately, not much is known about the habits of this wonderful fish. It appears to eat planktonic particles from the water column and will eat any aquarium fare.

Other interesting haplochromines are also being collected and sold from waterways near Lake Victoria, but not actually from the lake proper. Since some of these species are exported by commercial firms, exact collecting localities are not always known. Such is the case with an interesting haplochromine species named "Migori". *"Haplochromis"* sp. "Migori" is reportedly from the Migori River, which feeds Lake Victoria from the east. Information is not available on the exact habitats of commercial collections.

"Migori" males have a gold-green body with red patches on the operculum, and behind the pectoral fins. The dorsal and anal fins are suffused with a light blue hue, which is sometimes visible on the body adjacent to the anal and caudal fin. There are two to five yellow-orange spots present in the anal fin as well. The head is grayish with a slightly convex shaped forehead. Usually prominent is a black bar between the eye and corner of the mouth, typical of many Victorian haplochromines.

The female "Migori" is yellow or yellow-green in coloration, with a thin black longitudinal stripe from the operculum to the caudal. The ventral surface, from the mouth to the tail, is clear yellow in color as are the ventral fins and the soft rayed portion of the dorsal fin. Females are mouthbrooders, having more than twenty offspring per brood.

A haplochromine with similar male coloration from the northern shores of Lake Victoria is also known. It is unclear whether these two cichlids are the same species. Until systematics and distributions for haplochromine species new to the aquarium hobby are known, an exact classification is impossible.

"Haplochromis" sp. "Migori" is another very interesting find. Photos by Ad Konings.

A third colorful import is the true *Astatotilapia nubila*. In the past many fishes sold as *Haplochromis nubilus* were only similar and varied haplochromines from Lake Victoria. The true *nubila* male is a velvety black fish with a bright red edge to the dorsal fin, along with a bright red caudal fin and a bright red anal fin. The latter is decorated with sev-

eral golden-yellow spots. *A. nubila* is another shallow-water species found over sandy bottoms at several places in the lake. The females are mouthbrooders and have between 25 and 50 progeny in each brood.

With these new haplochromine imports from Lake Victoria, interest in these fascinating cichlids can be revitalized, making more commercial collection a viable pursuit. Like Lake Malawi, Lake Victoria has provided a site for complex species flock evolution. Both trophic and habitat specializations evolved gradually to give us the present-day lineages of species.

Anatomical features, such as dentition, shape of jaw, and morphology of skull parts, have been refined in each species (Greenwood, 1981).

Male coloration is probably a major factor in the prevention of hybridization. In many cases, species are virtually identical in their anatomy and can be distinguished only by male breeding colors. This slows commercial collection considerably and increases the cost the importer must bear.

With breeding colonies of colorful cichlids such as "Flameback" and "Migori" in place, progeny are now available. With increased interest in Lake Victoria fishes, many additional species will become available.

We have only scratched the surface of the many wonderful and colorful varieties from Lake Victoria. Hopefully many new and exciting Victorian cichlids will soon be available.

A male *Astatotilapia nubila*.

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"Haplochromis" sp. "Flameback", a female.

"Haplochromis" sp. "Migori", a female.

WEST AFRICAN CICHLIDS

Two new *Chromidotilapia* species

Roland Numrich

The species in the genus *Chromidotilapia*, which are mouthbrooders, belong to a still relatively unknown group of cichlids and are rarely kept in the aquariums of the West African "cichlidists". This is remarkable since this genus offers several species which have developed various and highly advanced breeding strategies. Moreover there are many *Chromidotilapia* with an attractive coloration and which are easy to keep in a community aquarium with other West African cichlids such as those from the genera *Pelvicachromis* and *Parananochromis*.

The species in *Chromidotilapia* can be split into two different groups:

(1) The *guntheri – kingsleyae* group with the species *C. guntheri* and subspecies *C. guntheri loenbergi* and *C. guntheri bosumtwensis* and *C. kingsleyae* plus about six undescribed species from the Ogoowe drainage in Gabun and two species from Congo.

(2) The *batesii – finleyi* group with the species *C. finleyi*, *C. batesii*, *C. linkei* and an undescribed species from the Korup region.

The features of the *finleyi-batesii* group make these

A female *Chromidotilapia* sp. "Mondemba". Photo by Roland Numrich.

A male *Chromidotilapia* sp. "Mondemba". Photos by Roland Numrich.

fishes excellent aquarium inhabitants. They are relatively small – a maximum size of approximately 10 to 12 cm – and there are a number of attractively colored races known, e.g. the "Mungo" variant of *C. finleyi* or the "Loum" variant of *C. linkei*.

The smaller species of the *guntheri-kingsleyae* group, in contrast to the larger species of the same group, exist in many different color variants in the respective drainages of their distribution. A similar situation is also found in the usually sympatric genus *Pelvicachromis*.

Here I introduce a newly imported species of the the *batesii-finleyi* group. *Chromidotilapia* sp. "Mondemba", as it is called, is found in the river system at the border between Nigeria and Cameroon and is new to science and to the hobby. *C.* sp. "Mondemba" grows to a length of approximately 7 cm and resembles *C. batesii*, although it has also some features in common with *C. finleyi*. Due to the lack of ample preserved or live material its status as a valid species is still unresolved.

The borderland between Nigeria and Cameroon was, a couple of years ago, completely unknown territory since it consists of virtually inaccessible mountainous terrain. The natural borderline is formed by the Akpa-Yafe River which is blessed with a rich and varied flora and fauna, of which many species are endemic to this region. The hinterland of the approximately 160 km long river forms one of the last intact rainforests in West Africa, which is in the process of being protected as a national park by both countries. In the process several surveys have been made and it was estimated that more than 140 species of fish live endemic in this region!

The first specimen of *C.* sp. "Mondemba" was collected in a small stream in the eastern Oban Hills in 1980. In 1987 more specimens were found in the Akpa-Yafe rivermouth near Ikono. In 1989 the first specimens were collected and brought back alive to Germany by M. Freier from Würzburg. He caught the fish at the western slopes of the Rumpi Hills near the Cameroon city Mondemba (Ndian drainage).

The fact that from the rivers east of the Rumpi Hills several populations of *C. finleyi* are known and in Nigeria west of the Oban Hills only *C. guntheri*, may indicate that this new species is endemic to the region. However, it is possible that *C.* sp. "Mondemba" also lives in the upper Munaya River (Cross River system).

Keeping *C.* sp. "Mondemba" proved to be rather simple as they are not aggressive towards each other

The collection site of *Chromidotilapia* sp. "Shiloango"

and eat any type of aquarium fare. This situation changed when the fish reached sexual maturity. I had put a male and female in a separate tank in order to breed them. The male became too aggressive and I had to separate the pair with a divider until the female was ready to spawn. Although the pair spawned several times they did not succeed in raising the offspring because the female repeatedly swallowed the eggs during the night after the spawning. I kept the pair in water with a pH of 5.5 and a conductivity of 120 microSiemens. All we know of their breeding technique is that *C.* sp. "Mondemba" is a ovophilous mouthbrooder. The reason that the brood was swallowed could be that the handing (mouthing) over of the eggs to the male did not function properly as is known for several aquarium populations of *C. finleyi* as well.

In contrast to the small species of the *batesii-finleyi* group, the *Chromidotilapias* from the African state Gabun, with its main river Ogoowe, are much larger. Fully mature females of *C. kingsleyae* can reach a size of about 20 cm. For most of the scientifically undescribed but aquaristically known species from this area the maximum size lies around 15 cm. A main feature of these species is the pointed, somewhat downwards directed mouth, which indicates a feeding behavior similar to that known for species of the South American genera *Geophagus* and *Satanoperca*. The members of the *guntheri-kingsleyae* group are substrate-sifters, i.e. they forage by "chewing" the substrate and passing it through the gills retaining any edible matter.

In the summer of 1988, during an expedition in Gabun, the author and F. Bitter from Lünen were able to collect five undescribed species and *C. kingsleyae*.

The second species I would like to introduce here was collected in the coastal region in the southwestern part of Gabun close to the border of Congo. It was found in the Nyanga drainage. I have chosen to name it *Chromidotilapia* sp. "Shiloango" as it may be conspecific with the species from the Shiloango that Linke & Staeck (1980) mentioned. These authors probably derived their data regarding the distribution of this mouthbrooder from the ample material in the Musée Royal de l'Afrique Central in Tervuren, Belgium. Their collection consists mainly of fish collected in the Niari-Kiolu and the Loango River systems in the, nowadays, Republic of Congo. Some specimens, however, were caught in the Nyanga in Gabun and appear, in spite of the wide distribution this assumes, conspecific with the Congo populations.

We found *C.* sp. "Shiloango" in some tributaries of

Chromidotilapia sp. "Shiloango". Photo by Roland

the Nyanga River in the savannas as well as in the coastal rainforests where we caught them in a number of different streams. In the main drainage system in this region, the Ngounie River between Du Chaillu Massiv and the coast, we find only *C. kingsleyae*.

The habitat of *C.* sp. "Shiloango", which grows to a maximum size of about 12 cm, consists of small rivers and fast flowing streams with bottoms of light and fine sand. Aquatic plants are seldom seen but here and there a waterlily (*Crinum spec.*), with two-meter-long, floating leaves, gives protection to the many killifishes of the genus *Plataplochilus*. The *Chromidotilapias* forage in loose groups of up to 12 individuals in the shallow water close to inundated banks, and dive for shelter in the leaves and root-systems which form a thick carpet in these areas. It was therefore difficult to catch specimens and we finally relied on the local fishermen who caught some with hook and line (this method proved very effective when we collected some smaller *Parananochromis* in the northern part of Gabun).

The composition of the water is, despite its proximity to the coast, very soft and acid. We measured a pH between 5.2 and 5.8 and a conductivity of 20 to 35 microSiemens. The temperature was rather low at 22° C. The main food of *C.* sp. "Shiloango" probably consists of the many 5 to 10 mm long, black-and-red colored shrimps which resemble to some extent the Asiatic Zebrashrimps of the genus *Caridina*, but have, instead of bands, black blotches.

Breeding this *Chromidotilapia* has been successful, even in hard water. The "Shiloango" *Chromidotilapia* is an ovophilous mouthbrooder in which the male – assiduously – takes care of the brood. He defends the fry against the other fish in the aquarium till they have reached a size of about one centimeter. The young *Chromidotilapias* reach sexual maturity and start pairing-off at a length of about 4 cm!

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The distribution of *Chromidotilapia* sp. "Mondemba" (blue) and *C.* sp. "Shiloango" (red).

Steatocranus ubanguiensis *Steatocranus mpozoensis*

Mark Smith

Steatocranus ubanguiensis.

Steatocranus mpozoensis. Photos by Mark Smith.

All known *Steatocranus* species are found in the rapids of the lower Congo or Zaïre River and its tributaries. Apparently *Steatocranus ubanguiensis* was first collected during a scientific expedition to the Mbomou River, a tributary of the Ubangui River, near Gozobangui. However *S. ubanguiensis* appears to be found in the Congo (Zaïre) River as well, for it has also been found sympatrically with *S. casuarius* in the Malebo Pool at Kinshasa, the location where most Congo (Zaïre) River fish are collected and exported. In careful looking through the hundreds of "Buffalo Head Cichlids" (*S. casuarius*) that make their way each month into wholesaler aquariums, one is guaranteed to find many "contaminants" mixed in with *S. casuarius*, and *S. ubanguiensis* is often one of them.

In the wild, *S. ubanguiensis* does not seem to grow much larger than 6 to 7 cm in total length, but can probably attain a larger size in captivity. This *Steatocranus* also behaves in a more aggressive fashion than does *S. casuarius*. The small to non-existent swimbladder and short stubby ventral fins, reminiscent of the suction disk-like ventral fins seen on some goby species, indicate that this cichlid inhabits fast flowing water. Even its squared-off, bluntly shaped head shows that it is used as an aid to cut through the currents of swift flowing water.

S. ubanguiensis' chisel-like teeth are used to pick away at the algae and micro-organisms encrusted on the rocks of its habitat. Yet, as with most other cichlids, *S. ubanguiensis* readily adapts to established aquarium fish food with great enthusiasm.

Steatocranus mpozoensis is another species that is regularly found in shipments of *S. casuarius* out of Zaïre, West Africa. At first glance one may be deceived into assuming that *S. mpozoensis* is in fact a juvenile *S. casuarius*. But upon closer examination a couple of obvious differences stand out. First of all, the head of *S. mpozoensis* slopes more gradually than does the blunt, blockhead-like appearance of *S. casuarius*. Secondly, the fright pattern is very different in *S. mpozoensis* to that in *S. casuarius*. *S. mpozoensis* has two horizontal, dark colored lines running down the length of the body, overlaying a dark, checker-like pattern. Only the dark checkered pattern is seen in *S. casuarius*. These dark markings vary from one species to the next within the genus *Steatocranus* and recognizing these varying patterns may help to identify the species.

