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eggspots

The journal on fishes with eggspots

No. 1

What are eggspots, really?

The phylogenetic relationships of the cichlids and the groups that are the focus of this journal

All beginnings are difficult - first tropical experiences in Uganda

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Editorial

eggspots ? A journal on fishes with eggspots? Isn't that something very specialised? Indeed, it is an online journal that will deal primarily and above all else with fishes that possess eggspots. By this we understand cichlids from Africa and the Near East belonging to the group that includes *Haplochromis*, *Pseudocrenilabrus, Pseudotropheus, Tropheus et al*. But aren't there already enough magazines dealing with fishes on the market? Absolutely not! There can never be too many! Competition not only invigorates business but also spurs authors and editors to greater effort, and each new magazine permits the reporting of a little more information on a fascinating and virtually inexhaustible subject. Even the information sheets published by cichlid societies are not sufficiently specialised to not leave plenty of scope on this topic. Moreover it is high time there was a journal dealing specifically with the cichlids that are particularly popular in the aquarium hobby, such as, for example, the numerous species from lakes Victoria, Tanganyika, and Malawi/Nyassa, on which an enormous amount of scientific research is being performed. For this reason **eggspots** will represent a bridge between scientific research and the aquarium hobby, explaining scientific findings to the layman. It is, however, also planned to publish original scientific work here in **eggspots**. This can't all be done on an *ad hoc* basis, and so it is primarily envisaged that **eggspots** will be published as a loose succession of issues. A printed version will appear only if this is necessary for any particular article. This will both save on natural resources and allow us to keep the purchase price extremely low. The fact that **eggspots** appears online allows for enormous flexibility. No subscription is required; the Contents list for each issue will be freely available so that anyone interested can decide whether or not he or she wishes to download the issue. In addition everyone who is interested can join our participants list, and will be notified of the contents of each new issue by email.

In this regard, I hope you will read this first issue with great interest!

Erwin Schraml

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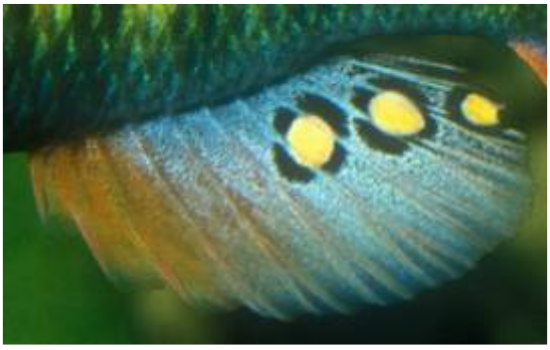
Cover photo: *Haplochromis aeneocolor*

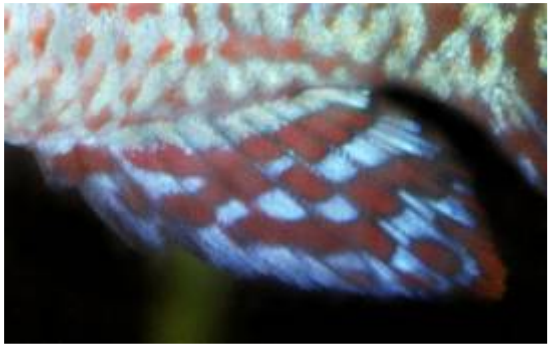
What are eggspots, really?

by ERWIN SCHRAML

The term 'eggspots' will be defined in a very broad sense with regard to the group of fishes that fall within the scope of this journal. In the narrower sense, however, eggspots are specifically 'egg dummies' that resemble the actual eggs of the fishes in both form and colour. Depending on the species, and with a few exceptions, there are one to nine such spots on the anal fin in males of these fishes. Particularly in species of the genus *Haplochromis* and their close relatives, each of these eggspots is surrounded by a transparent margin. The spots in such species are also known as 'true eggspots', as they actually perform the function of dummy eggs. During the spawning ritual and the 'practice runs' that often take place for hours prior to mating, the male of the



Anal fin of *Haplochromis* sp. "Thick Skin Like".



Anal fin of *Pseudocrenilabrus nicholsi.*

The typical "Follow me" behaviour, here in a *Haplochromis* sp. "Victoria Nile".

In *Haplochromis* the female mouths at the eggspots of the male even at the 'trial-run' stage of mating.

spawning pair displays his outspread anal fin during slow circling movements and his partner 'mouths' it. As a rule this will be a ripe female, ready to spawn. It has, however, been observed in the aquarium that unripe females will also participate in this ritual to show willing, and even subordinate males may also put on such a show, albeit in a more muted form.

However, suggestions that this is to avoid attack by the aggressive territory-holder require further clarification, and in addition make no sense, as there is no need for such behaviour in the wild where there is unlimited opportunity to escape.

When it actually comes to the spawning process, the biological function of this ritual becomes clear, in that while the female is mouthing the eggspots (which she mistakes for real eggs and so instinctively wants to pick them up), she

One biological reason for quickly collecting up the as yet unfertilised eggs is probably the resulting protection from spawn-robbers such as the *Synodontis grandiops* pictured here, which will even try to push their own eggs beneath the mouthbrooders.

Featherfin mouthbrooders such as this *Ophthalmotilapia ventralis* 'Mpulungu' have their egg dummies not on the anal fin but on the ventral fins.

takes the sperm of the male into her mouth. The latter contains as yet unfertilised eggs, which were released one or more rotations previously during the spawning act and picked up by the female immediately they were laid. The female picks up the eggs this rapidly in order to avoid losses. There is a danger of the eggs being consumed by spawn-robbers, for example catfishes (species of the genus *Synodontis* in particular have specialised in eating the eggs during the spawning process of the cichlids, and in the case of the Cuckoo Catfish have even evolved a perfidious system that outwits the preventive measures of the mouthbrooding cichlids and takes advantage of them for their own reproductive purposes), and, because mouthbrooder eggs are not adhesive, there is nothing to prevent them from being swept away by currents or turbulent water. In addition to these two reasons for the rapid uptake of the eggs, WICKLER[1)] suggests a third, namely that in some waters the oxygen content is so low at the bottom that the fishes have to mouth constantly at the water's surface in order to snap up air there. It seems me, however, that there is insufficient evidence to support this view.

Exceptions to these 'standard' eggspots include those that are sited not on the anal fin but on the tips of the ventral fins, as in the case of the featherfin mouthbrooders, for example *Ophthalmotilapia*. Another example is the members of the genus *Pseudocrenilabrus*, which don't possess eggspots but instead have either a yellow to red spot on the tip of the anal fin or a coloured lower margin to the latter. Both are again true egg dummies with the same function as 'true eggspots'.

1) WICKLER, W. (1962): Zur Stammesgeschichte funktionell korrelierter Organ- und Verhaltensmerkmale: Ei-Attrappen und Maulbrüten bei afrikanischen Cichliden. *Zeitschrift für Tierpsychologie,* 19: 129-164.

Species of the genus *Pseudocrenilabrus*, in this case *Ps.* sp. '"Kafue", do not have eggspots but a coloured tip or lower margin to the anal fin, with the same function as 'real' eggspots.

In addition, 'true eggspots' also have a signalling function, serving as a method of communication. In contrast to the frequently rather dark courtship dress of the male, the eggspots are light-coloured and often also particularly reflective, and during the 'fluttering' courtship movements of their owner they become particularly noticeable, acting as a clearly visible signal to the female that here is a potential spawning partner. Once he has thus caught the female's attention, the male increases his courtship activities and when she approaches he next displays his anal fin and eggspots to her, in order to entice her to the centre of the spawning site. Females that are ready to spawn are apparently relatively helpless to resist this "Follow me" because of their genetic programming. At least observations indicate that as a rule they are not at all coy and quickly follow the male.

But in this regard 'false eggspots' also have a role to play. We find these in, for example, males of the genera *Aulonocara* and *Lethrinops*, sometimes in large numbers on the anal fin. These eggspots are not surrounded by a ring and they are sometimes also not egg-coloured, but usually very light, often metallic and reflective, for example gold-coloured. They appear to have only the "Follow me" function and these 'shiny objects" again attract the female from afar and into the spawning arena of their owner. In some species, for example from the genus *Otopharynx*, the eggspots may be metamorphosed into light stripes and are no longer circular or oval in shape. Yet further 'false eggspots' are found in some *Serranochromis*. The latter have relatively small eggspots, which are surrounded by a ring; this isn't transparent, however, but a different colour to the centre.

