A new species of cichlid fish from the Malagarasi swamps and river (Tanzania, East Africa)

Peter Humphry Greenwood

Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Introduction

The material described below was collected in the Malagarasi river and swamps by members of the East African Fisheries Research Organization (later the East African Freshwater Fisheries Research Organization) during a survey of the area carried out in August and September 1952. Details of the habitats from which specimens were obtained are given in Greenwood (1954:401–402).

The new taxon brings the total number of cichlid species recorded from the upper part of the Malagarasi system to six, of which five (the new species, *Astatoreochromis vanderhorsti* [Greenwood], *Orthochromis malagaraziensis* [David], *Sarotherodon karomo* [Poll], and *Serranochromis janus* Trewavas) are endemic; the sixth species, provisionally identified as *Astatotilapia bloyeti* (Sauv.), belongs to a poorly understood complex of taxa. It may well be specifically distinct from the type and other populations of *A. bloyeti,* and thus would also have to be considered an endemic of the Malagarasi system (see Greenwood, 1954, &1979:283–286, 297–298 and 302–303).

Astatotilapia paludinosa sp. nov.

HOLOTYPE. An adult male 100 + 26 mm long, from the Malagarasi swamps at Katare (Tanzania); BMNH reg. no. 1956.7.9.266.

The trivial name, from the Latin, refers to the nature of the type locality.

DESCRIPTION (Figs 1 & 2). Based on 56 specimens (including the holotype) from the Malagarasi swamps at and near Katare, and the river below Uvinza. The material is divided into two groups, one of fishes 20–50 mm standard length, the other of fishes from 52–108 mm SL.

Additional material, examined in the field, is incorporated in the colour descriptions and in the data on food and feeding habits.

In the table of proportions, head length, body depth and caudal peduncle length are expressed as percentages of standard length; all other measurements (indicated thus †) are given as percentages of head length. M = mean.

Standard Length	20–50 mm	52–108 mm
Depth of body	33·3–36·7 M = 34·8	33·4–40·1 M = 36·8
Length of head	33·3–38·3 M = 34·8	32·6–39·0 M = 35·0
Preorbital depth †	10·0–16·7 M = 13·2	14·0–19·0 M = 16·7
Interorbital width †	18·8–25·0 M = 21·3	18·2–24·0 M = 21·1
Snout length †	22·2–30·0 M = 26·4	28·0–33·3 M = 30·7
Eye diameter †	25·0–35·0 M = 30·2	23·5–30·9 M = 27·2
Cheek depth †	12·5–23·0 M = 19·4	22·8–28·5 M = 25·1
Caudal peduncle length	14·0–19·0 M = 15·8	11·5–16·4 M = 14·0

Dorsal head and snout profile straight, except for a slight interorbital concavity; sloping moderately steeply (*c.* 30°–35° to the horizontal). Snout as broad as or slightly broader than