This particular *Steatocranus* seems to behave in a manner similar to *S. casuarius* with little variation.

S. mpozoensis was originally collected in the Mpozo River, a tributary of the Lower Congo (Zaïre) River. What is remarkable about the Mpozo River is that the pH of the water measured 8.5 to 9.0 at the time of collection on September 1st, 1973.

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Pelvicachromis taeniatus (Boulenger, 1901)

Pelvicachromis taeniatus, a male from Kumba Funge, Cameroon. Photo by Roland Numrich.

Pelvicachromis taeniatus, a female from Kumba Funge.

P. taeniatus, a female from the Nyong River population.

Pelvicachromis taeniatus from Calabar. Photo by Numrich.

P. taeniatus, a female from Calabar. Photo by Numrich.

Pelvicachromis taeniatus (Boulenger, 1901)

Pelvicachromis taeniatus, the so-called “Red Taeniatus”. A male photographed by Roland Numrich.

Pelvicachromis taeniatus, a female of the “Red” variety. Photo by Roland Numrich.

CENTRAL AMERICAN CICHLIDS

The re-discovery of *Paraneetroplus nebuliferum*

Juan Miguel Artigas Azas

Diving among the boulders, I suddenly observed green dashes crossing below me. I watched them among the rocks swimming at great speed against the strong current. I was surprised how fast a cichlid could swim that way without an apparent, big effort. From time to time an individual stopped abrubtly and remained still for a few seconds, looked around, then continued racing. The personality of the elongated cichlid I was watching was fantastic, and they didn't look like they were rushing because of my presence, which they seemed to ignore.

This event took place in April 1990, just outside the town of Santo Domingo de Ocampo (95° 4' W. Lon., 17° 09' N. Lat.) in the northern part of the isthmus of Tehuantepec in Mexico. I was at Rio Dos Caños, a small tributary of the Rio San Juan, which belongs to the Papaloapan river system in the Mexican state of Veracruz. I was about 45 km south from Catemaco crater lake, well known as the place of the witches.

The water, with a pH of 8.0, GH of 4° and a KH of 5°, was yellowish and warm (over 28° C). The

Paraneetroplus nebuliferum in breeding coloration. Photo by Juan Miguel Artigas

river, at the site, was an average of ten meterswide with perhaps ten meters of exposed riverbeds between the banks. Because of the fairly steep gradient, the water flowed at a moderate speed. Boulders were present on the bottom of the river which was about one meter deep. At some deeper spots it was two meters deep. Pools had muddy to sandy bottoms.

The cichlid I observed was indeed a cichlid of the genus *Paraneetroplus*. It was the Rio Papaluapan equivalent of *Paraneetroplus bulleri* Regan, 1905 of Rio Coatzacoalcos. I thought, it had to be the long searched for *P. nebuliferum* (Günther, 1860), a fish everybody interested in Central Americans has been asking me for, whenever I had collected in the Isthmus.

The type locality, as stated in the description, is an eastern lowland stream of the Isthmus of Tehuantepec, more precisely, at San Juan Evangelista. The last name makes it easy to find the exact spot; it is a small town located in the state of Veracruz at the edge of the Rio San Juan. I was snorkeling in the same river, not far away from this town.

I spoke with a fisherman around Rio Dos Caños and he told me that the fish is commonly known as "Corrientera", referring to its habit of living in currents. The same name is used for *P. bulleri* around Rio Coatzacoalcos. The fisherman also told me that the cichlid was hard to get, but, despite its little meat, it was tasty and very much appreciated.

The accompanying pictures give some indication of the coloration. The main characteristic is a dark horizontal stripe over the entire body. The tail fin is large and powerful and is an adaptation for swimming in currents.

Although its original description states a length of 35 cm, the larger specimens I saw could have been around 25 cm. When the fish grows larger, the green color on the scales of the flanks intensify in brightness. Large males show more spots which are also present on the forehead.

In Rio Dos Caños I found *P. nebuliferum* in the company of three other cichlid species. One was a species of the *Thorichthys* group, called "Chonga" by local fishermen. It was abundant near the banks and in calmer water. It occurred mainly over muddy and sandy bottoms. In small numbers, *"Cichlasoma" (Parapetenia) salvini* with a beautiful coloration was most frequently seen in quieter regions of the river. Its local name is "Mojarra Pico de Gallo" (cock's comb cichlid). The deeper areas of the river were dominated by *"C." (Theraps) fenestratum*, called "Testa Colorada" (red head) by locals.

P. nebuliferum feeds on the lush algae which cover the boulders in the stream. Its rather powerful mouth faces downwards and tears off pieces of the algae. In this respect it has no competition from other cichlids. Only *"C." fenestratum* occasionally feeds on algae but it prefers to do so in the calmer waters near the bank. It also has a more omnivorous diet.

At the time of my visit, the end of the dry season, all cichlid species were found in breeding activity. *P. nebuliferum* pairs were seen in the rapids, mainly in the shade of large trees. Females rounded up their fry, numbering up to two hundred, in close circles, meanwhile grazing from the algae on the rocks. Males rounded up the fry too, but more from a distance. They kept intruders away from the fry. Once in a while the pair would remain still in the strong current while hovering over their fry. I noticed that at the slightest sign of danger, the fry would immediately scatter and get protection under the rocks. The female then stays at a safe dis-

P. nebuliferum in normal dress. Photos by J. M. Artigas

A pair *P. nebuliferum.*

A Rio San Juan affluent, the collection site of *Paraneetroplus nebuliferum*. Photo by Juan Miguel Artigas Azas.

tance. Once danger had passed, the fry come out from their shelter and get all together again following the signals of the mother, who vigorously shakes her fins to her offspring.

Collecting some individuals proved quite a task, as this fish is very fast and intelligent. During a holiday afternoon, when people of the town were taking a picnic at the riverside and kids had been swimming all day long in the muddy pools, the water was very murky and the fish did not see the net. So, a friend of mine and myself, using casting nets, were able to collect three adult specimens, but only after hundreds of throws. We had to disentangle the net from the rocks every other throw, with the net getting torn in the process. After a while it became dark and we had to return the next day. The water was clear this time. The visibility was about three meters and the "Corrienteras" very hard to catch with the casting nets. I decided to snorkel for fry with a handnet. This proved to be a good choice, despite the fact that small *Paraneetroplus nebuliferum* are difficult to get this way because of their aforementioned habit of scattering for protection beneath the rocks. It was hard to handle the handnet in the current, but I was able to catch some forty small individuals.

For taking adult fish home we used large plastic jugs of fifty liters capacity. They were about half filled. We took care that the water did not get too warm, which is the worst type of danger since it will deplete the oxygen and kill the fish. The fry were transported in a bucket closed with a lid. They were fed algae. Twice a day the water was changed. An extra step we usually take is to add a commercial tranquilizer to the containers of the large fish. This prevents stress and oxygen consuming fights among them. Given such treatment, cichlids have survived eight-days-long trips. This time all the "Corrienteras" arrived home safely.

Once home I placed the *nebuliferum* in quarantine using a commercial parasite killing solution in order to prevent an outburst of disease. Quarantine, I believe, is a must for acclimatizing most wildcaught cichlids. The "Corrienteras" got acclimatized very quickly and started to eat voraciously from the day of their arrival.

I keep my *nebuliferum* in a well circulated and oxygenated tank with a warm temperature of 28°'C. They seem to be doing just fine and show a healthy appetite. Of course, I pay much attention to water

quality because, since I have observed the natural conditions in which these fish live, you know they would not settle for less.

I should remark the extraordinary personality of this fish, which does not get intimidated easily and has a fantastic appetite. In this regard, I have no trouble feeding them. They take, willingly, frozen shrimp, fish meat, lettuce, spinach, brine shrimp as well as live aquatic insects, which I collect near my house. I do, however, lean to a herbivorous diet. It is hard to believe how much food this fish can take.

As in the wild, the Corrientera keeps in constant movement in the aquarium as well. I provide them with ceramic pots in the shape of caves that they happily use for cover and rest. Cichlid company was, however, not easy to find because *P. nebuliferum* proved to be quite aggressive towards many other cichlids that I tried to house them with. Therefore I decided to give them the whole 200 liters-tank to their own. I divided the tank, with plastic light diffusers, into three compartments, one for each individual.

Meanwhile the fry were eating like their adult counterparts and growing steadily from one to about three centimeters in two months. They were being fed with live baby brine shrimp and softened spinach. Soon they started to show aggression among themselves, so I had to move them to larger quarters.

After a couple of months I noticed some kind of attraction between two of the adult *P. nebuliferum*. I decided to remove the divider under close supervision. Then the fish showed their magnificent breeding dress which is hard to appreciate in the yellowish and dark water of their natural habitat.

The genital tubes were down the next morning and the pair spawned on the gravel. Nearly two hundred, small, yellowish, translucent eggs, about three millimeters long, were deposited. During the entire length of the spawning, which took about two hours, the pair kept circling the spawning site. After a while, however, the eggs were eaten by the pair. I then had to put the divider in once again to prevent the pair blaming each other for their failure, which is common with cichlasomines; the male wants to spawn again while the female holds no more eggs.

Two weeks of heavy feeding passed before they were ready to spawn again. I took the divider out and this time the pair chose the inside of the ceramic pot to spawn. This was more in agreement with the natural situation where spawning takes place in nests between the rocks in order to prevent the eggs from being washed away with the current. The second spawning, however, again did not succeed, as the eggs were eaten the next morning. So I had to replace the divider once again.

The location where *P. nebuliferum* was collected.

Since then I have not placed the pair together, but I will surely do so again soon. This time they will have to settle for breeding or I will have to remove the eggs from the parents to assure myself of some fry.

New varieties of cichlids are being discovered or re-discovered year after year. Central American cichlids are gaining more popularity and many species, like *P. nebuliferum*, with an interesting coloration and a great personality will indeed make popular aquarium fish in the near future. Once they are established in the hobby, the biology and habits of the fish in the wild will begin to become important. With the growing interest, the availability of now rare cichlids will surely become a reality, as it soon will be for *P. nebuliferum*.

"Cichlasoma" spinosissimum (Vaillant & Pellegrin, 1902)

Willem Heijns

A wildcaught *"Cichlasoma" spinosissimum*. Photo by Ton Woeltjes.

Introduction

In 1902 Vaillant and Pellegrin described for the first time the species *"Cichlasoma" spinosissimum*, albeit in the genus *Heros*. They described it from six specimens which were collected in the Rio Polochic in Guatemala. Two of the six specimens lacked the black spots which were present in the other four. Pellegrin (1904) described these two as a variant of the nominal species and named it *Cichlasoma spinosissimus* var. *immaculata*.

In his famous revision of the genus *Cichlasoma*, Regan (1905) considered the difference mentioned between the two variants enough to regard *"Cichlasoma" immaculatum* as a valid species. After this little more was heard of this species.

In the beginning of the eighties a small cichlid appeared in the hobby which was initially identified as being *"C." spinosissimum*. Both Staeck (1983) and Mayland (1984) published in their books a photograph of this cichlid which showed close affinities with *"C." spilurum*. The authors Stawikowski and Werner (1985) duly note their doubts regarding the proper identification of this species and conclude that it is a geographical variant of *"C." spilurum*. The large distribution area of this species indeed justifies the assumption that several color variants exist.

The question concerning the identity of *"Cichlasoma" spinosissimum* was solved when, in 1989, some specimens were collected in Guatemala and shipped to the Netherlands.

Taxonomy

Regan divided the genus *Cichlasoma* into several groups which he named sections. One of these sections is *Archocentrus*, to which belong, besides *"C." spinosissimum* and *"C." immaculatum*, also cichlids like *"C." nigrofasciatum*, *"C." spilurum*, *"C."* sajica and *"C." centrarchus*. Within this section other groupings can be made. The species *"C." spinosissimum*, *"C." immaculatum* and *"C." centrarchus* constitute, in my opinion, a natural group which are more closely related to each other than to other members of the section *Archocentrus*.

A complication is created by the fact that *"C." centrarchus* is regarded by Bussing (1976) as a sibling species of *Herotilapia multispinosa*. The latter species, however, does not belong to the genus *Cichlasoma* let alone to the section *Archocentrus*. The placement of *multispinosa* in another genus is due to the difference in the shape of its teeth compared with

to those species currently in *"Cichlasoma"*. *H. multispinosa* has tricuspid teeth whereas all the species in *"Cichlasoma"* have uni- or bicuspid teeth. Nevertheless, I am of the opinion that these four species, *"C." spinosissimum*, *"C." immaculatum*, *"C." centrarchus* and *H. multispinosa*, form a closely related group where *H. multispinosa* might be a little more distant from the other three. Their close relationship is also expressed in their similar morphology and color patterns (see accompanying photographs).