***Lethrinops* sp. "Orange Top" is one of the species from Lake Malawi in which the spots are not 'true eggspots'.**

According to my own observations, the mouthing of the female during spawning is targeted not at the spots but directly at the region around the genital opening of the male. This also applies to the next group. We are also familiar with the phenomenon of the absence of eggspots. Phenomenon, because some species that have no spots

In *Otopharynx tetrastigma* the spots in the anal fin are elongated into streaks.

Serranochromis robustus jallae **is one of the species with eggspots that are surrounded by a differently-coloured but not transparent ring.**

The members of the monotypic genera *Cyrtocara* and *Fossorochromis* are two such species. The situation is different in the genera *Copadichromis* and *Otopharynx*, for example, where we know of species that have 'false eggspots' and others in which they are completely absent. In *Protomelas taeniolatus* we find both alternatives within a single species (assuming we are dealing with just one taxon and the variation doesn't point to a species not recognised as distinct), perhaps even within a single geographical population (for example in the so-called "Steveni Tiger").

do not exhibit appreciably different courtship or spawning behaviour as a result. Moreover these species are so closely related to species that do possess eggspots that we cannot exclude them from this journal either. We find such cichlids in Lake Malawi (Nyassa), for example.

Fossorochromis rostratus **is one of the Lake Malawi (Nyassa) cichlids with no eggspots.**

According to my own observations, in species with 'false' or no eggspots the female doesn't mouth the anal fin but targets the genital opening of the male. This can be readily seen here in a spawning of *Sciaenochromis fryeri*. It can also be seen from this photo that the female has two small eggspots, even though males of the species exhibit no spots at all on the anal fin.

Both the fishes above are supposedly *Protomelas* sp. "Steveni Tiger". Particularly noteworthy is the difference in the anal fin as regards the 'false eggspots'.

One thing that we have not yet explained is the function of the eggspots in females. Except in the case of some of the Malawi mbuna, in those mouthbrooders that possess 'true eggspots', if these are present in females at all then they are only rudimentary. They are always much smaller, less numerous, and also never surrounded by a ring. To date there have been no observations to suggest that they serve any purpose at all. I think that they are most likely a non-functional by-product of the evolutionary process, like nipples in males of *Homo sapiens*. Interestingly, they may also occur in species in which males develop no eggspots at all, as can be seen in the photo showing *Sciaenochromis fryeri*.

Before the function of eggspots was explained, scientists involved in the description of these fishes

If females have eggspots, including in species whose males possess 'true eggspots', then they are only rudimentary; in other words they are smaller, fewer in number, and not surrounded by a ring. The photo shows a female *Haplochromis cf.* sp. "CH 15".

didn't regard them as any different to the spots that can likewise occur in the soft-rayed part of the dorsal or in the caudal fin. Not all, but many species also have round spots or streaks on these fins, and these markings are not dissimilar in colour to those on the anal fin. In particular species without 'true eggspots' may have very large numbers of such coloured spots on these other fins. Perhaps they serve to create an overall impression, to make the male appear more striking and thus confer benefits during courtship.

WICKLER was the first to explain the function of 'true eggspots' in more detail. In fact others[2] had already described the spawning behaviour of African mouthbrooders (above all that of *Pseudocrenilabrus multicolor*) before him, but had never come to the correct conclusion regarding the spots and anal-fin edgings. In particular KIRCHSHOFER[3], who termed the eggspots 'eyespots', came very close to an interpretation in her observations, but went no further than speculation (translated from the original German): "the courting *Haplochromis desfontainesii* [*sic*!] positions himself at an angle in front of the female, his head higher than his caudal fin and pointing towards the cave. Quivering all the while, he curves his violently fanning tail away from the female and extends his anal fin, spread as wide as

***Aulonocara steveni* 'Usisya' is one of the species that also have markings on the soft-rayed part of the dorsal fin and in the caudal fin that are not dissimilar to those on the anal fin.**

2) BAERENDS, G.P . & BAERENDS VAN ROON, J.M. (1950): An introduction to the study of the ethology of cichlid fishes. *Behaviour*, Supplement 1, 243 Pp.
REINBOTH, R. (1956): Untersuchungen zur Maulbrutpflege von *Haplochromis multicolor* (HILGENDORF). *Zoologisches Jahrbuch allgemeine Zoologie*, 66: 217-271.
SEITZ, A. (1940): Die Paarbildung bei *Astatotilapia strigigena* PFEFFER. *Zeitschrift für Tierpsychologie*, 4: 40-84.
3) KIRCHSHOFER, R. (1953): Aktionssystem des Maulbrüters *Haplochromis desfontainesii*. *Zeitschrift für Tierpsychologie*, 10: 297-318.

possible, and its orange ocelli towards her...." ".....Within the pit the two fishes swim, head to tail, in very tight circles, but with repeated pauses during which the male, facing away from the female, fans vigorously with his caudal fin and extends his anal fin, spread as wide as possible, towards her, as during the invitation to follow. The female mouths at the orange-coloured spots on the anal fin....." ".....The spots on the anal fin of the male are the same size and orange colour as the eggs..... the display of the anal fin may well have an attractant effect."

WICKLER also describes in detail the display of the anal fin in *Pseudocrenilabrus multicolor* (again translated from the German): "The posterior lower corner of the anal fin in the male has a brown to orange margin. During fertilisation the fin is folded against the body, but the last rays less so than those in front, creating an upward-pointing tip next to the caudal peduncle; this, like the tips of the ventral fins, points towards the side of the pit and hence the female. This anal-fin tip is almost exactly the same colour as the eggs and also about as large as an egg."[4] However, my own observations during the spawning of a *Pseudocrenilabrus philander*-like species from Namibia, which has a coloured tip to the anal fin, indicate that this type of anal fin is spread in the same way as is known from *Haplochromis* with 'true eggspots'.

AXELROD[5] put forward a quite different theory on the function of eggspots. He had dived or

4) In his 1962 article WICKLER not only assigned the species to the genus *Haplochromis* (later *Hemihaplochromis*, before it was realised that *Pseudocrenilabrus* was the correct name) but also mentioned that the name *Astatotilapia strigigena* had been used in his film on the spawning behaviour of this species. The latter name has been used in the aquarium hobby for other species than that originally described under it. The current designation of the taxon as a synonym of *Haplochromis bloyeti* may also be incorrect.
5) AXELROD, H.R. (1974): *African cichlids of lakes Malawi and Tanganyika.* 2nd ed. T.F.H. Publications.

KIRCHSHOFER came close to putting forward the eggspot theory in *Haplochromis desfontainii*. She had the general idea.

***Pseudocrenilabrus multicolor* (this is a wild-caught specimen) was long the focus of eggspot research.**

snorkelled in Lake Malawi and in the process established that often the only part of a fish that he could spot among the dark rocks was its gleaming eggspots. From this he concluded that the effect was the same to the female and that the spots thus served solely as a signal to indicate the site of the male's territory to the female. There were also attempts to refute Wickler's theory by cutting off the part of the anal fin with spots from males with eggspots, and it was then observed that specimens maltreated in this way were nevertheless capable of spawning with females. For this reason some people concluded that Axelrod alone was correct. But this neglected to take into account that it is equally possible that in the course of millennia the strongly ritualised spawning procedure in mouthbrooders may have become so strongly established that the spots were no longer absolutely essential. Perhaps this is also the reason why in the course of evolution some species have lost their eggspots again. Without conducting better research it is, of course, impossible to gauge what the result might have been had more extensive experiments been performed and, for example, quantitative fertilisation rates evaluated.

The eggspot theory has for a long time ceased to be a focus of behavioural research, but further light might be thrown on the subject by consideration of the different types of eggspots - 'true', 'false', and absent - as well as the variable anal-fin coloration in *Pseudocrenilabrus* (here too we now know of species that have no anal-fin character that might be considered an egg-dummy). Perhaps genetic research will even establish a phylogenetic relevance to this characteristic, although at the moment this looks rather improbable in view of its absence or presence in very closely related species.

This as yet undescribed *Pseudocrenilabrus* species from the Kafubu at Lubumbashi (Dem. Rep. Congo) does not have a coloured tip to the anal fin.