Bull. Br. Mus. nat. Hist. (Zool.) **38** (3) : 159–163 Issued 29 May 1980

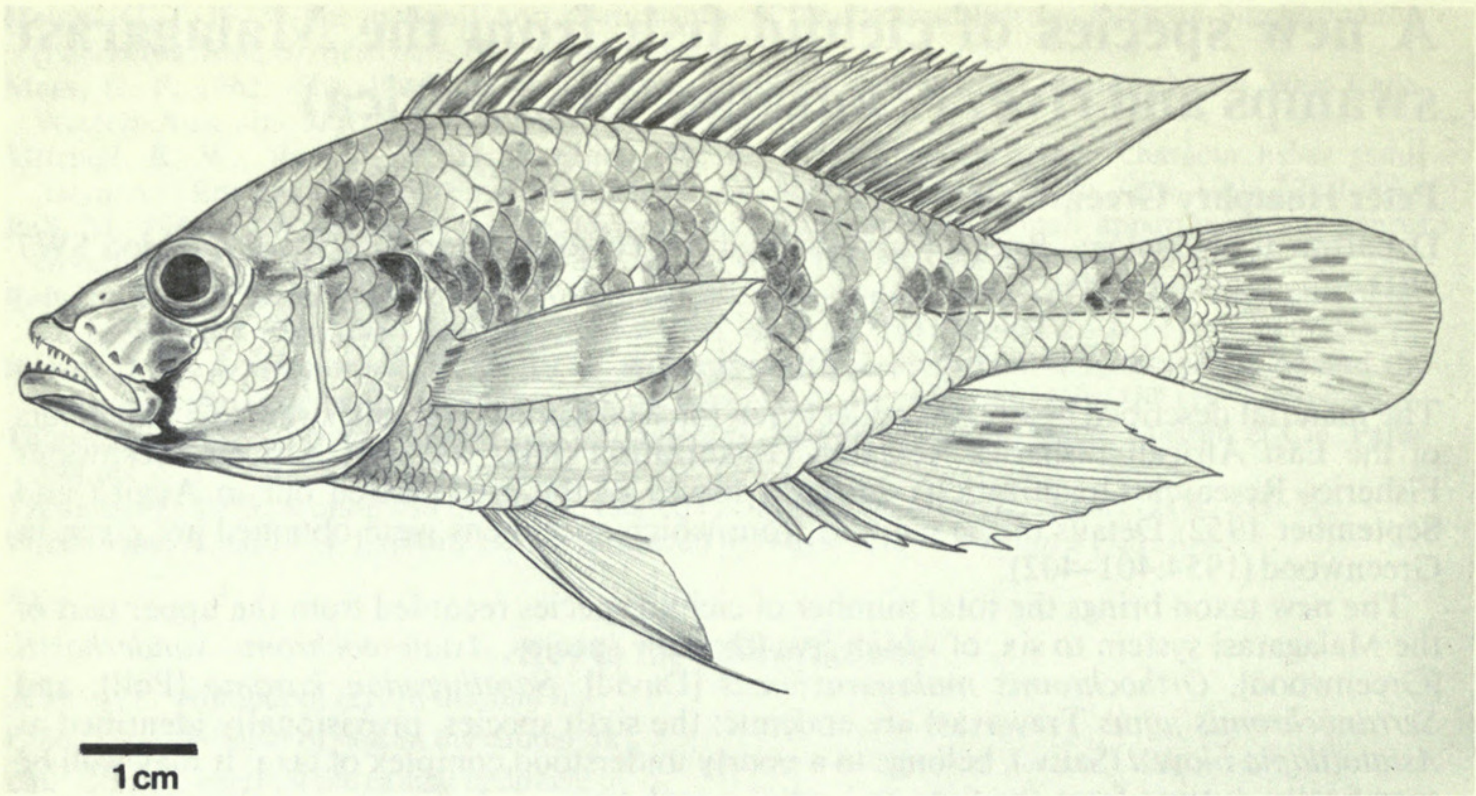

Fig. 1 *Astatotilapia paludinosa.* Holotype. Drawn by Gordon Howes.

long. Mouth slightly oblique; posterior maxillary tip extending to the vertical from the anterior orbital margin. Jaws equal anteriorly, the lower 33·3–46·0, M = 39·8 (fishes < 50 mm SL), and 38·0–44·5, M = 42·7 (fishes < 50 mm SL) per cent of head length; length/breadth ratio of the lower jaw 1·4–2·1 (mode 2·0).

Gill rakers. Short, 7–9 on the lower limb of the first arch, the lowermost one or two reduced.

Scales. Ctenoid except on the nape and chest; lateral line interrupted, with 29 (f.4), 30 (f.14), 31 (f.24), 32 (f.11) or 33 (f.3) scales. The last 2–6 scales of the upper lateral line series are separated from the dorsal fin base by 1 to $1\frac{1}{2}$ scales. Thoracic scales noticeably smaller than those occurring on the nape and belly. 7–10 (mode 9) scales between pectoral and pelvic fin bases; 5 or 6 (rarely 7) between dorsal fin origin and the upper lateral line. Cheek with 3 or 4 (mode), rarely 5 series of scales.

Fins. Dorsal with 24 (f.14), 25 (f.31), or 26 (f.11) rays, anal with 10 (f.1), 11 (f.24), 12 (f.28) or 13 (f.3) comprising XIV–XVI, 9–11 and III, 7–10 spinous and soft rays for the fins respectively. First pelvic ray produced, reaching to the vent in small fishes and as far as the third anal spine in larger individuals. Pectoral fin shorter than the head, 22·7–29·2, M = 25·7 per cent of standard length. Caudal moderately rounded.