If we consider the distribution patterns of the four species we will immediately note that between the areas of *"C." spinosissimum* and *"C." immaculatum* (Rio Polochic, Guatemala) and that of *"C." centrarchus* and *H. multispinosa* (the great lakes of Nicaragua) there is an enormous region where, up to now, no relatives of these species have been found. The fact that this area has not thoroughly been investigated, either by scientists or by aquarists might be a reason for this situation. I am sure that when this region is explored in a more thorough fashion, new species and variants are to be expected.

Above: *"Cichlasoma" spinosissimum*, subadults.
Below: *Herotilapia multispinosa*.

Ecology

"C." spinosissimum inhabits calm waters with

A pair of *"Cichlasoma" centrarchus* guarding their spawn. Photos by Willem Heijns.

The distribution of *"C." spinosissimum* (yellow), *"C." centrarchus* (blue), and *Herotilapia multispinosa* (red).

plenty of aquatic weeds, which could be anticipated regarding its close relationship with *"C." centrarchus*. The specimens which were exported to the Netherlands were collected in small tributaries of the Lago de Izabal, in the Rio Polochic drainage (the type locality). They were found in almost stagnant water with a muddy bottom covered with a carpet of dead leaves. Their food consists mainly of insect-larvae which hide in the bottom and in between the rich growth of aquatic weeds. The pH of the water was around 6 and the hardness could not be measured. *"C." spinosissimum* was not observed in the Lago de Izabal where the water conditions noticeably differ from its tributaries. No recent collections have been made in the Rio Polochic, the most important water supply to the Lago de Izabal. *"C." immaculatum* has not been found since its description and it seems rather questionable whether two such closely related species could live sympatrically. Probably *"C." immaculatum* turns out to be a geographical variant after all.

"C." spinosissimum seems to be a rather vulnerable cichlid. Several specimens died shortly after being caught. Some others, which survived the long trip back home, acquired a certain type of fin rot to which most of them succumbed. Some individuals were cured after a treatment with tetracycline.

In the aquarium

At this moment experience with *"C." spinosissimum* in captivity is rather scarce. The few specimens that made it to the Netherlands were bred but they did not survive after all. The observation of one breeder was that *"C." spinosissimum* is a very shy aquarium fish, which hides among the rockwork of the tank. His pair spawned inside a cave which might lead to the conclusion that it is a cave-brooder. This, however, is unlikely as its close relatives spawn on open substrates. Like *"C." centrarchus* and *H. multispinosa* it "hangs" the larvae on the roots of plants or against the side of the aquarium.

My first experience with this cichlid started with 30 juveniles, barely in the free-swimming state. I fed them large amounts of *Artemia* and encountered the first problems when I changed to another type of food in order to cope with their needs. Although the food that I offered, such as *Cyclops* and mosquito larvae, was certainly small enough to be eaten, they only reluctantly considered it as food. Their growth stunted and some died. At one time too many dead bodies made me think a disease had played havoc with the fish. Only three fish were left over when a normal situation returned. At this moment they are about 8 cm in size and I think I have two males and one female. One of the males is clearly the boss and chases the others from its territory. These two, however, show now and again some courting behavior. I have patience.....

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"Cichlasoma" melanurum (Günther, 1862)

Willem Heijns

A female *"Cichlasoma" melanurum* in breeding coloration. Photo by Willem Heijns.

When Carl Hubbs described *"Cichlasoma"' synspilum*, in 1935, he pointed to a close relationship of this species with *Heros melanurus*, which had been described by Albert Günther in 1862. The status of *"C." synspilum* had been in question for a long time and many authors believed that it should be regarded as a synonym to *"C." melanurum*. *"C." synspilum* was introduced into the hobby long ago but the locality of the origin of the red variety, which has established itself firmly among hobbyists, is still unknown. The holotype of this species, however, was collected in the Rio San Pedro de Martir, a tributary of the Rio Usumacinta. This location is just 100 km away from the type locality of *"C." melanurum*, which had been described from specimens collected in Lago Petén. It could be the proximity of both type localities that may have misled some authors who regard *"C." synspilum* as a synonym. Although the distance between the two type localities is small, these two waters belong to two different drainages. This may be the main argument for those authors who regard both cichlids as valid species.

Hubbs found that the black, horizontal band, which runs on the caudal peduncle towards the center of the body, marks the difference between the two species. In *"C." melanurum* this band runs almost mid-lateral on the peduncle whereas it "dips" down and runs closer to the anal fin in *"C." synspilum*.

Another usable characteristic of *"C." melanurum* is the golden-yellow coloration in adult specimens. The specimen in the photograph above was caught in Lago Petén, in 1989, and represents the first *"C." melanurum* that had been exported to the Netherlands. It is not certain if different color variants exist of this species which are known for *"C." synspilum*.

"C." melanurum is, like its close relative, a vegetarian but likes any type of aquarium fare given.

Distribution of *"C." melanurum* (red) and *"C." synspilum* (blue).

"Cichlasoma" sp. "Pantepec"

Willem Heijns

A wildcaught male *"Cichlasoma"* sp. "Pantepec". Photos by Willem Heijns

The species of the section *Herichthys* in the genus *"Cichlasoma"* belong to the group of most northerly distributed cichlids in America. One of them is the Texas cichlid. The *Herichthys* cichlids are mainly found in the Atlantic drainage of México. In the Pacific drainage *"C." beani*, a member of the *Parapetenia* section, inhabits an even more northerly region but this still lies in México.

The most important group in *Herichthys* is, without doubt, the species closely related to the Texas cichlid, *"C." cyanoguttatum*, to which also *"C." carpinte* belongs. The distribution of this group ranges from the Rio Grande and its tributaries in Texas to the drainage of the Rio Pánuco in the Mexican state San Luis Potosí. The entire distribution lies on the Atlantic drainage of Central America. The description of a *Herichthys* found in the Pacific drainage (Hernandez Rolon, *Revue fr. Cichlid.*, Sept. 1990) must be an error which may have been caused by an introduction of an *Herichthys* by men in this area.

During a recent trip through the drainage area of the Rio Pánuco we decided to travel towards the south in order to find some river systems which are independent from the Rio Pánuco and which might be inhabited by *Herichthys* as well, preferably different ones to those found in the Pánuco system. We traveled from Tampico towards Vera Cruz and at about 150 km south of Tampico we came to the small town of Alamo where the road crossed, via a very long bridge, the Rio Pantepec. Assisted by a few local boys we collected a new *Herichthys*, which we immediately named Turquoise Herichthys because of its coloration (see photograph). In coloration it seems to be intermediate between the Tamasopo *Herichthys* (Rio Pánuco) and the variant/species which had been collected some years ago near Nautla (Vera Cruz).

The Rio Pantepec where the new *Herichthys* was found.

"Cichlasoma" sp. "Poza Rica"

Willem Heijns

A wildcaught male *"Cichlasoma"* sp. "Poza Rica". Photos by Willem Heijns

About ten miles south of the crossing of the Rio Pantepec, where we had collected the Turquoise Herichthys, we stumbled on the town of Poza Rica. In the center of the town a bridge crosses the Rio Cazones which invited us to throw our nets in search of more cichlids. Probably due to the rather fast flowing current we could not catch any fish and we decided to look for a calmer side-stream to try our luck again. Searching for such a stream we arrived on the outskirts of the town where we found a smelly pool which was probably used as a sewer by the surrounding houses. While one of the housewives kept an eye on our car and valuables, we wet our feet in the far from inviting pool. Contrary to our expectations we collected some beautiful cichlids. The pool was part of a stream that looked cleaner downstream; so we decided to continue catching a little further downstream. It proved quite difficult to collect enough specimens as the population seemed rather thinly spread.

"C." sp. "Poza Rica" resembles in many respects the Turquoise Herichthys from the Rio Pantepec but can be distinguished by the red coloration, especially on the cheek and gillcover.

(At present it is difficult to assess the status of all the *Herichthys* found in the different streams of México. It seems, though, that a good part of them can be classified as geographical variants of *"C." carpinte*. The more populations that are investigated, the better we will understand the variation among the species of the *Herichthys* section of the genus *"Cichlasoma"*. Geographically-related changes in coloration are a common feature in cichlids and should not lead to a recognition of as many *Herichthys* species as there are streams in México. *Ed*.)

"Cichlasoma" sp. "Poza Rica", a female.

"Cichlasoma" bartoni (Bean, 1892)

Ad Konings

A pair *"Cichlasoma" bartoni* with fry, photographed in the Media Luna.

The distribution of *"Cichlasoma" bartoni* is restricted to the upper Rio Verde. The largest population is found in the Media Luna, a spring in the province of San Luis Potosí, México. There are some smaller populations north of the Media Luna. They are mostly found in spring-fed streams and rivers. I have observed only the population in the Media Luna. There, *"C." bartoni* is probably the most abundant cichlid. Unfortunately its position is slowly taken over by *"C." carpinte* which was introduced from the Rio Verde. In 1980 a canal from the spring – built to irrigate the land – was completed. This canal, however, lies below the floodplain of the Rio Verde. In the rainy season the river occasionally spills into the canal and thereby introduces its fish-fauna into the Media Luna system.

"C." bartoni is a rather small member of the *Parapetenia* section in the genus *"Cichlasoma"*. The maximum recorded size is 20 cm but the majority of the adult, breeding individuals measure between 9 and 14 cm. Almost any individual over 10 cm in size shows its breeding dress. *"C." bartoni* is probably one of the few cichlids in the northern half of México which breeds throughout the year. The temperature of the water in the Media Luna is rather constant and reads about 25° C throughout the year. The water temperature further away from the feedingspring fluctuates much more with the seasons. In late summer, the warm spring water – with a hardness of more than 50 degrees – is diluted with the colder rain water. Most cichlids in the Rio Pánuco drainage breed at the beginning of the year, in the dry season, because the water has its highest temperature. *"C." bartoni* is normally found close to the origin of the spring. In Media Luna, the spring produces a substantial flow of water in which it is difficult to move about. Nevertheless, many breeding pairs are found in the strong current. To prevent their broods from drifting away they dig pits in the sand, preferably behind a small rock. The turbulence, caused by the rock, brings drifting food particles right into the nest. Spawns may number more then 200 fry. Breeding pairs are found one to two meters apart.

"C." bartoni is a predator. It searches the bottom of the stream for something edible, usually invertebrates. Sometimes juvenile' *"C." bartoni*' profit from the foraging method of *"C." labridens* with which it lives sympatrically (see photo next page). Despite the multitude of *bartoni* fry in the spring only a few semi-adult individuals, which are solitary, are observed.

"Cichlasoma" labridens (Pellegrin, 1903)

Ad Konings

A pair *"Cichlasoma" labridens* leading their fry through the Media Luna.

In captivity *"Cichlasoma" labridens* attains a maximum total length of approximately 25 cm but most adult individuals seen in their natural environment have a length between 12 and 16 cm. *"C." labridens* has a rather wide distribution and is therefore found in differently colored geographical races. It is found in springs, streams and rivers in the catchment area of the Rio Pánuco. The yellow race – of which a pair is shown in the picture – is known only from Media Luna and the upper Rio Verde. Most other populations have a white breeding coloration. The neutral color-pattern, however, differs marginally among the different populations.

In the Media Luna, *"C." labridens* was originally found sympatrically only with *"C." bartoni*, but their habitat is now threatened by introduced tilapiines and, especially for *"C." labridens*, by *"C." carpinte*. Like the latter *"C." labridens*' searches for food on the bottom of the stream and both have the same, peculiar way of doing so. By wagging the entire body the sand is cleared from the debris. The uncovered invertebrates, usually small snails, are then collected by the fish. Both *"C." labridens* and *"C." carpinte* feed on snails since the tilapiines eat most of the edible plants. *"C." carpinte* is known to eat plants as well but thanks to the introduced tilapiines it competes effectively with *"C." labridens* for the hidden invertebrates.

A *"C." labridens* wags the sand clear of debris while juvenile *"C." bartoni* pick their choice from the shower of mulch.

"C." labridens usually spawns in spring. The eggs are frequently deposited on the stem or exposed roots of waterplants – there are many *Nymphea* in the Méxican waters. When the fry have reached the free-swiming stage they are led by the parents through the habitat. From time to time one of the parents clears the substrate by wagging and all the youngsters will dive in the clouds of debris to look for something edible.

SOUTH AMERICAN CICHLIDS

Tahuantinsuyoa macantzatza Kullander, 1986

Ron Bernhard

A wildcaught male *Tahuantinsuyoa macantzatza* from the Rio Huacamayo. Photos by Ron Bernhard.

It is 6.30 am. The weak outboard motor slices, with noticeable effort, the large canoe through the seemingly ropy water of the Yarina Cocha. The water is completely black and the thin shreds of mist that waft over the surface give the scene something mystical. Frequently, the black-mirroring surface is broken by a group of breathtaking dolphins. The rising sun lets us feel what incredible high temperatures we will have to endure again this day while parrots flying over our heads scream their loud protest. Some moments later we anchor at the fishermen's village Yarina from where we will continue our trip by car.

