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# A new species of Labeotropheus from Lake Nyasa, with a redescription of Labeotropheus fuelleborni AHL, and some notes on the genus Labeotropheus

(Pisces : Cichlidae)

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During the course of field work recently carried out in Lake Nyasa it was noticed that occasional specimens of a cichlid fish of the genus *Labeotropheus*, at the time believed to include only one species, *L. fuelleborni* AHL., were more elongate in relation to the depth of the body than the form most usually collected. It was only when the field work was completed, however, and time was found for making a detailed laboratory study of preserved specimens, that the difference, with which were found to be correlated certain other small differences, was seen to be more than phenotypic. As a result of these studies it has been found necessary to recognise two distinct but very closely related species.

Although only a relatively small sample of the commoner, deep-bodied species, shown below to be *L. fuelleborni*, was preserved, the body depth and standard length of a reasonably large number of specimens was determined in connection with a study of the allometric relationship of these characteristics, and these measurements, which have been available for comparative purposes, together with those of preserved specimens, have shown that the relationship between body depth and standard length is distinctly different in the two species described below.

The genus *Labeotropheus*, which is endemic to L. Nyasa, was established by AHL (1927) who described two species, *L. fuelleborni* and *L.*

*curvirostris*, whose distinctness was based mainly on the form of the snout. TREWAVAS (1935) who had seen AHL's types in Berlin, decided that this difference was of no taxonomic significance and regarded the two species as synonymous. Examination of a considerable amount of both fresh and preserved material indicates that TREWAVAS was justified in attaching little importance to this point as there is a considerable amount of phenotypic variation in form of the snout in both *L. fuelleborni* and in the new species described below.

Although I have not personally seen AHL's types it is apparent from the information which he gives on the relationship of body depth to standard length that both his « species » should be referred to the commoner of the two species here described which is therefore the true *L. fuelleborni*, and that it is the rarer, shallow-bodied fish which is the undescribed species. Dr. E. TREWAVAS kindly informs me that all the specimens in the collection of the British Museum (Natural History) are referable to *L. fuelleborni* on the criteria proposed here.

**Labeotropheus fuelleborni** AHL, 1927.

*Labeotropheus fuelleborni* AHL, 1927, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 52.
*Labeotropheus curvirostris* AHL, Ibid.
*Labeotropheus fuelleborni* TREWAVAS 1935 Ann. Mag. Nat. Hist., Ser. 10, *16*, p. 76.

Standard length 2.54 to 2.94 times the maximum depth (in specimens of total length 4.8 to 15 cm). (3.11 times as long in a specimen of total length 2.18 cm). Caudal peduncle not quite as long as deep.

Head comprising between 29.6 and 34 % of standard length. Snout with a fairly evenly curved profile and with a dermal thickening anteriorly above premaxillary symphysis which overhangs mouth and which obscures premaxillary pedicel. Snout length comprising 32.3 to 42.8 % of head length (less in a specimen only 2.18 cm in total length), and as long or a trifle longer than post-orbital part of head. Diameter of eye 23.9 to 30.4 % of head length (36.1 % in one exceptional individual of standard length 4.92 cm). Interorbital width 29 to 42 % of head length; the width increasing as the fish increases in size.

Mouth very wide, extending across entire width of head, and ventrally located. Both jaws almost straight except at lateral extremities where they bend almost at right angles.

Each jaw with 6 or 7 rows of tricuspid teeth of which outermost row is much the largest. Teeth very numerous; at least 70 in outermost series of upper jaw. Upper jaw with a series of 6 to 9 lateral, enlarged, conical teeth (These tend to be tricuspid in one specimen examined).

Gill rakers short, 8 or 9 on lower part of anterior arch.

Lower pharyngeal bone in form of an approximately equilateral

triangle with fairly deep indentation on posterior margin. Pharyngeal teeth numerous. Anterior teeth very fine. Posterior teeth densely crowded and becoming progressively stouter towards posterior margin of bone, but only most posterior row can be termed robust.

Nape densely covered with minute scales. Scales ctenoid. Lateral line interrupted. 31 to 33 (usually 32) scales in longitudinal series.