The phylogenetic relationships of the cichlids and the groups that are the focus of this journal

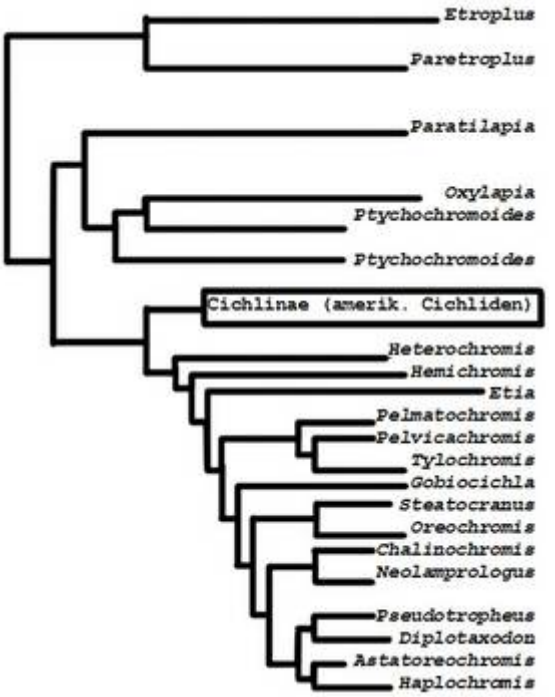
by ERWIN SCHRAML

According to the most recent major study of the phylogenetic relationships of cichlids in general, by SPARKS & SMITH (2004)[1], the African members of the family are divided into just two subfamilies, the Pseudocrenilabrinae and the Madagascan endemic Ptychochrominae. In fact there are also the Etroplinae, which likewise occur on Madagascar, but they are now regarded as an Indian faunal element and hence are no longer correctly included in the African cichlids.

According to this scheme of things, which has been greatly oversimplified here, the Indian and Madagascan Etroplinae are a sister group to the other Madagascan cichlids (Ptychochrominae) on the one hand and all other cichlids on the other. These others are again divided into the South American cichlids (Cichlinae) on the one hand and the true Africans (Pseudocrenilabrinae) on the other.

It is the last group that is the subject of discussion here. It has been divided into further subfamilies by earlier authors, for example the Tilapiinae by HOEDEMAN[2] (1947), the Tylochrominae by POLL (1986)[3], the Heterochrominae by KULLANDER (1998)[4], and the Boulengerochrominae and Paratilapinae by TAWIL (2001)[5]. Tribes have been established as further subdivisions of these subfamilies. These include groups that were previously subfamilies but which have been downgraded in rank. Thus we have the Bathybatini, Benthochromini, Boulengerochromini, Chromidotilapiini, Cyphotilapiini, Cyprichromini, Ectodini, Eretmodini, Greenwoodochromini, Haplochromini, Hemichromini, Lamprologini, Limnochromini, Perissodini, Tilapiini, Trematocarini, Tropheini, and Tylochromini.

This system of subdivision is also to be found

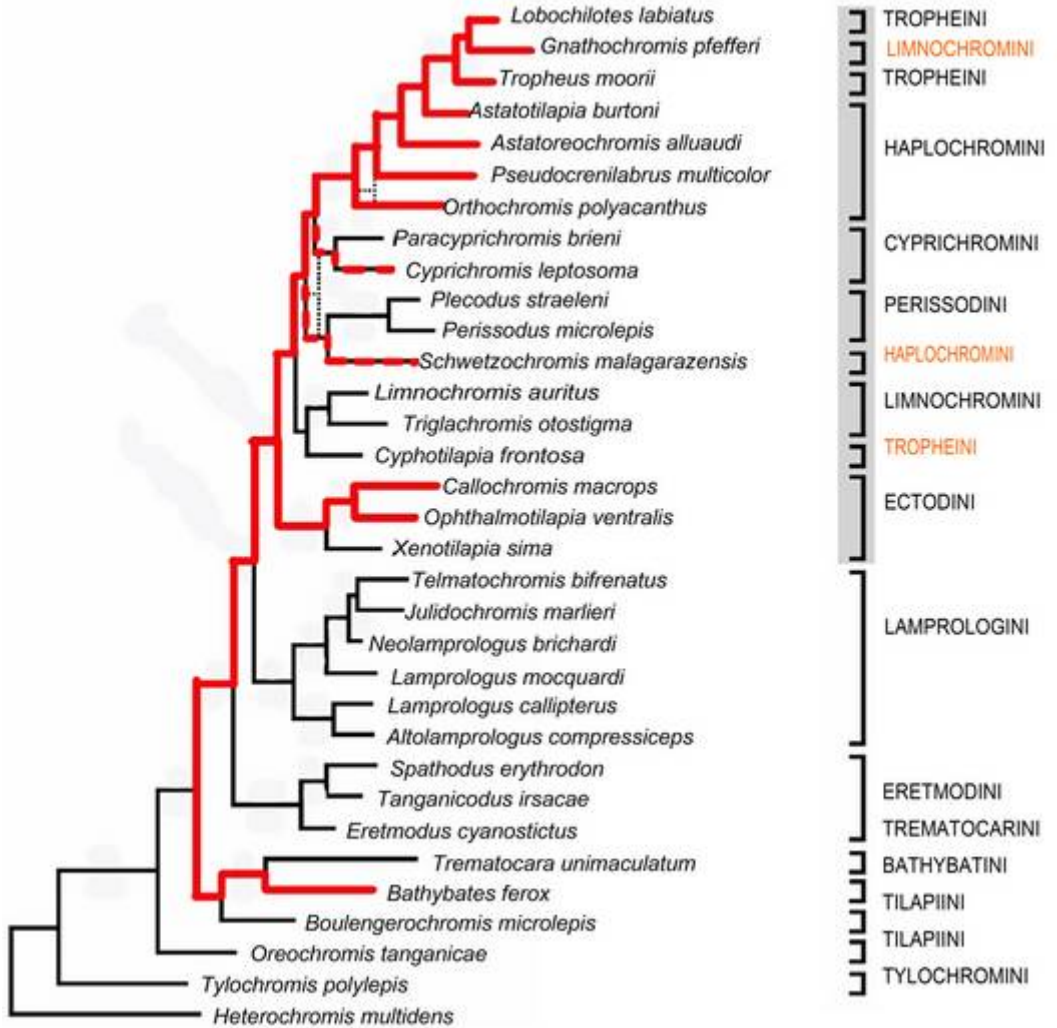


Simplified schematic after SPARKS & SMITH (2004) Phylogenetic relationships of the cichlids

1) SPARKS, J. S. & SMITH, W. L. (2004): Phylogeny and biogeography of cichlid fishes (Teleostei: Perciformes: Cichlidae). *Cladistics*, 20: 501–517.
2) HOEDEMAN, J. J. (1947): *Encyclopaedie voor de Aquariumhouder*. Pp. X. 60.76 (2).
3) POLL, M. (1986): Classification des Cichlidae du lac Tanganika. Tribus, genres et especes. *Mémories de la Classe des Sciences.* Series: Collection in-8o / Académie Royale de Belgique, 45 (2): 1-163.
4) KULLANDER, S. O. (1998): A phylogeny and classification of the South American Cichlidae (Teleostei: Perciformes). Pp. 461-498 in: MALABARBA, L. R. , REIS, R. E., VARI, R. P., LUCENA, Z. M. & LUCENA, C. A. S. (Eds): *Phylogeny and classification of Neotropical fishes*. Edipucrs, Porto Alegre. 1-603.
5) TAWIL, P. (2001): L'évolution des Cichlidés. Pp. 69-86 in: *L'an Cichlidé,* Volume 1, Association France Cichlid.

in part in the most recent phylogenetic work conducted on the Lake Tanganyika cichlids (SALZBURGER *et al*., 2002)[6]. It is interesting in that on the one hand it indicates a number of anomalies regarding the previous grouping of several species and on the other because the Lake Tanganyika cichlids (which are unique with regard to eggspots - the focus of this journal) form a very heterogeneous group.

But let us take a closer look at the phylogenetic relationships suggested by SALZBURGER *et al*. It is remarkable that *Gnathochromis pfefferi*, previously regarded as a member of the tribe Limnochromini, is now to be found as a subset of the Tropheini. The second surprise is that *Schwetzochromis malagaraziensis*, previously a member of the Haplochromini, now has its own separate lineage, which is to be seen as a sister lineage to the scale-eaters



Cladogram after SALZBURGER *et al.* (2002): representation of the phylogenetic relationships using the Maximum Likelihood (ML) method based on the mitochondrial NADH dehydrogenase sub-unit 2 gene (ND2) and cytochrome-B DNA sequencing. Groups with eggspots in red.