This was the start of a collecting trip to the interior of Peru. After a rather troublesome flight from Lima to Pucallpa we (myself and eleven other aquarists) were awaited by the staff of La Cabana, the lodge which we would use as a basis for our trips. A little later we were on our way on our first, nightly trip on the warm, pro-

lific waters of Yarina Cocha.

In the coming weeks we would make several expeditions in this area which abounds with rivers and streams. One of these trips supplied the introduction to this article. We were the four of us and had decided to drive towards the Andean mountains, to the type locality of *Aequidens patricki*. It proved rather difficult to rent a taxi in Yarina to drive us to Aquaytia. Not that the distance was a problem but the fact that the type locality of this pretty cichlid, Aquaytia, lies in the middle of Peru's largest "coke" plantatations. Finally we were on our way, much later than planned.

After we had located and collected *A. patricki* we returned to the lodge. Notwithstanding the fact that our expedition resulted in 22 specimens, Ulrich Minde was determined to repeat the procedure the following day.

When we drove to Aquaytia our road had crossed a small river, the Rio Huacamayo. Due to our late departure we did not have time to collect in this river but Ulrich, who went on his own, had. The water in the river was clear and there was a weak current. In his net were caught some cichlids with a strong resemblance to species of *Bujurquina* (the larvophilous mouthbrooders which previously belonged to *Aequidens*). He brought some specimens to the lodge but most of them proved to be sensitive and were subsequently lost during transport. The ones that had survived the trip died during the following days. Fortunately there was one female with almost matured larvae. These were treated with great care and survived the trip back home.

After Ulrich had raised the fry to a reasonable size he gave me seven. Meanwhile we had figured out the identity of this little cichlid. Its resemblance to *Bujurquina* species was striking but it had one feature which was not shared with these cichlids. All species in *Bujurquina* have a band between the eyes which lies forward on the head. In our species the band started at the eye but ran backwards, towards the dorsal fin. This seemingly simple distinction was enough to identify our cichlid, using Kullander's book "The cichlid fishes of the Amazon river drainage of Peru", as the Inca Stonefish or *Tahuantinsuyoa macantzatza*.

The common name is derived from the fact that the bottom of all rivers inhabited by *T. macantzatza* consists of pebbles and rocks. *T. macantzatza* is a slenderly built cichlid with a rather heavy head with thick lips, and is laterally somewhat compressed. The unpaired fins are, in both sexes, rounded. There are six vertical bars on the body which become distinct when the fish is excited. The maximum size of *T. macantzatza* is about 13'cm for the male; the female remains a little smaller.

The difference between the sexes is rather small. The coloration of the male is a bit more intensive and his proportions are a little more robust than those of the female. During the breeding period the female has a vague dark patch in the dorsal fin.

The behavior of the Inca Stonefish preceding the spawning, was rather strange. At one moment both fish were close together supposedly preparing for spawning and some hours later the female was chased to every corner of the tank. This kind of ritual lasted for about two weeks after which the pair-formation was a fact. Both male and female were frequently found side by side with head down and all fins erect while the entire body quivered.

The eggs were deposited on a small chip of wood. There was barely enough room for them. I recalled this behavior from *Bujurquina vittata*, who, when I was photographing them, took the chip of wood with the eggs and carried it out of reach of my camera.

Unfortunately, I have never succeeded in successfully breeding *T. macantzatza*. Every time the female swallowed the eggs two or three days after she had taken them into her mouth. Uwe Werner, who has spawned this species, found that the female took the larvae in her mouth after 52 hours (pH of 7.5 and 26°'C). Also the male participated in the care of the larvae. He sometimes took the larvae from the female while she fed.

The spawns are rather small; about 40 to 50 eggs were deposited each time. As soon as the fry are big enough to forage on their own they are released by the female. The first few days after the release she occasionally takes them back into her mouth but soon the fry go their own way.

T. macantzatza is a very interesting cichlid which needs a medium size aquarium. Regrettably, a wide distribution among hobbyists cannot be expected soon as it has only sporadically been bred in captivity.

Tahuantinsuyoa macantzatza with jaws extended.

Biotodoma sp. "Santarem"

Ron Bernhard

A fully mature male *Biotodoma* sp. "Santarém". Photos by Ron Bernhard.

For many years *Biotodoma cupido* seems to have been a frequently kept cichlid. It is mentioned in most aquarium literature but in reality it is difficult to obtain just a few specimens. The best chance one has is to looka for "contaminants" in shipments of *Geophagus surinamensis* or *Satanoperca leucosticta*. Another species of the genus *Biotodoma*, *B. wavrini*, is regularly exported but only during the last few years.

Biotodoma sp. "Santarém" was exported for the first time in 1988. A German importer in Munich offered this species as "the most beautiful *Biotodoma*". The accompanying photograph is a testimony to this title.

Biotodoma sp. "Santarém" is found near the town with the same name (in Brazil) in an enormous swamp where the Rio Tapajós flows into the Amazon. The water level in this swampy delta varies dramatically with the seasons. It can be 15 meters higher at the end of the rainy season than before the rains started. An unknown lake in this vast area is used as the collection site by the exporter. The collection of aquarium fishes in this area is possible only during the dry season, from August to December. If something pops up it can happen that this species is not available for more than a year.

Like the other species in the genus, *Biotodoma* sp. "Santarém" grows to a maximum size of approximately 12 cm. It is a very placid cichlid, which should be kept in an aquarium with ample hiding places. In particular driftwood and some larger aquatic plants are essential for a successful spawning.

The male is recognized by the filamentous extensions of the unpaired fins and its splendid coloration. From a size of about 6 cm individuals can also be sexed by examining the vents. The variation in the coloration of the males is remarkable. In a single shipment of wildcaught specimens, some males have a completely colored tail fin whereas others only have a white upper and lower edge. Adult males acquire a fantastic finnage; depending on the light the dorsal fin can be orange and green or red with blue. The exceptional finnage, as the male in the photograph shows, can be attained only in a tank without any dominant or aggressive inhabitants. The best way to keep this species is pairwise, possibly accompanied by small tetras or catfish.

Breeding *B.* sp. "Santarém" is, in comparison to other species of the genus, relative simple. Although I have kept, on several occasions, *B. wavrini* and *B. cupido* (from northerly regions of South America), it was now for the first time that a species of *Biotodoma* spawned in my aquarium.

The first specimens I could obtain were placed in a

A female *Biotodoma* sp. “Santarém” guarding the eggs.

130 cm-long aquarium. Already after one day a pair had formed and the male had dug a pit. The pair harmonized well and I expected them to spawn soon. But two weeks later I found the female between the plants and she seemed to have lost her colors. The new color pattern consisted of a white dorsal fin, the body and head rather dark except for the ventral region which was white again. The blue-fluorescing streaks, which were usually seen on the head, were diminished to vague blue spots. The initial thought that the pair had quarrelled soon vanished when I noticed, below the female, a few hundred eggs swaying in the stream caused by the fanning of her pectoral fins. The eggs were attached to the substrate by just a thin thread. After two days my joy disappeared because the female had eaten the eggs. Later spawnings failed as well; this was probably due to the high pH and conductivity of my tap water. Up to now *Biotodoma* had behaved as a purely monogamous cichlid. A new breeding setup cast some doubt on this assumption.

A new group, consisting of one male and three females, was introduced into a 90 cm-long breeding tank. This time I had adjusted the water to a pH of 4.5 and a conductivity of 80 microSiemens (at 25° C). As soon as the fish were released the females chose each their own little territory. The male regarded the entire tank as its property. After one week he started courting the females, all three of them. The complete change in coloration in a female indicated that there were eggs. The next day, however, I noticed all three females with a breeding coloration! All three females had spawned with the same male within 48 hours. The male moved from one female to the other and seemed to be at his wit’s end regarding this unusual situation. One day later the male had made its decision and stayed with one female. Together they chased the other females away from their spawn. In the end only the eggs of the pair hatched and the remaining two females had to accomodate themselves in a corner of the aquarium. Just five days after hatching the female led the fry through the tank.

The water quality seemed to be of crucial importance in breeding this *Biotodoma*. After its polygamous excesses, the male restricted itself to one female only. The polygamous behavior observed might thus have been caused by a coincidental presence of three ripe females.

The fry were easily raised. They grew fast and were soon spread among other hobbyists. I hope they have as much pleasure and luck with this cichlid as I had, because *Biotodma* sp. “Santarém” is a jewel among the cichlids, in coloration as well as in behavior.

Retroculus lapidifer (De Castelnau, 1855)

Ron Bernhard

All representatives of the genus *Retroculus* were, until recently, catagorized as cichlids which aquarists had never seen alive. The only illustration I had ever seen was a colored drawing of *R. lapidifer*. The drawing accompanied a scientific description of *Chromys lapidifera* which De Castelnau published in 1855. The illustration impressed me very much as I could hardly imagine a South American cichlid which would look like this species.

For years I wondered how this *Retroculus* would look like alive and it came as a surprise when I read a small article in DATZ (Vol. 40; Nr. 12) about the first import of this cichlid. Shortly afterwards it was seen in the trade.

When De Castelnau described *Chromys lapidifera* he could barely guess that, before the end of the century, it would change its generic name three times. Finally, Regan (1906) placed it in the still accepted genus *Retroculus*. Besides *R. lapidifer* two other species have also been described in this genus, namely *R. xinguensis* and *R. septentrionalis*.

R. lapidifer is distributed in the drainages of the Rio Tocantíns, Rio Araquaia and Rio Guamá, including their tributaries. It is known that several geographical variants exist. The specimens shown in the photographs were collected in the Rio Guamá. They lack the vertical striping in the tail fin and the dorsal fin is almost without markings. The throat and upper lip are yellow and there are some red spots on the ventral side.

The variety from the Rio Tocantíns, which was exported to Europe recently, has a lot more colors. The dorsal fin shows more red and white, while the upper lip is blue. There are many red spots on the belly.

In the aquarium *R. lapidifer* behaves as an ideal aquarium fish. It eats any type of aquarium fare apart from vegetable matter. Even small tetras, which are left unharmed by species of e.g *Satanoperca*, are considered as food. Its favorite occupation, in which it reveals the close relationship with *Geophagus*, is to poke its snout up to the eyes in the sand, long after it has been fed. The way it dives into the substrate is rather unique. Before it "strikes", it puts itself in an almost vertical position. A quick dart forwards plunges the head in the sand. The eyes are placed far back, away from the mouth, a feature that gave these species the generic name *Retroculus*.

The sexes are difficult to identify. It seems that males have thicker lips and a more intensive coloration than females. I also noticed that the shape of the female's head is less robust, as in many species of *Satanoperca*. The female's snout seems to be shorter and her head, as a whole, looks more "friendly".

Adult *R. lapidifer* reach a size over 20 cm; this, together with its sometimes temperamental behavior indicates that it needs a large aquarium.

Already in the description of De Castelnau, in 1855, the breeding behavior of *Chromys lapidifera* was discussed. He wrote that it makes a nest of small pebbles, which are arranged in a round heap. This is confirmed by recent observations in the wild. Moreover some successful spawnings have been recorded in captivity. Hartwin Kiefel reported his observations on the breeding pair in his aquarium. The eggs were deposited on a flat stone and were immediately covered by small pebbles and stones. These were collected from every corner in the tank and thrown on the spawn! This behavior gave the cichlid its scientific name; *lapidifer* means "stone-carrier".

Unfortunately the eggs never hatched, although the pair spawned several times. This is probably due to the differences in the water chemistry and maybe the oxygen content of the water. The pH of the water in its natural habitat measured barely above 7 while the hardness was not measurable.

Retroculus species prefer fast flowing waters and belong to the rheophilic cichlids. Like *Steatocranus* and *Teleogramma*, they have lost the ability to hover motionlessly in the water. Their buoyancy compensating organ, the swimbladder, is only rudimentarily present. When *R. lapidifer* swims, it gives the impression as if something is pulling it down. We must not forget that this cichlid lives in waters that flow too fast for us to stand upright. The decoration and filtration of the aquarium require some extra attention. The bottom should be covered with coarse gravel or medium sized pebbles. The water must be in motion al the time; a powerful power filter should create a visible current in the tank. *R. lapidifer* likes to watch its environment from an elevated position. Some flat stones, slabs or flagstone, will make it easy for them. They also use these as spawning-sites.

If the tank has been prepared in the way mentioned, one will enjoy the presence of a couple of *R. lapidifer* even if a successful spawning is not to be expected for some time.

Retroculus lapidifer from the Rio Guamá.

Retroculus lapidifer is a very attractive cichlid. Photos by Ron Bernhard.