Teeth. Outer series. In fishes between 21 and 70 mm SL, the majority of teeth in this series of both jaws are compressed and unequally bicuspid; individuals in the size range 77–95 mm SL have some unicuspid, caniniform teeth, chiefly in the lower jaw and posterolaterally in the upper. Above this size, moderately slender caniniform teeth predominate in both jaws. Tooth number is variable, but shows positive correlation with size; thus, fishes less than 45 mm SL have from 24–36 outer teeth in the upper jaw; in larger fishes the range is from 40–56 (one exceptional individual possessed only 32).

In fishes less than 70 mm SL, the posterior few teeth in the premaxillary outer series are not noticeably enlarged, nor are they unicuspid (the usual condition in most specimens of *Astatotilapia* species in the size range above 40 mm SL). Larger specimens, however, have the posterior 1–4 outer teeth larger than those preceding them, and invariably unicuspid.

Inner series. In fishes less than 90 mm SL, inner teeth are mostly tricuspid, but in larger individuals unicuspid teeth predominate, although an admixture of both types is common.

The number of inner rows in either jaw is variable, from 1–3, with 2 rows as the modal frequency at all sizes.

Lower pharyngeal bone (Fig. 2). Triangular, its dentigerous surface slightly broader than long (most fishes < 90 mm SL) or equilateral (fishes > 90 mm SL), its teeth arranged in 20–22 rows. Teeth of the median rows enlarged and stout, clearly cuspidate in small individuals, becoming conical and sub-molariform in the largest specimens.

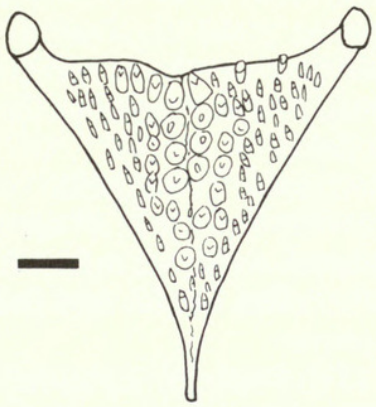

Fig. 2 *Astatotilapia paludinosa.* Lower pharyngeal bone; occlusal view (scale = 2 mm).

Skeleton. The neurocranium and jaw skeleton are identical with those in other *Astatotilapia* species (see Greenwood, 1979:274, 282 and fig. 6).

Vertebrae (excluding the fused PU_1 and U_1 elements) 28–30 (mode 29), comprising 12 or 13 (mode) precaudal and 15 or 16 (mode) caudal elements. The caudal fin skeleton in 21 of the 23 specimens examined radiographically has all the hypural elements free; in the two exceptional fishes hypurals 3 and 4 are fused.

Coloration. Preserved material. Since coloration of the few females caught is not markedly different from that of males, the description is applicable to both sexes. Ground colour brownish; seven to nine dark transverse bars on the flank and caudal peduncle, with faint indications of an interrupted mid-lateral stripe. A broad and distinct sub-lachrymal stripe is usually present. Posterior spinous and entire soft part of the dorsal fin maculate, less so in females; caudal fin maculate, especially on its dorsal half. Pectoral and anal fins clear, the latter, in males, with a single row of 3 or 4 ocelli with a narrow clear surround. Pelvic fins clear, or the outer half black, the leading edge of the first ray whitish.

Live coloration – breeding males. Ground colour grey-green; chest and belly dark silver-grey. Operculum golden; branchiostegal membrane blue-grey between the rami of the lower jaw, but yellow between the opercula. Lips iridescent blue. Dorsal fin yellow, lappets and margin red; dark red spots, often coalesced, on posterior spinous and entire soft part. Caudal fin with yellow lower and clear upper half on which deep-red maculae occur. Anal fin light grey, with a faint red flush; ocelli orange-yellow. Pelvics with outer half dusky, inner half yellowish; first ray blue.

Transverse and longitudinal banding was observed in live fishes, especially in a male seen guarding an established territory.

No information is available on the coloration of females.

ECOLOGY. *Distribution.* Lower Malagarasi river and swamps (Tanzania).