6) SALZBURGER, W., MEYER, A., BARIC, S., VERHEYEN, E. & STURMBAUER, C. (2002): Phylogeny of the Lake Tanganyika Cichlid Species Flock and Its Relationship to the Central and East African Haplochromine Cichlid Fish Faunas. *Systems Biology*, 51 (1): 113–135.

***Bathybates* - the photo shows *B. fasciatus* - are regarded as relatively basal cichlids. Nevertheless the males already have eggspots in the anal fin.**

(Perissodini). In addition *Cyphotilapia frontosa*, which has previously been regarded as a member of the Tropheini, has also turned out to belong to a discrete lineage that is close to that of the Limnochromini.

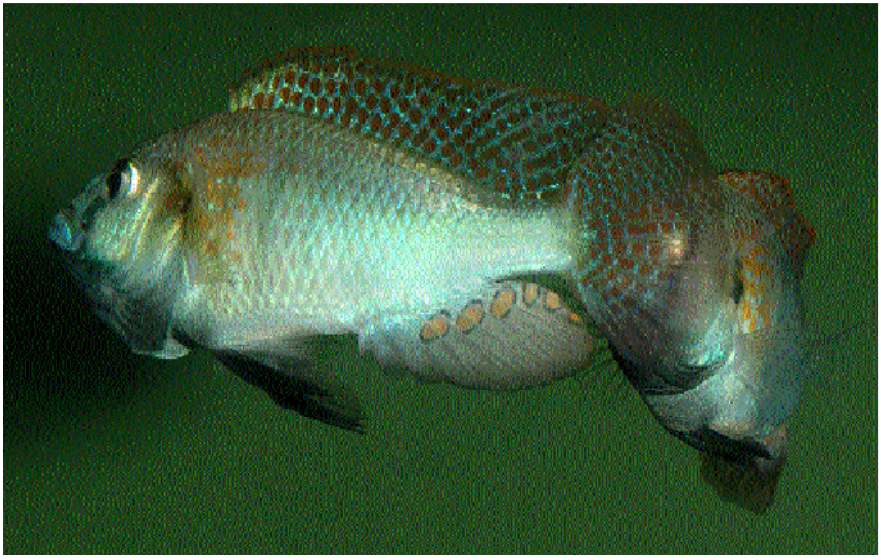
So what does all this have to do with eggspots? The cladogram can also be used as an indication of basality. *Heterochromis* is thus the most ancient species, while *Tropheus, Lobochilotes*, and *Gnathochromis* are the most recent lineages.

Surprisingly we find eggspots in relatively basal groups such as the Bathybatini, likewise in the Ectodini. In some of the Cyprichromini the tips of the ventral fins can be seen as eggspots in the broadest sense, and, of course, we find eggspots in the

Male *Callochromis macrops*

It may be that in *Cyprichromis* - the photo shows *C. leptosoma* 'Moba'- something akin to eggspots on the ventral fins has developed in the course of evolution. In other species of the Cyprichromini, however, there is no trace of this to be seen.

There are two sorts of eggspots in the Tropheini. The photo shows *Petrochromis orthognathus* with eggspots on the posterior, soft-rayed part of the anal fin and in the anterior, spinous part.



No question but that in typical *Haplochromis*, like this *H. burtoni*, eggspots are obligatory.

not much smaller than the eggspots on the posterior part. In *Petrochromis* the anterior eggspots may be situated near the tips of the hard rays.

The occurrence of eggspots in the very basal group of the Bathybatini on the one hand, and the position relatively high up in the dendrogram of the basal *Haplochromis burtoni* and above all *Pseudocrenilabrus* (itself seen as a very basal group), is puzzling. Have eggspots evolved several times in the evolution of Lake Tanganyika cichlids? Or have intermediate forms died out in the meantime? To date DNA study has failed to produce an unequivocal answer.

Haplochromini and Tropheini. As far as is known so far, *Schwetzochromis*, and/or *Orthochromis malagaraziensis*, do not possess any eggspots, but other members of the latter genus do (*O. torrenticola*). It also appears, from looking at photos, that eggspots may not occur in all *Tropheus* species/populations (but this requires more precise clarification). In addition, this genus also exhibits - in some populations - the phenomenon of two different types of eggspot-like spots on the anal fin. On the posterior, soft-rayed part we find the 'true' type, yellowish in colour; and at the same time on the anterior part there are sometimes small spots of a different colour, which are

It remains unproven whether eggspots occur in all members of the genus *Tropheus*. This is *T.* sp. "Cherryspot" ("New Kirsch" variant).

All beginnings are difficult - first tropical experiences in Uganda (part 1)

by ERWIN SCHRAML

Is it possible to write an article about an expedition, whose results, taken all in all, were less than satisfactory? Yes, perhaps, as a warning to all those who nurture a similar dream, not to make the same mistakes.

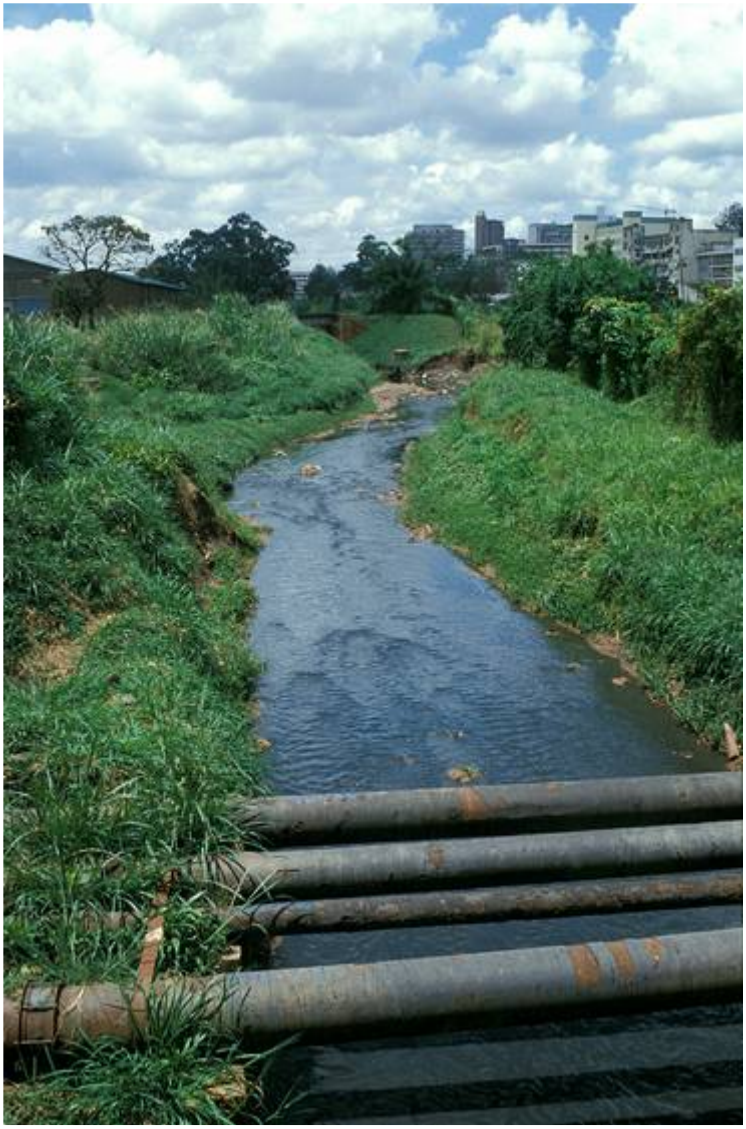
It was 1996. By then for some time cichlids had been turning up in the ornamental fish trade that purportedly originated from Uganda. Initially it was assumed that they were Lake Victoria cichlids. The surprising thing was that they included species from trophic groups which it had been assumed had become extinct in Lake Victoria through the agency of the Nile Perch. Slowly but surely the information filtered through that their actual provenance was a small satellite lake of Lake Kyoga. I had for a long time nurtured the desire to travel to Africa in order to visit the home of the fishes in which I had such a very great interest. And the time now seemed ripe for the project.

So there I sat in the plane, feeling just a trifle apprehensive and still rather surprised that I - not really an adventurer at all - had actually made my mind up to travel to the heart of Africa. I hadn't been able to sleep properly for excitement for the past two weeks. My long cherished wish was about to become true, I would finally be able to satisfy my desire to visit the Lake Victoria

View of Kampala. It is a common (beginners') mistake to choose a 'Moloch' like this - and probably every African metropolis - as the starting point for wildlife excursions.

basin, the home waters of the fishes that had been my interest for decades. Unlike myself, my neighbour on the plane, a young Swiss, was already much travelled in the tropics. He expressed the opinion that Europeans in a Third World country should always check into a reasonable hotel, in order to enjoy familiar environment for at least some hours. So I allowed myself to be persuaded to stop off at a good hotel. Perhaps it would be good to have such a refuge for my first contact with Uganda, especially as I was on my own. During subsequent trips I have avoided such hotels. Contact with the local people has been far more important to me.