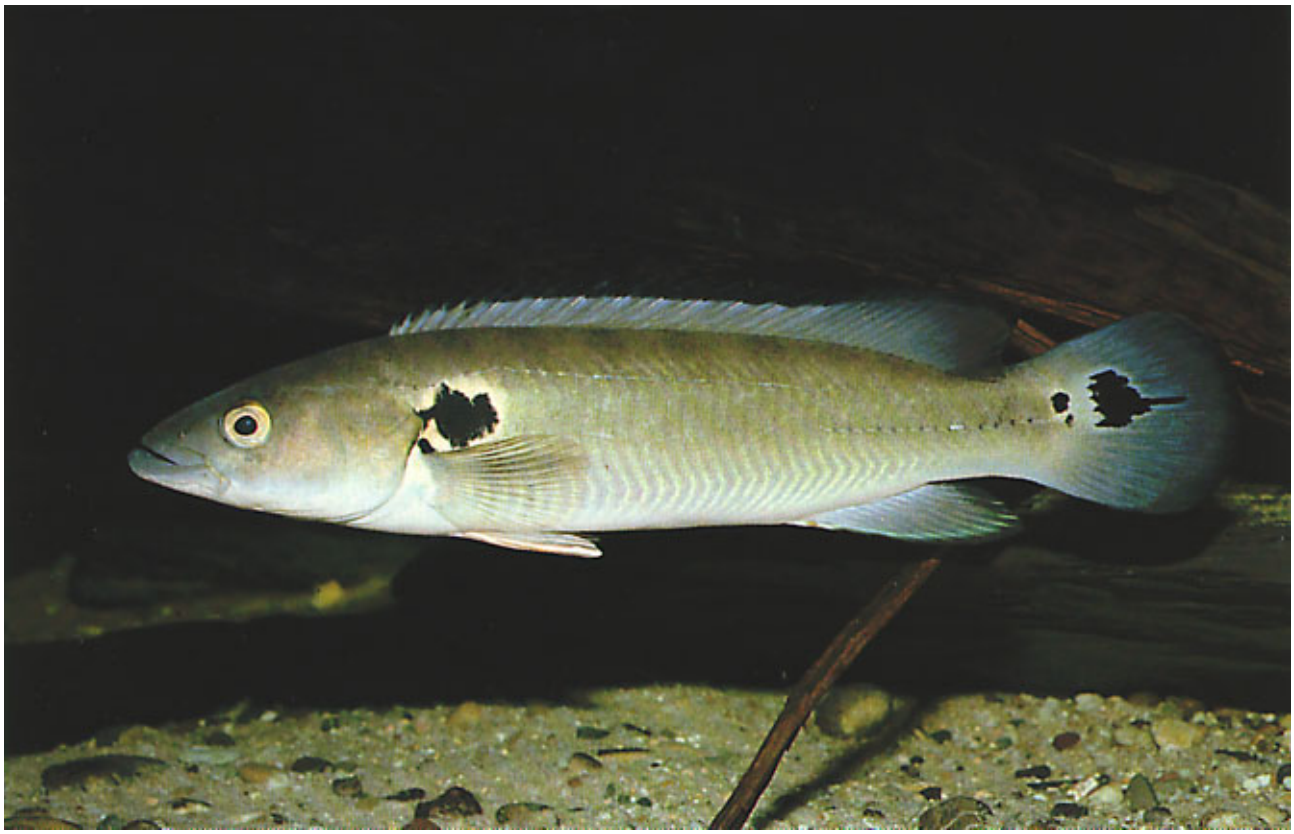
Some large *Crenicichla*

Frank Warzel

Most *Crenicichla* rarely exceed a size of more than 25 cm in their natural habitat, but there is a group among the pike cichlids which normally grow over 30 cm in length. Many common features like morphology, meristics of fins and scales, and similarities in the development of fry to adult fish, indicate that this group of large pike cichlids may form a distinct section within the genus *Crenicichla*. Although imports of such large *Crenicichla* have been rare, at least one species of this group was infrequently shipped to Europe in the last ten years. This species, which was collected in Venuzuela, became known under the name *C. strigata*. The name *strigata* is derived from the fact that juveniles have a pattern consisting of horizontal lines on the body. Besides these lines there are also black spots on the head, arranged in an attractive pattern. A drawing of a similarly patterned cichlid in Regan's *Crenicichla* revision (1905) strongly suggested that the Venezuelan pike cichlid was conspecific with *C. strigata* Günther, 1862. The fact that there are at least three valid species with this type of juvenile color pattern was not known until recently.

The first doubts were cast on the identity of the Venezuelan species when, about two years ago, a "new" *Crenicichla* was found in the Rio Capim drainage. The Rio Capim was mentioned, in 1862, as one of the two original localities of *C. strigata*. The "new" pike cichlid closely resembled the Venezuelan species, but had a greenish coloration and a conspicuous white-edged blotch behind the gillcover. In the same shipment of these green *Crenicichla* there were several, more than 20 cm-long, pikes which showed an attractive pattern of spots and stripes. The pattern was identical with that in the drawing of *C. strigata* in Regan's publication of 1905. Later, when the green *Crenicichla* gained a similar size to that of the striped individuals, it became clear that both belonged to the same species. The obvious conclusion that this species is the true *C. strigata* is not basically wrong but still needs some scientific verification. For certain, the species from the Capim drainage (and also a green *Crenicichla* from the Rio Tocantins) is not conspecific with the aquaristically known "Strigata" from Venezuela.

Another species, with Manaus as its alleged origin, likewise shares similarities with the former "Strigata" from Venezuela. It has, however, a more elongated body shape and caudal peduncle and shows a narrow black and white band in the dorsal fin. Moreover, the blotch on the caudal peduncle



An adult *Crenicichla strigata* from the Rio Capim. Photos by Frank Warzel.

has an irregular shape without a light border, which is seen in similar-sized Venezuelan pike cichlids.

A cichlid with a great resemblance to this species, *Crenicichla lugubris*, was described by Heckel in 1840. In Heckel's description there is no mention of a light band in the dorsal, but this is a typical characteristic of females which is regularly observed in the other species of this group. According to recent opinion (Kullander & Nijssen, 1989) *C. lugubris* is found only in the Corantijn system, at the border between Surinam and British Guyana, in the Essequibo river, in the Rio Branco and in the lower Rio Negro. Besides morphological conformities, the alleged distribution of the species (Manaus) further suggests that we are dealing here with the true *C. lugubris*.

The coloration pattern, as far as one can regard it as such, consists of a plain, light gray on the body and some red pigment in the ventral fins. During the breeding period, which usually takes place in winter, the fish changes its garment completely and one would think it an entirely different cichlid. The lower part of the head becomes yellow and orange, the ventral fins become bright red, while dark, violet zones are visible on the flank. As in most *Crenicichla*, the ventral region of the female becomes lighter with some reddish hues. Unfortunately nothing is known, aquaristically speaking, about the male coloration or about that of juveniles since only a single female has been exported.

Something more is known about *Crenicichla marmorata* Pellegrin, 1904, which was imported from the lower Rio Tapajós. This species, which is readily identified when adult, also shows a juvenile pattern of stripes and spots and is in this phase hardly distinguishable from the other species. Not until the moment of the color-change was the author convinced he had kept semi-adult *C. strigata*. In retrospect, the horizontal stripe of juvenile *C. marmorata* did not seem to be so sharply bordered as it is in *C. strigata*.

Although juveniles all look alike, adult *C. marmorata* show an individual color pattern. Even fish from the same spawn display a variable pattern. While some individuals have black blotches alternating with colored ones on the dorsal part of the body, others have a horizontal row of colored spots. The most common pattern is a combination of these two basic patterns.

Besides that from Santarém on the lower Rio Tapajós more populations of *C. marmorata* are known. The Dutch ichthyologist Alex Ploeg (1987)

A female *Crenicichla lugubris* allegedly from Manaus.

A juvenile *Crenicichla marmorata*. Photo by F. Warzel.

A juvenile *C. strigata*. Photo by Rainer Harnoß.

A juvenile *C.* sp. “Strigata Venezuela”. Photo by F. Warzel.

An adult *C.* sp. “Strigata Venezuela”. Photo by F. Warzel.

An adult male *Crenicichla marmorata* from Santarém. Photo by Frank Warzel.

describes this species from the lower Rio Trombetas, where the population has nine irregular bars that reach onto the ventral region. Three specimens from the Rio Madeira system show, in contrast to the previous population, a more dorsally oriented and partially connected blotch pattern. The head patterns are different, too. While the Trombetas *marmorata* has a completely black head, except for a small zone behind the eye, Ploeg found the head of the Madeira *marmorata* dotted with small, black spots.

It will probably take years before all systematic questions regarding *Crenicichla* are solved.

Less problematic is the maintenance of these cichlids, although some experience with large fish is required (Stawikowski & Werner, 1988).

One of the peculiarities of these large species is the social behavior of the juveniles, who, when they still have the characteristic spots-and-stripes pattern, are very peaceful and seek contact with each other. The cohesion of a group can be so strong that they jointly chase intruders from their territory. In the natural habitat this may be the duty of the parents, who guard their offspring for a period of six months or longer. After about one year – the period may vary according to species and conditions – the change in color takes place. A concomitant change in their behavior is noticeable, and skirmishes among the members of the group are frequently seen. In tanks larger than 150 cm these rebellious pikes can still be kept together, provided that they equal each other in size.

Like most large cichlids these pike cichlids are monogamous, i.e. they breed in pairs. In the restricted quarters of an aquarium this might sometimes lead to quarrels between the pair. The distinction between the sexes is rather difficult as the regularly observed extensions of the unpaired fins in males of other species are not seen in *Crenicichla*. In general, the females have, however, a light band or zone in the upper part of the dorsal fin.

Regrettably, a successful spawning, in captivity, of one of these large *Crenicichla* has not yet taken place, although courting behavior and females with ripe eggs have been observed. Probably certain environmental factors, which can only partially be created in an aquarium, play a crucial role here. It would be a shame if, in future, we are not able to breed these cichlids, because then we must continue to depend entirely on imports of these magnificent fish. Many of them will then probably "ooze away" in one tank or another.

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Crenicichla compressiceps Ploeg, 1986

Frank Warzel

A wildcaught male *Crenicichla compressiceps*. Photo by Frank Warzel.

Normally one would not expect to find a small and attractively colored cichlid among the species of a genus which has the reputation of consisting of large, unattractive predators. However, the genus *Crenicichla* includes a group of small (in comparison to the other species) dwarf-sized cichlids which attain, under natural circumstances, a maximum length of less than 10 cm. Not only the size but also the elegant and graceful appearance and the interesting courting behavior of these dwarf *Crenicichlas* make them very rewarding aquarium residents.

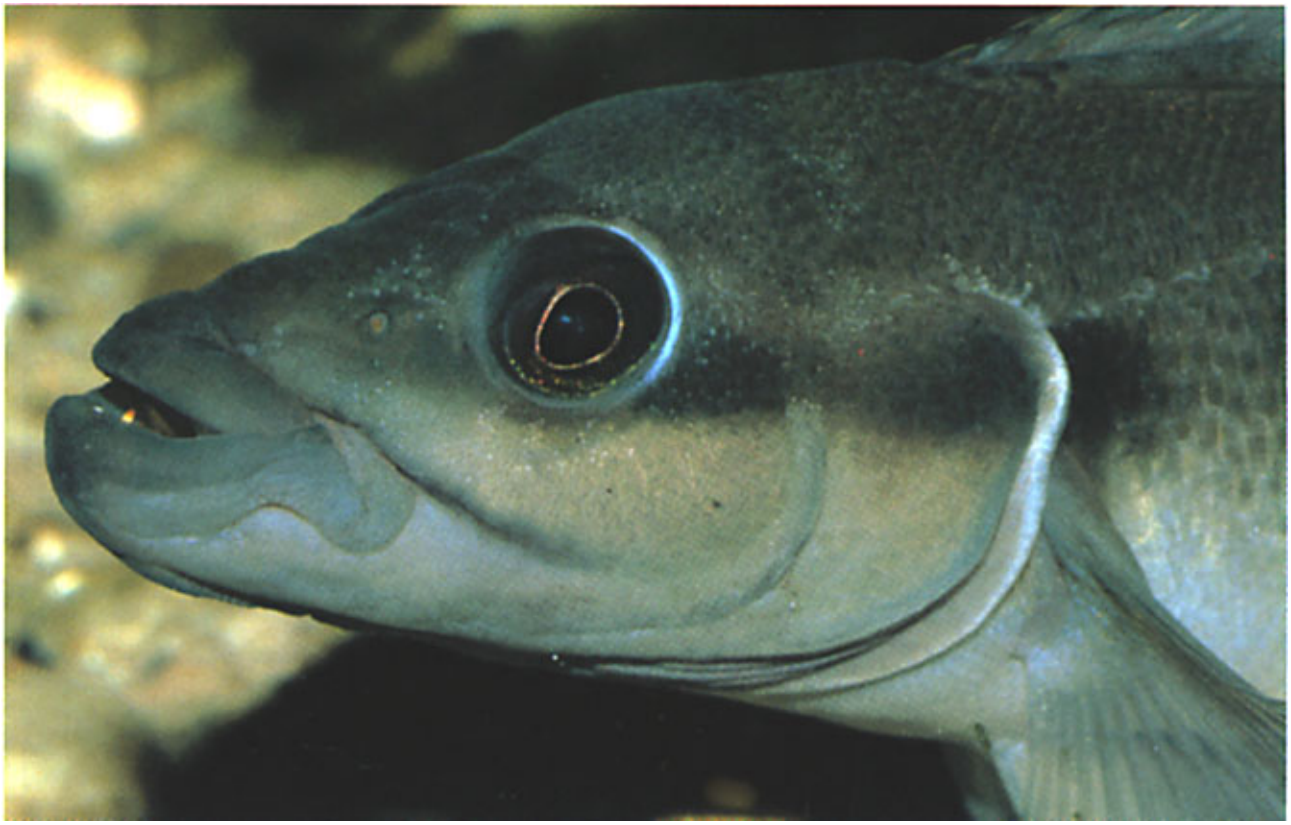
Until recently only two species of this group were infrequently imported. In 1990 a third species, *Crenicichla compressiceps*, was imported for the first time. The "new" dwarf *Crenicichla* shows surprisingly little similarity to the other species of the group. This is mainly due to the difference in biotopes which these species inhabit. Whereas *C. regani* and *C. notophthalmus* are found mainly in the weedy, shallow regions near riverbanks, *C. compressiceps* is observed only among the rubble and rocks of the lower Tocantíns River system. When I observed *C. compressiceps* in their habitat, I noted that they were not at all shy and they rarely hid under rocks. Large caves and gaps between the rocks were principally avoided. This remarkable behavior might be explained by the fact that two much larger *Crenicichla* species inhabit the same biotope and they commonly use these caves as shelter. The agile behavior of *C. compressiceps* might also be related to the situation in their home waters. This dwarf *Crenicichla* has a lot of temperament and males require rather large territories from which they energetically chase rival males.