Habitat. The species was collected both in the swamp and the open river, at Katare and Uvinza respectively. At Katare, specimens were obtained from traps set amongst marginal vegetation, in open-water further off-shore and in nets set amongst dense off-shore stands of water-lilies. The greatest depth of water in any habitat was about 4 metres. A number of young *A. paludinosa* was found in a small and shallow pool partially isolated from the main swamp.

In the open river at Uvinza specimens were caught within the marginal reed beds, in the river itself and in sheltered embayments with a dense surface cover of water-lily leaves.

There appears to be no difference between the preferred habitats of this species and those of *A. bloyeti* inhabiting the same areas of the Malagarasi swamps and river. However, in the river at Uvinza *A. bloyeti* were relatively uncommon in areas away from the banks.

FOOD AND FEEDING HABITS. Analyses of stomach and intestinal contents in forty fishes (size range 44–107 mm SL) from all habitats at both localities provided little concrete evidence on the food of *A. paludinosa;* they do, however, indicate that the species is a bottom feeder.

In both the swamp area and in sheltered river embayments the bottom is largely covered by a thick deposit of semi-decomposed plant material. Detritus typical of this deposit was predominant in the stomach contents of twenty-five individuals. Since many of its constituents were partly decomposed before ingestion it is impossible to determine what material, if any, was digested by the fishes.

That the feeding habits of *A. paludinosa* are facultative is suggested by the occurrence of fish-guts as well as bottom debris in the stomachs of eleven individuals caught near a site where commercial catches were cleaned. Analyses made in the field showed that over 80% of fishes from this station had fed on fish offal. Scales and fish ova found in these fishes should probably be attributed to the same source.

Although some insect remains (Trichoptera, Ephemeroptera and Odonata larvae, and chironomid pupae) were recorded, insects, at least on the basis of this sample, do not contribute significantly to the diet of *A. paludinosa.*

Apparently there is little difference between the feeding habits of *A. paludinosa* and syntopic individuals of *A. bloyeti,* except that 21 of the 47 *A. bloyeti* specimens examined had ingested (and partly digested) water-lily seeds.

BREEDING. No data were obtained on breeding sites or habits, save for a single male seen guarding a 'nest' prepared in the sand substrate near emergent reeds. Sexually active fishes of both sexes were found in all habitats. Fishes less than 60 mm SL are sexually immature.

DIAGNOSIS. *Astatotilapia paludinosa* is distinguished from most congeneric species by its small chest scales (which are markedly smaller than those on the ventrolateral aspects of the flanks and belly, but are not separated from them by an abrupt change in scale size; see Greenwood, 1979), and, where live coloration is known, by its coloration and colour patterns (i.e. from *A. flaviijosephi* [Lortet], *A. nubila* [Blgr.], the *A. bloyeti* complex, *A. burtoni* [Günther], *A. swynnertoni* [Blgr.], *A. calliptera* [Günther] and *A. stappersi* [Poll]).

From the four *Astatotilapia* species with small chest scales, *A. paludinosa* is distinguished as follows:

(i) From *A. flaviijosephi* by its finer lower pharyngeal bone and few, less extensively molarized lower pharyngeal teeth (for a description of male coloration in *A. flaviijosephi* see Werner, 1976).

(ii) From *A. desfontainesi* (Lacép.) by its more slender head, especially its narrower snout (snout noticeably broader than long in *A. desfontainesi,* slightly longer than broad or, rarely, slightly broader than long in *A. paludinosa*), straighter, less decurved dorsal head profile, finer lower pharyngeal bone, and by its coloration, especially that of adult males (see Kirchshoffer, 1953, for colour descriptions of *A. desfontainesi*).

(iii) From *A. calliptera* by its smaller chest scales and in having outer row jaw teeth with acutely and unequally bicuspid crowns (as opposed to subequally bicuspid, obliquely truncate crowns in *A. calliptera*). Similar dental differences distinguish *A. paludinosa* from *A. swynnertoni,* which species also has relatively larger chest scales. Colour descriptions for *A. calliptera* and *A. swynnertoni* have been published by Bell-Cross (1976) and Jubb (1967) for the species respectively (the latter author treating *swynnertoni* as a synonym of *calliptera;* but see Greenwood, 1979:284).