At the airport in Entebbe the major hotels all had their own buses providing a free shuttle service to Kampala. After checking in at the hotel there was still enough of the afternoon left to do something. Naturally I could hardly wait to finally take my first look at Lake Victoria. The head receptionist, whom I asked about the distance to the lake, thought it was somewhere around seven kilometres. Yes, that would be a nice walk after the long flight. No sooner said than done. Off I set in what I thought was roughly the right direction.



Stream at the edge of the city of Kampala.

An African metropolis - and they are probably all the same - can perhaps be summed up as a crazy amount of traffic, terrible stench of petrol in the air, no noticeable traffic regulations, he with the loudest horn has right of way, pedestrians have no rights at all. One bit of excitement was to suddenly find a metre-square manhole-cover missing from the pavement and a clear view down the shaft, several metres deep and no safety barrier, naturally. Then, at the edge of the city, the first taste of the wild: a stream. Swarms of tiny little

fishes were to be seen at its surface. "Those must be lamp-eyes", thought I. Only on a later return trip with a net did I establish that they were actually Guppies. Millions of them, introduced at some time or other to control mosquitoes and now doing their duty in numerous waters in Uganda, although probably also having at least a slight adverse effect on the indigenous fauna.

I continued through the suburbs of Kampala, with very basic dwellings for the residents. Was this what slums looked like? Did I need to worry about the bright yellow camera bag, bearing the name of an internationally well-known film manufacturer, that I carried on my shoulder, as the local value of its contents probably amounted to a year or two's income for anyone living in this area? I enquired all the more frequently whether I was on the right road to the lake and invariably received an extremely friendly reply. Of course I always got a surprised look as well - what was a white man doing alone in this area and on foot? And after I left the suburbs the children gave unbridled vent to their amazement. *Musungu*! (= foreigner. Nowadays used almost exclusively to describe a white person.) I was often to hear this shout during my visit, and for the first time in my life I experienced the fascination that people can feel for other, different people. It must have been like that in Europe too, right up until the end of the 19th century, in an age without television and constantly available news from all parts of the world, when there were sideshows with negros at fairs and people paid money to stare, amazed, at people with black skins, who in turn were paid a fee for travelling around the country in an itinerant troupe.

It was almost dark when I finally reached the lake in the vicinity of Port Bell, the port for Kampala. It was too late to do anything

Port Bell, Kampala, the inland port situated some distance from the city itself. The photo shows children catching fishes with primitive rods. The *Haplochromis* they caught then served as live bait for catching larger fishes.

by the water. Purely because of the blisters I had acquired from walking, I treated myself to a shared taxi for the return journey. A so-called *matatu*. Generally a Japanese minibus, also available in Germany as a seven-seater. After "appropriate" conversion, however, 20 people can easily fit into such a vehicle in Uganda.

I went back the next day, but this time equipped with net and rod. Only it wasn't at all easy to find a spot suitable for angling, let alone make a sweep of the net through the water. The shoreline everywhere was bordered by a strip of water hyacinths several metres wide or bounded by a wide and impenetrable belt of papyrus. There were as good as no areas of open water accessible from the bank. The local people managed by balancing precariously on iron girders in the harbour area or going out in rowing boats and fishing from there. They too - especially the children - were fishing for *Haplochromis*. However, I learned that these weren't for eating but to be used as live bait for larger fishes. Because I wasn't successful in my own angling, I was glad that it was possible to persuade the children to part with their catch in return for money. And now I also learned the vernacular name for *Haplochromis* in Uganda, at least in this part of the country: *enkejje* (pronounced en-ketsch-e). And so I had my first fishes, although their mouths were generally so badly damaged by the hook that they didn't live long. I hadn't thought about preservation, as I was planning to bring live fishes back with me and back then I wasn't fishing for scientific purposes. So to the present day I can't say, apart from a few exceptions, what species they were.

It was only a few days before the start of my trip that it became known that the fishes from Uganda available at that time

In the photo-cuvette: two different *enkejje*, the local name for *Haplochromis*-like fishes in parts of Uganda; I was able to buy such fishes from the children at Port Bell.

in the ornamental-fish trade had originated from Lake Nawampasa. I had never even heard of this lake before. In Entebbe, in the vicinity of the Botanic Garden, there is a cartographical institute, and so I went there next. Practically every map that has ever been made of Uganda is available there. Because in the past the country was a British Protectorate for a while, it has been painstakingly measured, and as a result there are maps of all parts of the country with a scale of 1:50,000.

So, armed with a map and the knowledge of where this portentous lake lies, all I had to do was find a way to get there. I planned to first of all travel to the Fisheries Department in Jinja. Perhaps they would be able to help me further. I had already written to them long before, although without receiving any reply. From Kampala there are regular bus services to Jinja on a very well made road. The bus almost always runs as soon as it is full up. These middle-distance buses are larger than the *matatus* but not as huge as those used for long-distance trips. Just as with the *matatus*, the driver stops anywhere along the route that a passenger requests. There is thus a fairly quick - and for Europeans dirt cheap - method of travel throughout the country. The railway system is virtually defunct nowadays. Obviously, the buses and *matatus* are also used to transport merchandise and purchases to and from the markets, but in Uganda this includes not only pre-packed goods but sometimes also the odd hen - or several. The result is an often motley company assembled in a communal taxi.

I got off the bus on the outskirts of Jinja. My chosen mode of transport for the next leg was a bicycle taxi. I felt sorry for the poor guy who had to do the pedalling, he probably didn't often have to contend with passengers that exceeded the 100-kilo

mark. But he bravely battled along the slightly uphill stretch to the Fisheries Department with me perched behind him on a luggage carrier fitted with a cushioned seat. On arrival I couldn't rid myself of the feeling that nobody had taken seriously my letter from Germany announcing my arrival - on precisely this day - to talk about *Haplochromis*. But they handled the situation with bravado and first of all gave me a tour of the institute. They also before long offered to take me out in their boat on the Napoleon Gulf so that I could see a bit more of Lake Victoria. It was interesting to see that here too the lake was almost completely fringed with papyrus. The surrounding hills were almost totally deforested. The enormous downpours that are the rule in the area were thus able to wash away the entire layer of topsoil to accumulate in Lake

Victoria, as a result of which nowadays the 'transparency' of the water in the Napoleon Gulf looks more as if someone had put earth and water in a bucket and stirred it vigorously. As the boat glided across the mirror-like surface of the water it was like being in a whirlpool bath. The foul gases that constantly rose from the bottom all around produced a constant "popping" noise as the bubbles burst. My companions would have liked to show me what fishes were caught there, but unfortunately it was already too late in the day. We landed on an island with a fishing village, but the fishes caught that day had long since been sold and transported away, which was hardly surprising in view of the temperature and the lack to electricity for refrigeration.

When I expressed my desire to visit Lake Nawampasa, they straightaway offered to take me there next day in one of the institute's vehicles, as long as I was prepared to pay for the necessary fuel. Naturally I immediately agreed to this deal. On the way back to Jinja I made another stop, this time at the Owen hydro-electric dam, which lies just outside the town. Long ago, before the dam was constructed in 1954, the Ripon Waterfall thundered down at this spot. Since then the associated hydro-electric generation has been the most important source of electricity in the country. This spot is, as in the past, the outflow from Lake Victoria, and even today is regarded as the source of the Nile (if one ignores the fact that the Kagera empties into Lake Victoria and hence its source is also the source of the (White) Nile). It was fascinating and at the same time rather alarming to see how water hyacinths had accumulated over an area a square kilometre in extent next to the dam.

We landed on an island in the Napoleon Gulf that harbours a fishing village. The fishermen live there with their families while they are actually fishing in the surrounding waters, and then they move on.

The mechanical removal of the plants via a conveyor belt, visible on the far shore, was comparable to Don Quixote tilting at windmills. My attempts to capture this remarkable scene on celluloid were immediately noticed by a passing watchman, and I was told to stop. He said that in Uganda it was strictly forbidden to photograph bridges and so he would have to confiscate my camera. I wasn't having that and so he hauled me off to his superior. I think the latter had other more important things on his mind than arresting tourists for taking photographs, and so the dispute ended in a friendly exchange of farewells. I think very much to the chagrin of the watchman, who had been happily envisaging himself as the new owner of my camera.

