

GENETIC POLYCHROMATISM IN LAKE KIVU HAPLOCHROMINES.

by

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Introduction.

In taxonomic research on cichlids, the knowledge of the live colour patterns is a very important tool. Apart from sexual dimorphism, intraspecific differences in colouration can be attributed to geographical variation, individual variation and to changes within one individual depending on its motivational condition. Another phenomenon involved, is the occurrence in many African lake species, of two or more colour morphs. This polychromatism in cichlids is a special case of genetic polymorphism, which can be defined as the occurrence together of a number of discontinuous forms of a species, at corresponding stages of development, of the same generation, in the same habitat, and in such ratios that the least frequent form can not be maintained by recurrent mutation (after Ford, 1940; Kosswig, 1965; Fryer & Iles, 1972).

Since several years, the Koninklijk Museum voor Midden-Afrika (K.M.M.A.) at Tervuren, in collaboration with the Institut National de Recherche Scientifique (I.N.R.S.) at Butare (Rwanda), is involved in research on the ichthyofauna of Rwanda, including a taxonomic study on the haplochromines of Lake Kivu. Here also, some taxonomic confusion due to the occurrence of polychromatism, had to be clarified.

Material and methods.

The results are mainly based on the large research collections of the K.M.M.A. at Tervuren. Some type specimens and additional material of various institutes and museums (I.S.N.B. Brussels; B.M.N.H. London; Z.M.H.B. Berlin; M.N.H.N. Paris) have also been examined. For the morphometric methods, see Snoeks et al. (1987) and Snoeks (1988).

Results.

Presently polychromatism has been observed in five haplochromine species from Lake Kivu, i.c. Haplochromis vittatus (Boulenger, 1901), H. adolphifrederici (Boulenger, 1914), H. paucidens Regan, 1921, H. murakoze Coenen et al., 1984 and one new species (description in press, Snoeks, 1988). In all these species, a second morph of the bicolor (piebald) type is found, beside specimens with the typical normal colour pattern. These bicolor specimens all show from dark brown to blackish blotches on a silvery-yellow background. Although seemingly irregularly arranged all over the fish, these blotches sometimes seem to form interrupted, transversal dark bars on the body.

In the taxonomic tangle of H. paucidens, mainly three nominal species were involved. In a first step, H. wittei, described by Poll (1939) on three piebald specimens, was proven to be the bicolor morph of H. schoutedeni Poll, 1932 (Coenen, 1980; Snoeks, 1986). Recently, a comparison of the type material of H. schoutedeni and H. paucidens (all normal coloured specimens) showed those two nominal species to be conspecific (Snoeks, 1988). The normal colour morph (males and females) accounts for about 70 % of the collections of this species; the bicolor morph for about 30 %. Almost all bicolor specimens are females and the occurrence of bicolor males is rather exceptional. More recently, a