A suitable aquarium will be larger than 80 cm and have ample rockwork. Hiding places should be created in the upper part of smaller tanks. Victimised fish will thus find an easy refuge. In return for its aggressive inclination we are rewarded with an attractive coloration.

According to the experiences gathered from keeping this species in captivity we should not expect many difficulties. *C. compressiceps* relishes any type of frozen and live food. We must be careful not to overfeed them because their enthusiasm for food may get the better of them.

Crenicichla cyclostoma Ploeg, 1986

Frank Warzel



The head of *Crenicichla cyclostoma*; note the large teeth. Photos by Frank Warzel.

In 1986 the Dutch ichthyologist Alex Ploeg described some new *Crenicichla* species, which were collected in the beginning of the eighties during several scientific expeditions. These expeditions were undertaken to survey the local fish fauna, as a construction of an enormous dam would soon for ever destroy the rapids habitat in the lower Tocantíns.

Our collection trip in late summer 1990 brought us to Marabá, a small town upstream of the now over 170 km (!) long reservoir. One of the rheophilic species known from this region is *Crenicichla cyclostoma*. The name means "round mouth" and is derived from the fact that, when viewed from above, the lower lip (which is larger than the upper) is almost perfectly round. As in the sympatric *C. compressiceps*, the head and body of *C. cyclostoma* are laterally compressed, which is a remarkable feature considering the wide-mouthed appearance of most other species of the so-called *Batrachops* group. The maximum size of *C. cyclostoma* is about 13'cm, which is again in contrast to that of its closest relatives. The large teeth on the outer jaws (sometimes also seen when mouth is closed) are another characteristic of this peculiar species.

C. cyclostoma, which lives a hidden life under the rocks of its biotope, adapted gradually to its new environment and greedily accepted frozen foods.

Crenicichla cyclostoma.

In the wild the diet probably consists of insect larvae and small crustaceans. For maintenance the water is of minor importance but enough shelter, in form of rocks, should be created.

C. cyclostoma has the ability to change its color pattern rapidly, especially upon confrontation with conspecifics. The dominant individual acquires a light body coloration with vertical bands whereas the weaker one becomes dark gray with a light gray, horizontal line. During the breeding period females have a bright red band in the trailing part of the dorsal fin.

Symphysodon aequifasciatus Pellegrin, 1904

A very decorative pair of a strain of *Symphysodon aequifasciatus*.

Symphysodon aequifasciatus Pellegrin, 1904

A beautiful female of a red-turquoise strain with a regular pattern

Make your own reef

Gerard Tijsseling

It is advisable to offer most cichlid species ample hiding places in the aquarium for the available space is usually not sufficient to let all inhabitants coexist harmlessly together. Shelter in tanks is normally created by placing rocks and other heavy artifacts in such a position that the inhabitant can find refuge among them. A second reason to place heavy rocks in your tank is to imitate the natural biotope of the cichlids and to increase the surface area onto which algae, the natural food of many rock-dwelling cichlids, can settle. From an aesthetic point of view large rocks are recommended as they will give the impression of a larger tank. Because of the fact that most aquarium bottoms are made of glass, large rocks are hazardous. To abridge the wish of an aesthetically approved reef and that of an intact glass bottom, the following method describes how one can make featherweight rocks.

What we need is a rock, which serves as an example, gypsum, clay and a wooden box, which we custom make for the size of the rock.

Casting the mold

We construct a box from wood, which fits the rock by at least 3 cm on all sides. On the bottom we place a ring of clay, at least 3 cm high. This will be the drain when the mold is ready. The ring must be strong enough to hold the rock, which is placed on top of it, in its place (see fig.'1). Now we grease the inside of the box and the rock with soft soap. This will allow us to release the cast when it has hardened.

To be able to dismantle the mold in order to remove

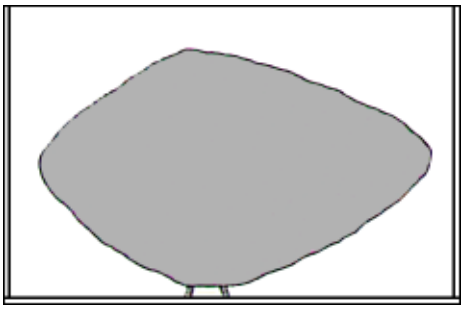


Fig 1. The rock is placed on a 3 cm-high ring of clay.

the rock (and later the cast rock), it will be made of several layers. Every layer must harden before a new one is applied. The number and thickness of the layers is dependent on the shape and the size of the rock (see fig. 2). Prepare enough plaster to make the first layer. The plaster must have the consistency of yoghurt and be cleared of any dry clumps of gypsum. When the plaster is hard enough, cut some grooves in the surface. These will be filled with the next layer and help fixing the different layers when they are hardened. Before we pour the next layer the surface of the previous is greased with soft soap. A ring of clay is placed on top of the rock before the last layer is poured. This ring has a diameter of about 8 cm and will later be the opening through which the mold is filled.

When the plaster of the last layer is strong enough to take it apart, all layers are removed and the soaped washed of. Sometimes, depending on the shape of the rock, a layer has to be sawed in two (see fig. 2). Now we dry all parts of the mold for several weeks.

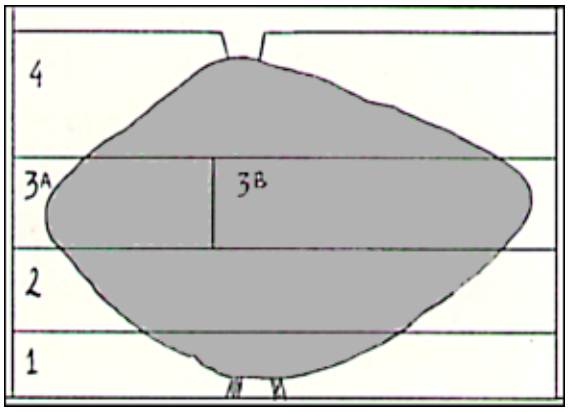


Fig 2. This mold consists of five parts.

Casting the rock

For making the rocks we need casting-clay which can be bought or made by mixing water with clay powder. It must have the consistency of yogurt.

The mold is reconstructed – if we have made some grooves it will hold the layers perfectly in place – and fixed by rubber bands. In this case, the inner tube of a bicycle wheel works fine. We close the drain with a

Fig 3. The mold is filled to the brim with the casting clay.

wooden stopper or of some other material which does not absorb water. The mold is now completely filled with the fluid clay (see fig. 3).

The water in the casting-clay is absorbed by the plaster of the mold. Every five to ten minutes we top of the clay. After a half, with very dry molds, to one hour we drain the remaining clay in a bucket (it can be re-used). Now a layer with a thickness of about one centimeter lines the mold inside. We let this dry for about two to three days before we dismantle the mold (see fig. 4). The filling opening and the drain in the cast are closed with soft, moist clay. Any irregularities, caused by the structure of the mold, are trimmed from the cast (see fig. 5).

When we have decided what side will be facing the back of the aquarium, we cut here one or two holes to permit entrance by the fish (see fig. 6).

Also some smaller holes are punctured on all sides of the rock in order to release the air that got trapped inside (see fig. 7). When you forget these small holes, you will find your carefully constructed reef floating by when the aquarium is filled. With some artistic experience a cast can be re-shaped a little by denting it. This is, however, not mandatory. It is remarkable how many identical "rocks" one can place in an aquarium without giving the impression that all "rocks" are the same.

After the casts have dried for several weeks they have to be baked in a kiln at 1000 to 1200°C, depending on the type of clay. A friendly potter or brick factory might help you out if you have no ready access to such an oven. The color of the clay or glazing is of minor importance because the ceramic rocks will be covered with algae in a few month's time (see fig. 8).

All photos by Iemkje Tijsseling

Fig 4. Care must be taken when dismantling the mold.

Fig 5. The cast is trimmed to obtain a smooth surface.

Fig 6. One or two larger holes are made to enable entrance.

Fig 7. Small holes in the cast release trapped air.

Fig 8. A completely ceramic reef in the author's

A *Julidochromis* breeding tank

John Szwechlowicz

The chief problem in regularly breeding *Julidochromis* species or indeed any of the small rock dwelling Tanganyikans results from the difficulty in removing the young fish without disturbing the parents. The usual method involves removing all rockwork from the aquarium before it is possible to net the young fish out. The rocks are then replaced causing great upheaval and stress to the parents which usually shows itself by their unwillingness to spawn again until they have settled down, which can take as much as 6 to 8 weeks. Also, when subjected to this amount of disturbance, it sometimes happens that the pair "fall out" with each other to the extent that one may be actually killed.

Re-pairing adult *Julidochromis* and some other cave-inhabiting cichlids is something that I now never do, as the pair bond is never as strong as with their original mates, so there is a tendency for intermittent fighting. It is far better to start again with a selection of young fish to give a choice of mates and wait for a stable pair to form.

My method for maintaining and breeding these fish removes most of these problems.

I have found it best to custom build a double aquarium to accommodate two pairs of fish. First, build a basic aquarium 48 x 18 x 18 inches (122 x 45 x 45 cm) – 6 mm glass is adequate for this as the shelves and divider strengthen it and stop it flexing when full. A clear divider glass is siliconed in place to divide the aquarium into two equal halves, approximately 24 x 18 x 18 inches (60 x 45 x 45 cm). The seal on this must be watertight.

A glass shelf measuring 24 x 6high x 9wide (60 x 13 x 22'cm) is then fitted along the back of each compartment. This should be made separately (6'mm glass) and painted on what will be the *underside* with two or three coats of matt black or any dark coloured paint. The shelf should appear "solid" when finished. The dark colour enhances the markings on *Julidochromis* and helps to prevent them looking "washed out" as well as discouraging algae growth. The corners of the shelf should be rounded off with a grinding disc in order to accommodate the inner silicon seal of the aquarium.