Right on the dot next morning I was back at the Fisheries Department. The off-road vehicle that was to transport us was in immaculate condition. A driver and Sylvester Wandera, one of the staff at Fisheries, accompanied me. On the way to Lake Nawampasa we picked up the District Fisheries Officer from Kamuli, as he had never yet been to the lake even though it lay in his jurisdiction. The police station at Irundu, where we were supposed to report in, was as yet unmanned and so we continued without bothering with the formalities. There was no proper road to the lake. At some random point the vehicle turned off the track and forced its way through the bush. Sometimes the driver followed a foot-track, but sometimes I couldn't tell how he knew where to drive. After five to ten minutes of cross-country driving we were, it seemed, there, but all that was to be seen was a few boats, a large puddle of water, and masses of reeds. It had all looked quite different on the map!

The Owen hydro-electric dam was constructed in 1954 at the site of the Ripon waterfall at the outflow of lake Victoria. This is still regarded as the source of the Nile.

It wasn't long before a few people emerged from the bush. The driver acted as interpreter, as apparently the officers weren't familiar with the local dialect here. He explained that I wanted to go out on the lake and so one of the boats was cleared out for us. The large nets were removed and the water baled out. Then we shoved off. Not until we had passed the girdling reeds was it possible to see the open water. The atmosphere was quite magical. We glided in total silence across the water, which was relatively transparent. It was possible to see lots of aquatic plants, and repeated small groups of lamp-eyes just below the surface. Perhaps 50 or 100 cm below them there were cichlids. This was beyond my wildest dreams. Gone right away were my worries about catching bilharzia and I never even gave a thought to crocodiles. I already had my swimming trunks on, the camera was already in the underwater housing. I quickly stripped off my shirt and trousers, donned my mask and snorkel instead, and then straight into the lake. Yes, there they were, exactly the same species as has just been imported back home. *Haplochromis latifasciatus* and *H. orthostoma* were easy to recognise. And others that I couldn't immediately identify, for example one with an orange-red forehead, probably *H. phytophagus*, and another with almost the same body form but with bluer coloration. I also spotted a pair of *Tilapia* - could they be *T. zillii*?

My time in the water was far too short, I could have spent hours there. But I was worried about the strong sunlight as I hadn't put on any sun lotion at all and didn't want to risk sunburn. Later I learned that there are still large crocodiles in Lake Nawampasa, so I was extremely happy that I hadn't seen any,

The District Fisheries Officer from Kamuli at Lake Nawampasa. The lake itself begins the other side of the surrounding reeds.

Underwater photo: this fish may be *Haplochromis phytophagus*.

Jinja there was a small aquarium area for observing live fishes. To my great regret, almost all the photos I took of this and the fishes it contained turned out to be practically useless, as I had made a serious mistake in the settings on the camera, and didn't realise this until a lot later. Only at considerable expense was it possible to rescue the odd shot from this film.

and, more to the point, that they probably hadn't seen me either!

Before we travelled back the officers bought some *Haplochromis* caught by the locals to take back alive. At the institute in

This species couldn't be unequivocally identified. We call it *Haplochromis* sp. "Nawampasa Blue".

Underwater photo in Lake Nawampasa: this is probably *Tilapia zillii*.

Back at the hotel in Kampala the news awaited me that the Swiss I had met on the plane was looking for someone to investigate the night life of the city with him. But I had already had enough excitement for one day and had thoughts only of getting

to bed, though I let myself be persuaded for the next day.

There are several night clubs along the Ggaba Road in Kampala, although when we visited these places there was very little going on there, it being a weekday. While others were seeking amusement here, I used the opportunity to collect information. I wanted to know, for example, whether it might be possible to make a trip out on Lake Victoria, to hire a boat somewhere or other? I was told to enquire on the day at the fish market, which lay just at the end of the road in the Ggaba part of the city. Note that in Uganda there are different ways of spelling in some places, and I have also seen Ggaba written as Gaba or Gabbaa.

Three piscivorous species from the aquaria of the F.I.R.I. in Jinja. All three originated from Lake Nawampasa. The top fish is known as *Haplochromis* sp. "Serranus Red Eye", the middle as *H.* sp. "Torpedo Krib", and the bottom species as *H.* sp. "Gold Largemouth".

Lake Nawampasa, after the boat had passed through the belt of reeds and reached the open water. The photo shows a thunderstorm brewing.

And so, next day, I sought out the fish market. I really should have guessed that by late morning I couldn't expect to see much in the way of fishes. They are a perishable commodity and their meat won't tolerate lying unrefrigerated in the hot tropical sun for all that long. All that remained was dried fish and the last of the catch that had been landed early in the morning. Fishermen and fish-sellers are not the same people. And so it wasn't at all clear to me whether my request, to travel for a little way along the shore in a boat and catch small fishes, had been correctly understood. What I did understand was that the fishermen would now be sleeping, as they actually went out at night. Even so I could still see occasional people in boats on the water.

It should be explained that not all the people here speak English and the fishermen don't necessarily belong to the group that do. And I did encounter people with very different attitudes. Some that were tongue-tied and didn't want to have anything to do with me, and others who were inquisitive and sometimes even made the first approach. Some of the attempts to sell me stuff were, when all's said and done, not intended seriously, such as that of a young merchant who followed me everywhere and tried to sell me a sack full of straw. When I asked what I was supposed to do with it if I did buy it, he answered that I could use it to feed my donkey. My reply, that I had no immediate plans to own a donkey, were countered with the reply that one could also sleep very well on such a sack. If you make the effort to engage in this sort of humorous banter with the people, then they will begin, slowly but surely, to lose their shyness and then it is suddenly also quite OK to start taking photos.

The market in Ggaba is, however, not only a fish market but also a perfectly normal farmers' market as well. So given that I was there already, I thought I might as well take a look at the numerous other stalls even though the fish market didn't have much to offer. There were heaps of every conceivable tropical fruit, all top quality, and everything else that the farmers' fields produced. Trying some of the fruits, for example the pineapples, is an absolute must. The aroma is unbelievable, and then when you get home you have the problem of re-adjusting to the insipid-tasting stuff, harvested while it was still practically

This photo not only documents the sale of dried fishes, in this case *dagaa*, the herring-like cyprinid *Rastrineobola argentea*, but also demonstrates the meaning of "full" in Uganda. The containers are not only filled to the brim, but heaped up on top.

Stall at the fish market in Ggaba, right on the edge of Lake Victoria. On offer are Nile Perch, tilapia, lungfish, *Clarias*, and *Synodontis*. I never saw any *Haplochromis* there, they are in fact used only as bait for larger fishes.

One of the 'shopping malls' in the rather chaotic market in Ggaba, with all that the local terrain can supply and most of it of organic quality.

Fish-seller with lungfish at the market in Ggaba.

green, that we are offered in our shops. Many products are grown without the use of chemicals - as their producers can't afford the latter - and are thus of "organic" quality. Ironically, however, in Uganda today the products that have been sprayed are actually more expensive, as they are larger and look nicer. For this reason the organic way of thinking has not become established here, as the belief that everything that originates from industrialised countries must be good, has not yet been replaced by sound environmental awareness.

To be continued

Pineapples by the truck-load.

New research on the genus *Melanochromis*

by MARTIN GEERTS

Not only are the mbuna (the native name for the rock-dwelling cichlids of Lake Malawi) popular ornamental fishes, but science is also regularly at work on this group of cichlids. For example, three new species of the genus *Melanochromis* have recently been described in a paper that devotes considerable attention to the nomenclature of the genus, and in the process clarifies the taxonomic status of a number of disputed species. The authors of the paper are G. KONINGS-DUDIN, A. KONINGS, and J. STAUFFER. The title is: Descriptions of three new species of *Melanochromis* (Teleostei: Cichlidae) and a redescription of *M. vermivorus* (*Zootaxa* 2076: 37-59).