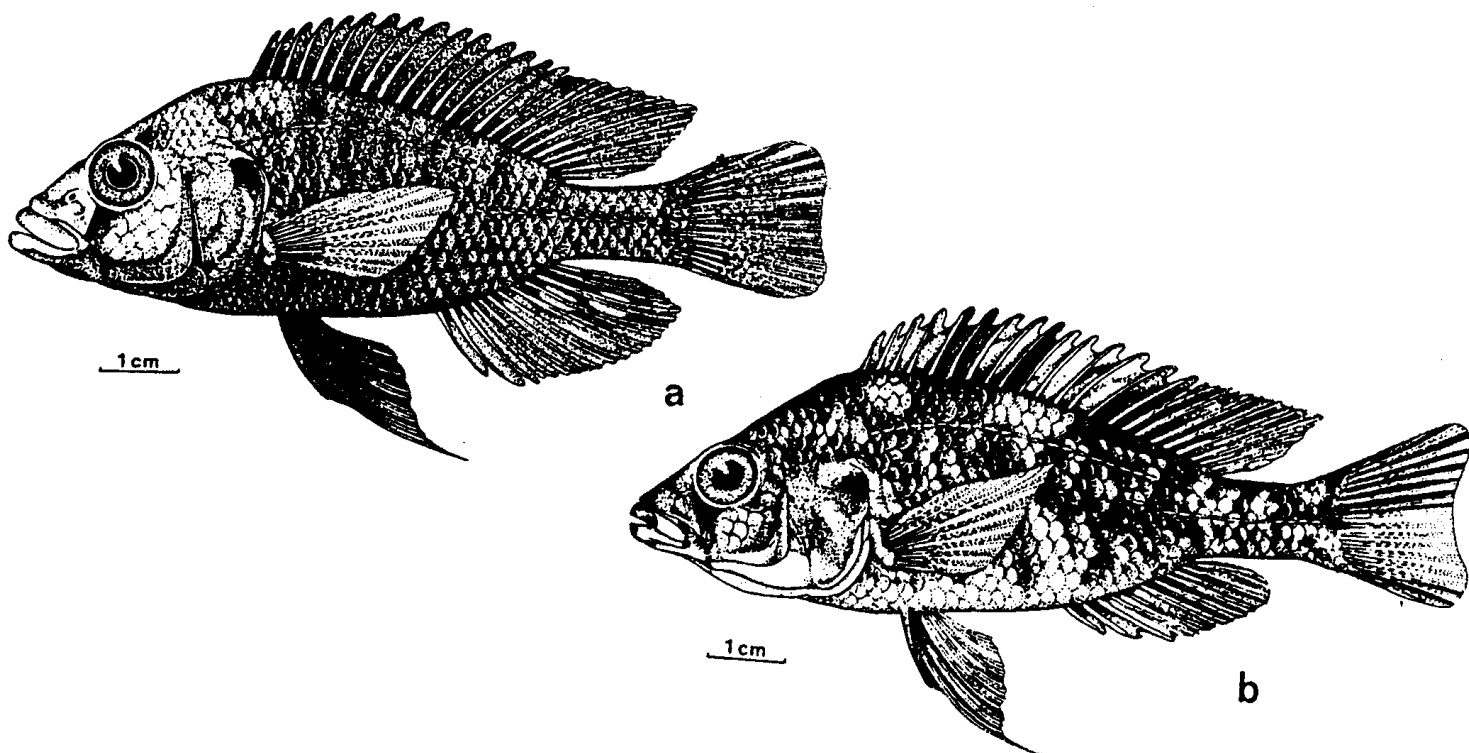


Fig. 1 : Haplochromis adolphifrederici :

a) male of the normal colour morph; MRAC Rég. n°. 12946 B

b) female of the bicolor morph; MRAC Rég. n°. 12866 B

third, rather rare, grey colour morph was found. These grey specimens, up to now all females, constitute about 0,5 % of the collected H. paucidens specimens (Coenen, 1980). The colour pattern of these specimens is composed of numerous small brown-blackish spots, very close to each other, on a silver-yellow background, as if they were bicolor specimens of which the pigment of the dark blotches has dispersed all over the body, thus creating a more or less uniformly grey fish.