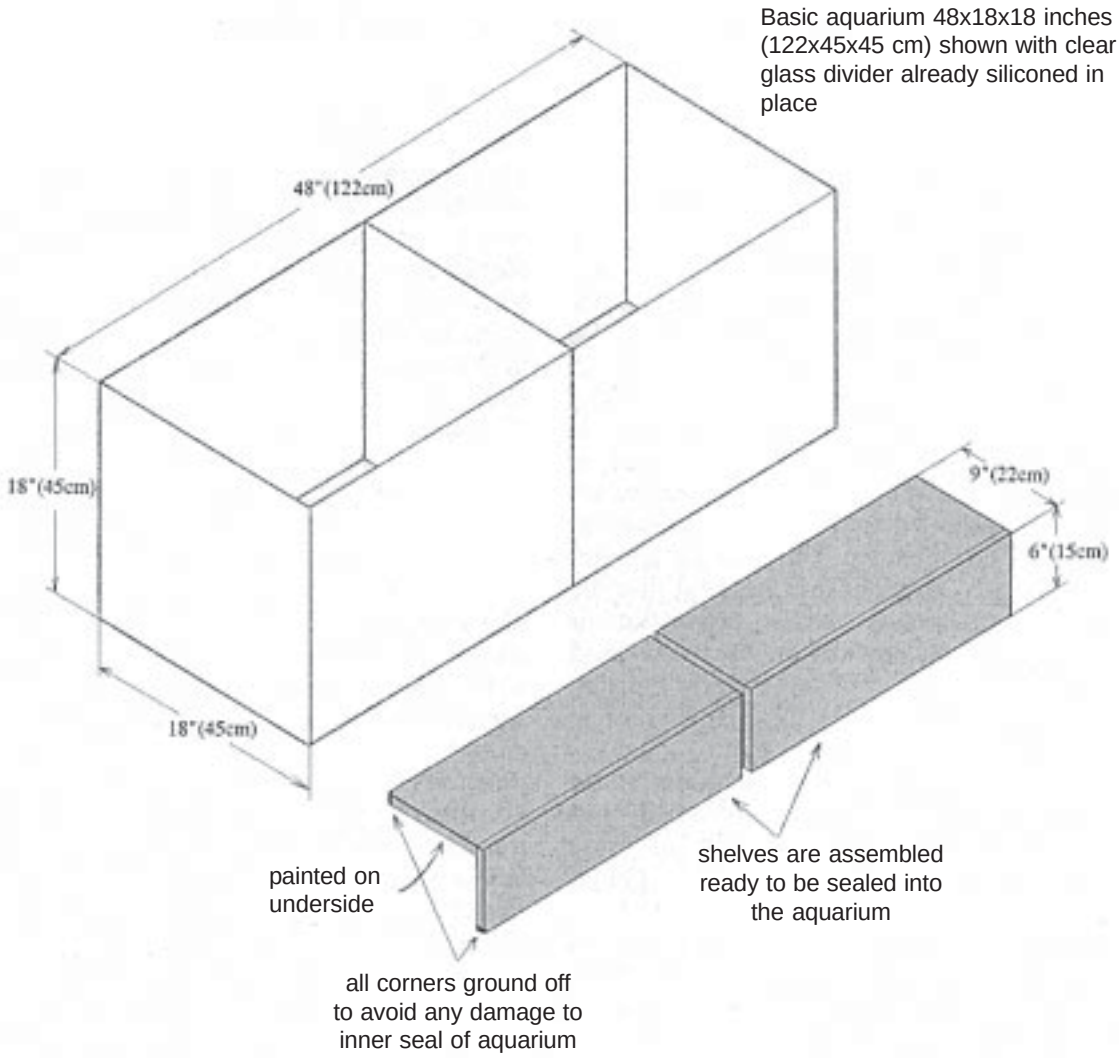
It is absolutely vital to make certain that all seals on the shelf are watertight, forming an airtight compartment under the shelf. If water should seep into this compartment it will make the paint fall off the underside of the shelf. Removing it for repainting is very difficult indeed (I speak from experience here!) and it is far easier to make certain you have a good seal in the first place.

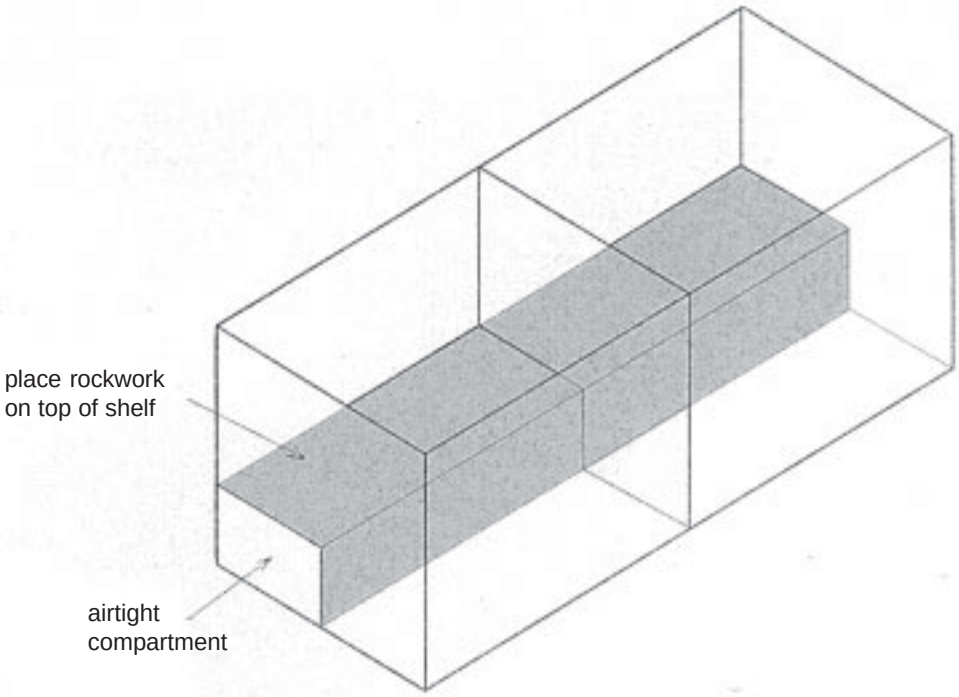
When the aquarium is ready for use, rocks and/or clay flowerpots are arranged to form the usual caves on top of the shelf. No substrate is necessary and filtration is provided by a double Algarde Biofoam 200 or similar foam filter. It is a good idea to direct the filter outlet towards the back of the tank to help prevent sediment settling among the rocks. It will be flushed out to collect in the front of the aquarium from where it can be periodically syphoned out. Maintenance is thus greatly simplified.

A pair of *Julidochromis* (or other rock dwelling cichlids) is placed in each side of the aquarium. Here they will live and breed as in a conventional aquarium, but several benefits soon become apparent. Because each pair can see another pair on the very edge of their territory, much time is spent threatening the opposite pair, although the divider prevents actual physical contact. This tends to occupy their minds and dramatically reduces the chances of a pair falling out with each other, which I consider to be mainly due to the fishy equivalent of boredom, when they are not having to actively defend a territory.

If good water quality is maintained, sooner or later the pair will produce fry. Initially, these stay in among the rocks as normal but as they reach about 2 or 3 cm in length, the parents evict them from the rocks, down into the front of the aquarium where they tend to congregate around the sponge filter as it is the only shelter in that part of the tank. At this stage they should be removed as the parents will be preparing to spawn again. This is accomplished by syphoning the water out into a bucket, down to the level of the top of the shelf. Some of this water is then poured over the back of the rocks with a jug in order to flush out any fry which darted back into the rocks due to the initial disturbance. The fry are then easily removed as there is nowhere to hide and not enough water to enable them to get back into the rocks. It does not matter too much if the adults are flushed out at the same time, providing they are not netted out and the positions of the rocks remain absolutely untouched, i.e. their territory is unchanged. The water is then returned to the tank.

Since the adults territory is exactly the same, the rocks not having been moved at all, and they also have the opposite pair to distract them, they tend to settle down again very quickly, with a much reduced chance of any fighting. If a 25 to 30% waterchange is done about two days later, it is usually enough to trigger another spawning and the sequence is repeated





Above: The construction of a specialist aquarium for breeding *Julidochromis* and similar species.
Below: The aquarium with the shelves installed. Drawings by John Szwechlowicz.

The last minutes of speciation

Martin Geerts

The family Cichlidae is exceptionally rich in species. Of course, this fact is caused by the ease with which these fishes are able to speciate. Moreover, cichlids are also known for their plasticity, which means that within one species considerable phenotypic variation can occur. It is more than justified when the South African ichthyologist Michael Bruton (1989) states: "The adoption of alternative phenotypic states in nature is probably more widespread than is currently realised and many populations which are currently recognised as species may in fact, be no more than ecophenotypes of one or another homeorhetic state". It might thus be clear that the question whether one or another population or group of populations should be regarded as a distinct species or not, will be a hotly debated issue among cichlid scientists for many years to come.

Evolutionary biologists usually call attention to the cichlids of Lake Nabugabo whenever they want to demonstrate that speciation in these fishes can take place in a relatively short period of time. Lake Nabugabo was part of Lake Victoria in previous times. About 4000 years ago a bay was separated from the main lake by a sandbar. In the lake thus formed Greenwood (1965) recognizes five distinct species which must have developed from ancestral Victorian populations which remained in the isolated bay. Since Greenwood's paper the cichlids of Lake Nabugabo have been presented in many publications as examples of how much faster speciation might progress than was previously accepted.

Some recent observations, however, suggest that speciation among cichlids may operate at an even faster speed than the cichlids of Lake Nabugabo let us assume. One of these observation relates to the description of a new Mexican cichlid (Werner & Stawikowski, 1988). The new species, which is named *Paratheraps breidohri* by the authors, is reported to be endemic to Presa de la Angostura, a reservoir in the southern part of Mexico. The closest relative of *P. breidohri*, named *Paratheraps hartwegi* by the same authors, occurs in the rivers and streams flowing into the reservoir as well as in the reservoir itself. Hence, we cannot escape the notion that *P. breidohri* developed from a population of *P. hartwegi* after the man-made dam formed the reservoir. This would mean that *P. breidohri*, if accepted as a distinct species, would just be less than 30 years old! On the other hand we cannot exclude the possibility that *P. breidohri* should be regarded as the lacustrine morph of *P. hartwegi*. Further examination is required to provide a solution to these questions.

Very recently it became apparent that human intervention may have yielded a new species in Africa as well. This species was named *Haplochromis erythromaculatus* by the authors, De Vos *et al.* (1990). *H. erythromaculatus* is found in Lake Bulera and Lake Ruhondo. These lakes lie in the northern part of Rwanda where, as early as 1907, the German H. Schubotz investigated the fish fauna of Lake Ruhondo. He concluded that this lake was inhabited only by small barbs, but certainly did not mention cichlids. Later fishery biologists tried to enrich the fish fauna of the Rwandan lakes with species suitable for consumption. Therefore they introduced several tilapiines which were collected in Lake Edward. Among the tilapias there were apparently also some specimens of a haplochromine. From these "contaminating" individuals *H. erythromaculatus* must have been originated (in a period of time which is less than 80 years). De Vos *et al.* tried to discover what species in Lake Edward was transferred to Lake Bulera and Lake Ruhondo, but could not find it. The cichlids of Lake Edward are apparently not well studied yet. Nevertheless, the recognition of *H. erythromaculatus* as a valid species suggests that cichlids are able to speciate much faster than previously thought by evolution biologists. Jos Snoeks (pers. comm.), one of the authors, believes that speciation needs more time than the suggested 80 years.

Not only do human interventions in nature allow us to study the speed of speciation among cichlids, but also our expanding knowledge about the ecological history of the waters in which cichlids live contributes to these studies. Moreover such knowledge suggests that speciation among cichlid can take place at a much higher speed than is generally accepted.

Recently, Owen *et al.* (1990) showed that the level in Lake Malawi fluctuated more frequently and between much higher extremes (not the yearly fluctuations) than had been concluded from previous studies. From the paper by Owen *et al.* it appears that the level of Lake Malawi, in the last decades of the eighteenth century and in the first decades of the nineteenth century, was at least 120 meters below that of today's lake. If these findings prove to be true it would mean that about 150 to 250 years ago many of the locations which are presently inhabited by endemic Mbuna were a part of the continent. This is true for the islands Likoma, Chizumulu, Mbenji, the Maleris, Boadzulu, Thumbi West, etcetera. The authors conclude that the Mbuna, which are endemic to these islands, cannot be older than the mentioned 150 to 250 years (see editor's note). For the time being we regard these endemic species as valid species and not as ecophenotypes.

Now, examining the bathymetric map of Lake Malawi, we should be able to indicate from which locations the endemic species of certain islands were derived and which species can be regarded as their ancestors.

In the frame of this yearbook it is, unfortunately, not feasible to continue the discussion of these examples or to detail others. Cichlidists with a multidisciplinary background will, without doubt, be able to find more and maybe better examples. Then it will be possible to gain a better understanding of the process which is called speciation, of which it is usually thought that a man's lifetime is too short to see it happen.