The authors have also undertaken a revised description of the genus *Melanochromis* in their paper. They state that the most important characters are: a melanin pattern consisting of two black horizontal stripes on a light background; a median stripe is that is not interrupted and which covers the lower part of the lateral line; and a dorsolateral stripe that may be interrupted and lies between the base of

***Melanochromis heterochromis*, male from Mumbo Island.** **Photo: Ad Konings**

***Melanochromis vermivorus*, male from Nkhudzi** **Photo: Ad Konings**

***Melanochromis melanopterus*, male from Thumbi East Island** **Photo: Ad Konings**

the dorsal fin and the median stripe. The latter is often broader (two to three scales). A further important character is the reversal of the colour pattern in courting males. The two black stripes of the initial colour pattern are then replaced by two light (white, yellow, or blue), uninterrupted stripes. In 12 species this colour reversal is complete; only in *M. lepidiadaptes, M. wochepa,* and *M. kaskazini* do courting males become sky blue and the lateral stripes disappear. The other characters - the body form (slender and sub-cylindrical), the long snout, and the large mouth - suggest a predatory existence.

Melanochromis vermivorus was in the past incorrectly regarded by field biologists as *M. melanopterus*, while *M. heterochromis* has frequently been seen as a junior synonym of the former species. KONINGS-DUDIN *et al*., however, are of the view that three valid species are involved. *M. vermivorus* possesses a larger interorbital distance than *M. melanopterus* (18.5-25.5 versus 16.6-20.6 % of head length) and a broader head (80.5-99.4 versus 68.7-82.0 % of head length). *M. vermivorus* as a rule lives at depths of less than five metres at Nkhudzi (the type locality), and at the islands of Mphande and Boadzulu, and at greater depth (10-15 metres) at Makokola Reef. This species is nowhere sympatric with *M. melanopterus* and/or *M. heterochromis*. The latter is distinguished from *M. vermivorus* by the length of the lower jaw (29.3-34.6 versus 37.2-41.7 % of head length).

Three species are described in the paper. The first of these is *Melanochromis kaskazini*. This is the mbuna that has been termed *Melanochromis* sp. 'northern blue' by AD KONINGS (in several editions of *Malawi Cichlids in their Natural Habitat*). The type locality for this species is Manda (Tanzania) and it is found along the northern shore of the lake from Nkanda in the north to Lundu in the south. It is encountered predominantly in the intermediate zone, at a depth of 5-40 metres. The specific name is derived from the Kisuaheli word for "northern".

M. kaskazini can be distinguished from all its congeners, with the exception of *M. lepidiadaptes*, by the colour pattern of territorial males, as they exhibit an only partially reversed stripe pattern. They are cobalt blue and lack the light median stripe as well as the light laterodorsal stripe. They can be distinguished from the congeneric *M. lepidiadaptes* in courtship dress by having a shorter preorbital, a longer head, and a longer lower jaw. Females are white with a yellow-orange anal fin. The largest specimen in the type series has a standard length of 121.5 mm.

The type locality of *Melanochromis wochepa* is Lumessi, a village in the Mozambique part of the lake. This species is known only from the east coast, between Nkhungu Point and the Lumessi River. The specific name is derived from the Chinyanja word for small, referring to the fact that this is a fish that attains only a modest body size when full-grown. The largest specimen in the type series is no longer than 65.1 mm.

M. wochepa occurs in shallow rocky habitats. Members of this species are

***Melanochromis kaskazini*, male in the aquarium** **Photo: Ad Konings**

***Melanochromis kaskazini*, female at Manda** **Photo: Ad Konings**

***Melanochromis wochepa*, male at Lumessi** **Photo: Ad Konings**

***Melanochromis wochepa*, female at Lumessi** **Photo: Ad Konings**

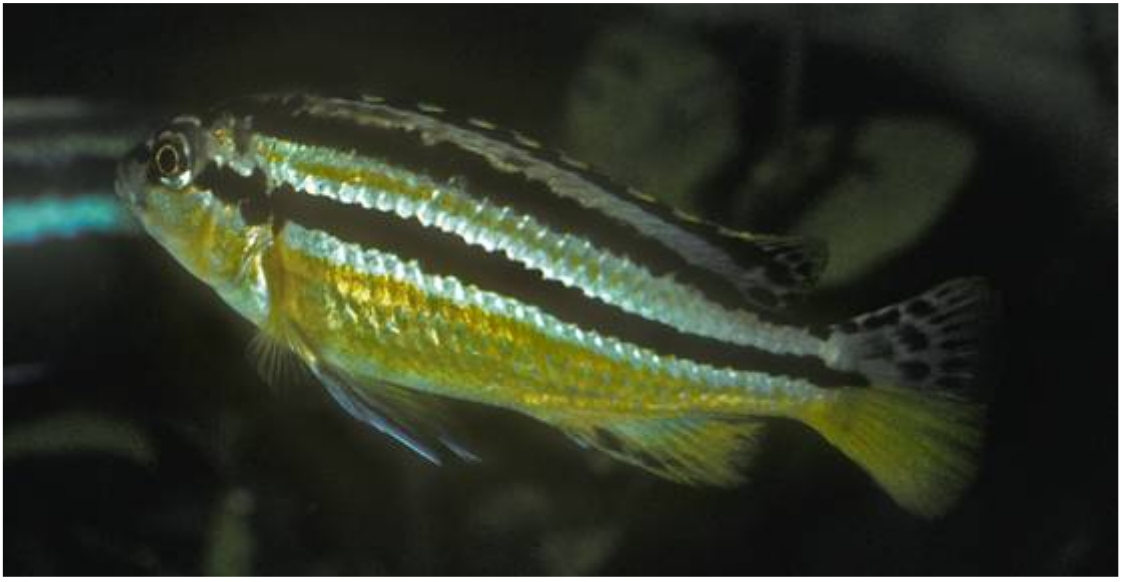
***Melanochromis mossambiquensis,* male at Minos Reef** **Photo: Ad Konings**

***Melanochromis mossambiquensis*, female at Minos Reef** **Photo: Ad Konings**

as a rule found living solitary, although this is not a fish with a predatory lifestyle but an algae-picker. The species closely resembles *M. auratus* and *M. dialeptos* but males are distinguished by their colour pattern (blue with white stripes versus blue-black with yellow or light blue stripes). The females are distinguished from those of *M. auratus* by having a submarginal stripe in the dorsal fin that is broader than the median stripe and the laterodorsal stripe. *M. wochepa* has a longer head, a deeper body, longer pectoral fins, and a larger number of rays in the dorsal fin than *M. dialeptos*.

The third new species has been described as *Melanochromis mossambiquensis*, a name that requires no further explanation. The type locality is Minos Reef, a reef that is known primarily as the home of the Red Zebra, *Metriaclima estherae*. The distribution of the new mbuna extends from Chuanga to Nkhungu Reef in Mozambique. In earlier versions of AD KONINGS' *Malawi Cichlids in their Natural Habitat* this form was termed *Melanochromis* sp. 'auratus elongate'. This cichlid too cannot be regarded as predatory, as it feeds on *Aufwuchs*. It is encountered in the intermediate zone, above all at Minos Reef. The largest specimen in the type series has a standard length of 76.1 mm. The populations at Metangula and N'kolongwe have a longer snout and a more slender body.

As is evident from the above-mentioned popular name, this species is very similar in appearance to *M. auratus*. It is distinguished by the median stripe and laterodorsal stripe being narrower and by having a submarginal stripe in the dorsal fin. The lower lobe of the caudal fin in females is patterned with black spots, while that in females of *M. auratus* is yellow and lacks any black markings.



For comparison: female *Melanochromis auratus*, in the aquarium.