(iv) From *A. dolorosa* (Trewavas) by its narrower interorbital width (18·2–24·0, mean 21·1% head length, cf. 25·8%), shallower cheek (22·8–28·5, mean 25·1% head length, cf. 30·3%) and its shorter, broader, lower jaw (38·0–44·5, mean 42·7% head length, cf. 48·6%; length-breadth ratio 1·4–2·1, mode 2·0, cf. 2·5 in *A. dolorosa*). All these morphometric

comparisons are with *A. paludinosa* in the size range 52–108 mm SL; the holotype and unique specimen of *A. dolorosa* is 93·5 mm SL. For further comments on these two species see below.

AFFINITIES. The small chest scales of *A. paludinosa,* apparently a derived character (see Greenwood, 1979:270–271), suggest that the species' closest living relatives are *A. desfontainesi* (Tunisia and Algeria), *A. flaviijosephi* (Israel and Syria) and *A. dolorosa* (Lake Edward basin, Uganda).

In its overall morphology, particularly its more streamlined head shape, *A. paludinosa* resembles *A. dolorosa* more closely than it does the other two species, but the phylogenetic significance of that feature cannot be assessed; it would certainly seem to be the commonest form amongst the African *Astatotilapia* species, and thus may be the primitive condition.

The extent to which the lower pharyngeal bone and its dentition are hypertrophied (presumably a derived feature) suggests that *A. flaviijosephi* and *A. desfontainesi* are more closely related to one another than to any other *Astatotilapia* species. As a corollary, the finer bone and dentition found in *A. paludinosa* and *A. dolorosa* is probably a feature of little phylogenetic significance.

Unfortunately *A. dolorosa* is known only from the holotype, a specimen now rather flaccid and completely bleached of its body and fin markings. This fish differs from comparable-sized *A. paludinosa* in certain morphometric features (see under Diagnosis above), which, since they involve bony features are not likely to be affected by the relatively poor condition of the specimen. However, the importance of the features in helping to establish the affinities of *A. paludinosa* are diminished by the absence of other *A. dolorosa* specimens. No further material of that species has been captured, despite recent collections made in the vicinity of the type locality.

Clearly the relationships of *A. paludinosa* cannot yet be determined. It is, however, interesting to note that they do not appear to lie with congeners presently occurring in the same geographical area (Lake Tanganyika basin and drainage), that is *A. burtoni,* the *A. bloyeti* complex, or *A. stappersi.*

STUDY MATERIAL AND DISTRIBUTION RECORDS

Museum and Reg. no.	Locality	Collector
BM(NH) 1956.7.9.266 (Holotype)	Katare, Malagarasi swamps.	E.A.F.R.O.
BM(NH) 1956.7.9.267–285 (Paratypes)	Katare, Malagarasi swamps.	E.A.F.R.O.
BM(NH) 1956.7.9.291–311 (Paratypes)	Katare, Malagarasi swamps.	E.A.F.R.O.
BM(NH) 1956.7.9.254–265 (Paratypes)	Malagarasi river at Uvinza (below the rapids).	E.A.F.R.O.

References

Bell-Cross, G. 1976. *The fishes of Rhodesia.* Salisbury.

Greenwood, P. H. 1954. On two species of cichlid fishes from the Malagarazi river (Tanganyika), with notes on the pharyngeal apophysis of the *Haplochromis* group. *Ann. Mag. nat. Hist.* (12) **7** : 401–414.

— 1979. Towards a phyletic classification of the 'genus' *Haplochromis* (Pisces, Cichlidae) and related taxa. Part 1. *Bull. Br. Mus. nat. Hist.* (Zool.) **35** (4) : 265–322.

Jubb, R. A. 1967. *Freshwater fishes of southern Africa.* Cape Town.

Kirchshoffer, R. 1953. Aktionssystem des Maulbrüters *Haplochromis desfontainesii. Z. Tierpsychol.* **10** (2) : 297–318.

Werner, Y. L. 1976. Notes on reproduction in the mouth-brooding fish *Haplochromis flaviijosephi* (Teleostei: Cichlidae) in the aquarium. *J. nat. Hist.* **10** : 669–680.

Manuscript accepted for publication 15 October 1979