H. adolphifrederici has been described by Boulenger (1914) on one bicolor specimen. This specimen, which Greenwood (1980) thought to be lost, has been found again and exceptionally happens to be a bicolor male. Some authors (e.g. Regan, 1921; Poll & Damas, 1939) regarded this species on the basis of its bicolor pattern and the length of the pectoral fin as different from H. graueri (Boulenger, 1914). Others considered H. adolphifrederici to be a variety of H. graueri (Pellegrin 1933) or eventually of H. paucidens (David & Poll, 1937). Surprisingly it took until 1939 before the most distinctive characteristic of H. adolphifrederici was described by Poll, mentioning Trewavas' observation of the molariform pharyngeal teeth, a unique feature in Lake Kivu haplochromines. This apparently did not put an end to the confusion as subsequent authors (Hulot, 1956; Mahy, 1979) considered normal coloured specimens with molariform pharyngeal teeth to belong to H. placodus Poll, 1939, a species described on one type specimen (normal colour) from the Molindi river, near Lake Kibuga, Edward system. Due to the existing confusion, the bicolor specimens of H. adolphifrederici, deposited in the K.M.M.A. (tervuren) and the I.S.N.B. (Brussels), were assigned to three nominal species : H. adolphifrederici, H. graueri and H. wittei. At present, however, it is clear that H. adolphifrederici is a valid, polymorphic species, endemic to Lake Kivu. The question of the status of H. placodus, yet can not be solved unambiguously (Snoeks, 1986). In view of the great tendency of haplochromines to be endemic, we consider H. placodus tentatively as a valid species, only known by one specimen and confined to the Lake Edward system.

Discussion.

In the Victoria-Edward-Kivu haplochromine species flock, as considered by Greenwood (1980), genetic polychromatism is mainly observed as the presence of piebald females next to normal coloured females. From Lake Victoria presently some twelve polychromatic species are reported (Greenwood, 1974; van Oijen *et al.*, 1981), whereas in the Lake Edward system no polychromatic haplochromines have been found up to now (Greenwood, 1973). In Lake Kivu, the percentage of polymorphic species is relatively high. The presence of piebald specimens is found in about one third of the species (including the undescribed ones). Among lake Kivu haplochromines, H. paucidens is special, having a second, grey colour morph. However, such specimens are also reported in Lake Victoria haplochromines i.c. Hoplotilapia retrodens Hilgendorf, 1888, Haplochromis barbarae Greenwood, 1967 and an undescribed species (Greenwood, 1967; 1974).

It is beyond the scope of the paper and the competence of the authors to comment on the genetic basis of this "almost sex limited" colour polymorphism in Lake Kivu haplochromines. Greenwood (1974), following Fryer & Iles (1972) accepts "the manifestation of a potency balance between the expression of alleles on autosomes and suppressor alleles on the sex chromosomes" as a good working hypothesis, assuming the females are the heterogametic sex. As well among Lake Kivu, as among Lake Victoria haplochromines, males of the grey morph are not found, and the occurrence of bicolor males is rather exceptional. Greenwood (1956), suspecting protandry, examined microscopically the gonads of two piebald males of Macropleurodes bicolor (Boulenger, 1906), but found only evidence of testicular tissue.

Greenwood (1974) also mentions, merely as a colour aberrancy, atypically melanic specimens of the polychromatic Haplochromis obesus (Boulenger, 1906) from Lake Victoria. In Lake Kivu, melanism is quite normal as highly dominant males of several species become almost completely (H. vittatus, H. nigroides (Pellegrin, 1928) and H. gracilior (Boulenger, 1914) or completely black (H. kamiranzovu Snoeks *et al.*, 1984; H. astatodon Regan, 1921 and one undescribed species). This phenomenon has led to the description of H. astatodon var. nigroides (Pellegrin, 1928) and of H. vittatus var. nigroides (Pellegrin, 1935), which were both erroneously attributed to genetic colour polymorphism (Fryer & Iles 1972). In H. vittatus this was clearly due to intra-individual variation in an adult male specimen. Although such variation also is found in H. astatodon, the description of a supposed black variety has to be attributed to an error, for the type of H. astatodon var. nigroides is not conspecific with H. astatodon, but represents the clearly distinct species H. nigroides.

Summary.

In Lake Kivu, actually, five polychromatic haplochromines are known. Of two species (H. paucidens and H. adolphifrederici) the taxonomic confusion due to the presence of colour morphs is reviewed. A more general discussion on the occurrence of colour polymorphism in haplochromines is given. Finally, some examples of colour variation, erroneously attributed to genetic polymorphism are discussed.

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