Species profile

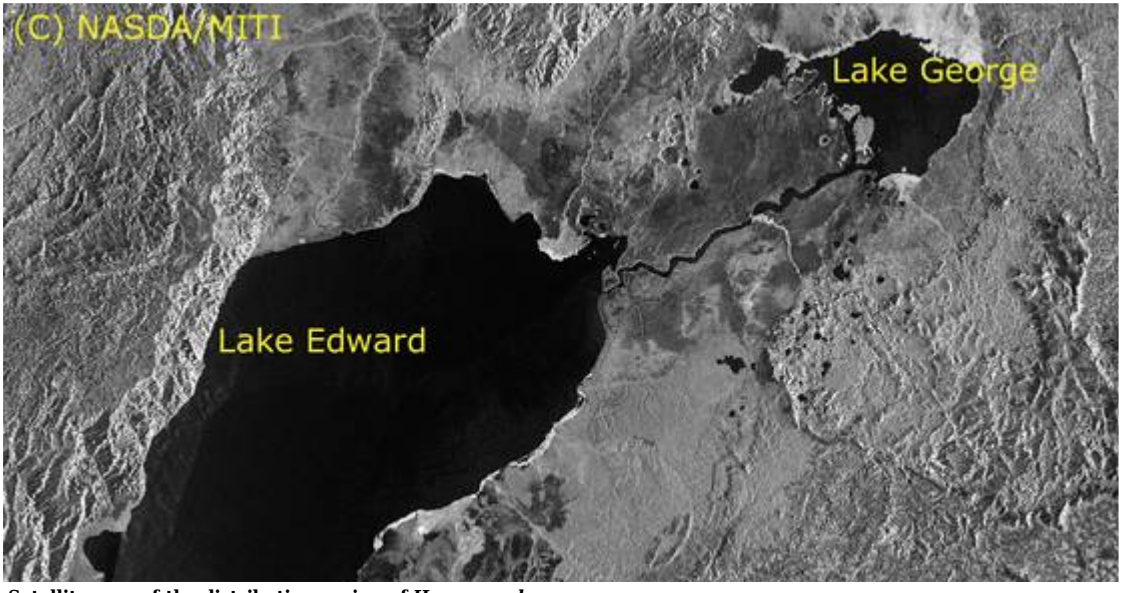
Haplochromis aeneocolor Greenwood, 1973

Synonyms / name recombinations:
Astatotilapia aeneocolor (Greenwood, 1973) Greenwood, 1980, new combination
Haplochromis nubilus (*non* Boulenger, 1906) Trewavas, 1933 in parts, misidentification
Haplochromis sp. "Lake George" Schraml, 1994, not identified

Similar Species:
Haplochromis eduardii, H. engystoma, H. limax, H. vicarius, H. sp. "Lake Albert Aeneocolor", *H.* sp. "Victoria Nile", *H.* sp. "Yellow Belly"

Etymology:
Latin *aeneus* = "of brass" + *color* = colour; referring to the appearance of adult males. Greenwood may perhaps have used the word "brassy" - which not only means brass- or bronze-coloured but is also used, in slang, of an "easy woman", bleached blond and usually too heavily made-up - as a *double entendre*, as the intense coloration of males of this species reminded him of such "ladies".

Distribution:
Type locality: Northeastern shore of Lake George, near Mpanga River mouth, Uganda.
Eastern Africa: Lake George and Kazinga Channel, Lake Edward(?).



Satellite map of the distribution region of *H. aeneocolor*.

***Haplochromis aeneocolor* male displaying his size to a rival by spreading his fins.**

Type material:
Holotype: BMNH 1972.6.2.43. Paratypes: BMNH 1972.6.2.44-50 (7), 1972.6.2.52-54 (3), 1972.6.2.55-63 (9), 1972.6.2.64-67 (4), 1972.6.2.68-72 (5), 1972.6.2.73-79 (7). Additional material: BMNH 1972.6.2.81-84 (4).

Habitat:
Common near shores with papyrus. Apparently never occurs at any distance from the shore.

Conservation Status (IUCN):
Vulnerable: Restricted distribution in Lake George (surface area 260 km^2) and the Kazinga Channel with potential lake-wide threats from water pollution from the mining activities in Kasese District (DUNN 1989, OGUTU-OHWAYO *et al*. 1997). Qualifies as Vulnerable on account of restriction to a single location that could, in this case, be impacted by water pollution.

Identification:
GREENWOOD (1973) wrote that it would be difficult to give a diagnosis for this species until more was known about the species from Lake Edward. For instance, *H. eduardii* superficially resembles *H. aeneocolor*, but differs in having stouter, non-flanged, and less acutely cuspidate teeth, a shallower body, and a more rounded head profile. *H. engystoma* has dental characteristics more like those of *H. aeneocolor*, but differs in several morphometric characters, especially in its higher eye/cheek ratio, shorter lower

***Haplochromis aeneocolor*, large specimen (around 100 mm SL), shortly after capture, collection of Herbert Tichy, HT8718.**

***Haplochromis aeneocolor*, female (around 65 mm SL), shortly after capture, collection of Herbert Tichy, HT8877.**

jaw, and strongly decurved head profile. *Haplochromis vicarius* has an overall superficial resemblance, but differs in having obliquely cuspidate outer teeth, more rows of inner teeth, and a larger eye.

Description: (from GREENWOOD 1973: 150)
SL: 75 mm[1]. BD: 35.7 - 41.1 (m = 37.7) %SL; HL: 32.0 - 36.8 (m = 34.5) %SL; dorsal head profile straight or slightly concave, sloping fairly steeply at around 35°- 40° to horizontal; upper margin of eye not reaching to upper profile but distinctly below it. PoD: 12.0 - 18.2 (m = 14.6) %HL; SnL: 26.7 - 31.8 (m = 28.8) %HL; SnL: 0.8 - 1.0 times SnW; EyL: 28.6 - 35.0 (m = 31.4) %HL; ChD: 19.0 - 25.0 (m = 22.8) %HL; CPL 12.9 - 17.4 (m = 15.3) %SL; CPD: 1.2 - 1.5 (m = 1.2 - 1.3) times CPL; mouth angle horizontal to slightly oblique, lips somewhat thickened; LJL 38.0 - 44.0 (m = 41.0) %HL; LJW: 1.5 - 2.1 (m = 1.6 -1.8) times LJL; posterior tip of maxilla reaching vertical through anterior part of eye or even vertical through anterior margin of pupil (MxPE: 0/+).

BD = Body Depth
ChD = Cheek Depth
CPD = Caudal Peduncle Depth
CPL = Caudal Peduncle Length
EyL = Eye Length
HL = Head Length
LJL = Lower Jaw Length
LJW = Lower Jaw Width
m = Mean value
MxPE = Maxillary Posterior Extension
POD = Pre Orbital Depth
SL = Standard Length
SnL = Snout Length
SnW = Snout Width

***Haplochromis aeneocolor*, paratype BMNH-1972-6-2-44-50.**

Dentition: The outer teeth are of the generalized type with unequally bicuspid crowns, but possess the special character of a well-developed, thin flange on the cutting edge between the minor and major cusps. According to GREENWOOD only a few individuals lack this flange, which is usually thin and almost transparent, but can be so well developed that the tooth appears to have a prolonged and slanting major cusp. The minor cusp is well developed, but its tip is not very pointed. The crown of an outer tooth has practically no incurvature, and its neck

1) Up to around 100 mm SL according to own observations.

Teeth of the anterior series in *Haplochromis aeneocolor* (Specimen HT8727 from the collection of Herbert Tichy). The typical flanges on the cutting surfaces of the major cusps of the bicuspid teeth are clearly visible.

is a somewhat compressed cylinder. The posterior 1-4 upper teeth are either compressed and tricuspid or unicuspid and canine in form.

According to Greenwood there are 40-56 (average 48) teeth in the outer row of the upper jaw. In a small number of specimens all the outer lower-jaw teeth are unicuspid, while those in the upper jaw are typically bicuspid in form. The inner teeth in both jaws are small, compressed, and tricuspid, and are arranged in 2 or 3 (rarely 4) rows in the upper jaw, and 2 (rarely 1 or 3) in the lower. The lower pharyngeal bone is moderately stout; the tooth-bearing part is equilateral or slightly broader than long. The pharyngeal teeth are fine, compressed, and cuspidate; they are arranged in some 24-26 rows, with the median teeth not perceptibly larger or coarser than those of the lateral rows.

Coloration: Both live coloration and that in alcohol are best taken from the numerous colour photos illustrating this profile. Typical coloration is a yellow belly and bronze- to reddish-coloured dorsum, but after capture the initial neon-yellow coloration of the underside slowly changes to dark greenish. The specific identity of the colour morphs shown here requires further clarification.

Trophic group:
According to Greenwood a detritus feeder, as plant remains and insect larvae were the dominant elements during stomach-contents analysis. However, adult insects are also eaten.

Biology:
Depending on stress factors, females brood for two to three weeks, and, depending on their size, can carry 40 or more fry in their mouths.

Remarks:
To date the as yet undescribed species noted as similar have not been exhaustively studied to see whether or not they may be conspecific. In addition physical characteristics are known to sometimes change with increasing age.

Hints for aquarium maintenance:
Tank size: >90 litres; maintenance temperature: 24-28 °C; pH 7.5-8.5; hardness around 10 °dGH, tolerates up to 30 °dGH. Moderately aggressive species. Several males can be kept in the same aquarium as long as territories are large enough.

***Haplochromis aeneocolor*, confrontation between two males.**

***Haplochromis aeneocolor,* blue morph or - on the basis of the straighter upper head profile - perhaps a different species?**

***Haplochromis aeneocolor*, dark morph.**

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