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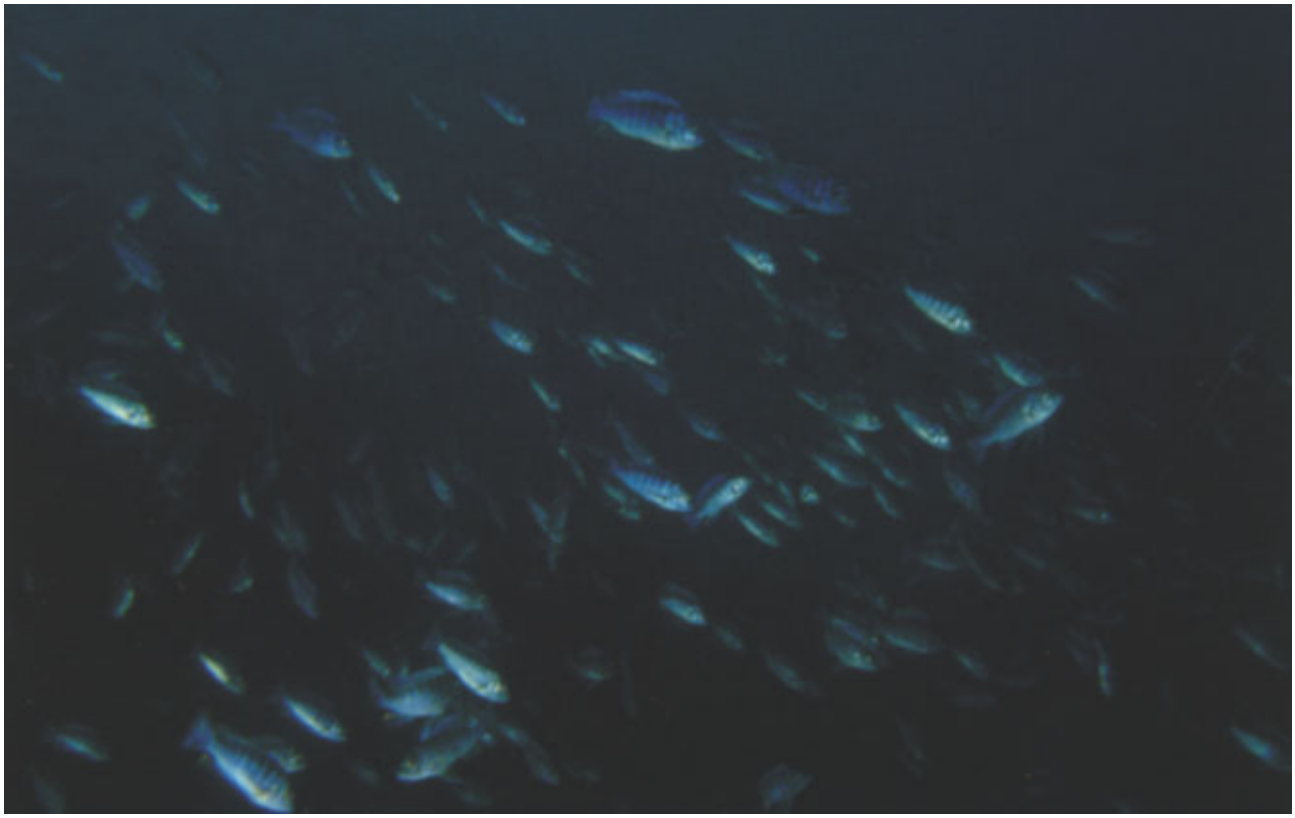
Editor's note

In the paper of Owen *et al.* (1990) it is concluded that most of the endemic species inhabiting islands, which were part of the mainland 200 years ago, have developed in recent times. Disregarding the fact that the definition of a species is still hotly debated and will probably never become a universally agreed entity, there are some species (distinct taxa) which are found on both sides of the once dried-up southern part of Lake Malawi. This would suggest that, during the low lake level, there must have been a suitable habitat where at least these species could have survived the "drought". These species are *P. barlowi* (distribution: Mbenji, Maleris, Thumbi West, Nkhudzi and Eccles Reef), *P.* sp. "Dumpy" (distribution: Maleris and Fort Maguire), *P.* sp. "Zebra Red Dorsal" (distribution: Mpanga Rocks, Nakantenga, Nkudzi and Eccles Reef) and *Copadichromis azureus* (distribution: Nkhomo Reef, Mbenji, Maleris and Eccles Reef).

One of the habitats that could have served as a "sanctuary" during a low lake level is a reef between Chinyamwezi Island and the Nankhumba peninsula. This reef remains at least 24 meters below the surface while its basis meets the sand at a depth of at least 105 m. I have visited this reef in December 1990 and found *Cynotilapia* sp. "Chinyankwazi" in vaste numbers (see photo). Also present were *P. tropheops*, which is further distributed around the Nankhumba peninsula and Chinyamwezi, *P. flavus*, which is known from Chinyankwazi and *P. ater*, known from Chinyankwazi and Chinyamwezi.



Eggspots and Ocelli

Reviews by Lee Finley

GOLDSCHMIDT, T. & J. DE VISSER (1990) On the possible role of egg mimics in speciation. *Acta Biotheoretica* 38: pp 125-134.

The potential mechanisms of speciation in the mouthbrooding haplochromine cichlids is a topic that has been widely studied and hotly debated in recent times. There have been numerous pro and con arguments presented in regard to the possible speciation effects of both the courtship behavior and mating system of these fishes. One interesting approach to this topic is presented in this paper. While, like most such studies, it is highly theoretical in its approach, the authors feel that sufficient evidence is at hand to warrant both a preliminary report and further pursuit of the topic.

This study is based on initial observations of a Lake Victorian species *Haplochromis "argens"*. This species is widespread in Mwanza Gulf, but in Emin Pasha Gulf what is described as a "....very similar "species" or variety of *H. "argens"*...." was found mixed in with catches of *H. "argens"*. This fish was designated as *H.* dusky *"argens"*. In preliminary studies, females of the two fishes could not be distinguished, but the males were noticeably different. The males differed not only in body color (*H. "argens"* = silver white with red caudal; *H.* dusky *"argens"* = dusky grey with no red on caudal) but also in the number, color and placement of the egg dummies on the anal fin. Based on this initial observation and other information at hand, the authors present two theories (models) by which egg dummies and their potential subsequent divergence in a species may trigger reproductive isolation which in turn could lead to the formation of new species.

The first model (with the proposed designation of mimetic isolation) supposes that if there are changes in the characteristics of the eggs (size, shape) in small temporarily isolated populations that matching changes in the egg dummies will also develop in the males. This model stipulates that this will be for species in which the egg dummies accurately mimic the eggs. Should these factors take place, the fish involved would then be reproductively isolated, if re-united with its former larger population. This is noted to be only a theoretical model and that no direct positive evidence is available to substantiate its validity.

The second model, again dealing with small temporarily isolated populations, involves initial changes in the egg dummies based on selection pressures aimed at them. Such pressures may include habitat (light vs. dark areas) and potential for predation. The authors note some evidence generally indicating that cichlids living in darker areas tend to have more numerous, larger, or more colorful ("supra-normal") egg dummies when compared to those living in lighter areas. Such adornment in light areas might have poor selection factors by making the fish more visible to predators. Again, if such changes did take place these fish would be reproductively isolated should they rejoin their original population. Although this model is, like the first, lacking in proper testing, some field evidence does tend to support it. The authors also suggest that laboratory studies may be worthwhile in shedding some light in this area.

In this paper the authors also provide a handy listing of the possible functions of egg dummies and note that the function (or functions) of them in species to be studied ".....should preferably be known".

WINEMILLER, K. D. (1990) Caudal eyespots as deterrents against fin predation in the neotropical cichlid *Astronotus ocellatus*. *Copeia* (3): pp 665-673.

The variety of colors and patterns observed in cichlids are fascinating and may often lead one into questioned thought as to why they are the way they are. This paper attempts to answer that question for one species of cichlid, the so-called Oscar.

Most aquarists are familiar with the Oscar and its distinctive color pattern. Most noticeable is the large ocelli, or "eyespot" that is located near the base of the caudal fin. It is this feature and its possible function that is addressed in this paper. Theories regarding the function of ocelli in cichlids are certainly not new. In 1977 T. M. Zaret presented a study on another cichlid, *Cichla ocellaris*. Zaret's conclusion was that the ocelli serve as a form of species recognition which inhibit cannibalism. Furthermore, according to Zaret, *A. ocellatus* (and other cichlids such as *Crenicichla* spp.) have evolved mimic ocelli to avoid predation by the *Cichla*.

Winemiller possesses a different vision in regard to the possible function of the ocelli in the Oscar. Based on the results of a field study in Venezuela that spreads over five years, the author has con-

cluded that the ocelli acts as an eye mimic with the function being to reduce the attacks of fin eating piranha (mainly of the genus *Serrasalmus*).

A. ocellatus, and the co-existing cichlid *Caquetaia kraussii* (which also possesses ocelli), were collected throughout the year and comparisons were made as to the extent of fin predation by piranha. For the four driest months of the year, when piranha were absent from the study area, no damage was noted. But for the rest of the year the results were quite dramatic. When compared in a series of size groupings, the *C. kraussii* always showed more extensive damage than that seen in *A. ocellatus*. The author found this interesting in that considering the feeding and behavioral styles one would expect reverse results. *C. kraussii* is decribed as a "sit and wait" predator and theoretically would have more opportunity to "...detect and avoid....." piranha. On the other hand *A. ocellatus* spends much of its time slowly swimming and examining the roots of floating plants searching for its prey which consists of almost 60% insects (both aquatic and terrestial).

From the above, the author concludes that the ocelli of *A. ocellatus*, which resembles the eye both in size and color (as compared to that of *C. kraussii* which does not), combines with the anal, dorsal and caudal fin shapes to form a full caudal mimic of the head region which thereby reduces or prevents attacks by fin eating piranha. Additional backup theories are also presented (the fins don't taste good; Oscars as social fishes may be better able to fend off attacks than the solitary *C. kraussii*, etc.).

Supporting aquarium studies using fin eating piranha and a variety of fishes, including ocellated and non-ocellated cichlids, show that ocellated cichlids fare the best by far. One last, and very interesting experiment was attempted. Both *A. ocellaris* and *C. kraussii* were set up in concrete pools with piranha. Grease paint was used to obscure and accentuate the ocelli of both species. Unfortunately, before observations could be made as to the effects of this, the paint "wore off". It is noted that similar experiments would prove useful for further testing the "...fin-predator/head mimicry hypothesis".

Some West African cichlids show other types of spots in their fins. Do they have a function as well? Photo by R. Numrich.

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The **CICHLIDS** yearbook

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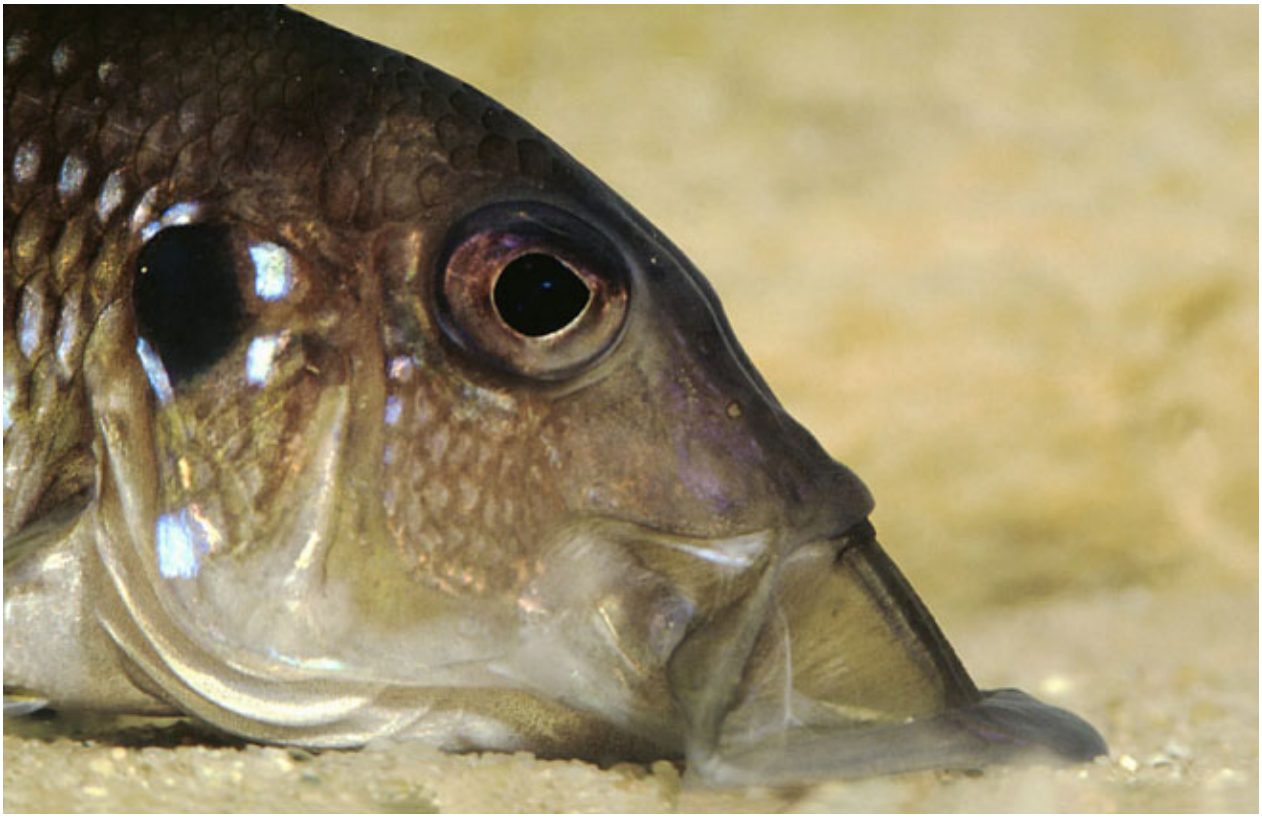

Gnathochromis permaxillaris, one of the most interesting cichlids from Lake Tanganyika.

A female *Crenicichla marmorata* from Santarém. Photo by Frank Warzel.

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