Dorsal fin with 16 to 18 (usually 17 or 18) spines and 7 to 10 (usually 8 or 9) soft rays. Anal fin with 3 spines and 7 or 8 (rarely 9) soft rays. Last anal spine half or a little less than half length of head. Pelvic fin not reaching back to anal in female but just reaching it in ripe male.

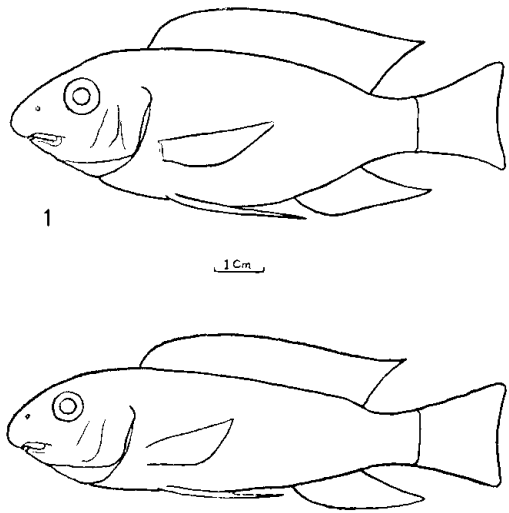
Caudal fin feebly emarginate; covered with minute scales, particularly near root.

Female with left ovary atrophied. Both testes of male functional. Female broods eggs and young in mouth.

Alimentary canal long and convoluted.

Colour of « typical » female rather dull blue grey, lighter ventrally; and usually with trace of several dark vertical bars, usually 8 below dorsal fin. Two dark bars usually distinguishable on snout. A dark spot on post dorsal part of operculum. Pelvic fins dark towards margins, and with a very narrow white marginal line.

One female (from Benji Island) peppered with black and orange pigment; similar in some ways to the « orange blotch » pattern described below but much more finely peppered.




Figs 1-2. — Outline sketches of the two species of *Labeotropheus*.
1. *L. fuelleborni* Ahl. 2. *L. trewavasae* sp. nov.

Male in breeding dress with ground colour suffused with a bright ultramarine blue. Anal fin with 2 to 4 bright orange spots posteriorly.

*Variation* : As the description shows there is considerable variation in the snout length. This is largely due to variation in form of the dermal thickening which sometimes forms a flap-like extension over the mouth and sometimes, particularly in larger specimens, tends to be somewhat upturned in this region. The interorbital width also appears to be very variable from the description, and is indeed somewhat variable from individual to individual, but most of the apparent variability is in fact due to allometry, the skull becoming proportionately wider as the fish increases in size.

*Occurrence* : Apparently widespread on rocky shores of the lake, including those of offshore islands, having been recorded from the northern and southern parts of the lake, from the eastern and western shores, and from Likoma and Benji Islands.

**Labeotropheus trewavasae** sp. nov.

Standard length 3.13 to 3.61 times as long as maximum depth (in specimens of total length 7.4 to 11.7 cm). Caudal peduncle as long as deep or a little longer.

Head comprising between 28.3 and 32.2 % of standard length. Snout with similar profile to that of *L. fuelleborni* and with a similar dermal thickening above premaxillary symphysis. Snout length comprising between 38.6 and 42.5 % of head length, and about as long as post-orbital part of head. Diameter of eye 22.5 to 26.8 % of head length. Interorbital width 28.7 to 37.4 % of head length.

Mouth and dentition as in *L. fuelleborni*.

Gill rakers short, 8 or 9 on lower part of anterior arch.

Lower pharyngeal bone as in *L. fuelleborni* but, in specimens compared, a trifle more slender.

33 or 34 (usually 34) scales in longitudinal series. In one specimen 35 scales present on one side.

Dorsal fin with 18 or 19 spines and 7 or 8 soft rays. Anal fin with 3 spines and 7 or 8 soft rays. Last anal spine half or little less than half length of head. Pelvic fin not reaching back to anal in female but doing so in ripe male. Caudal fin feebly emarginate; covered with minute scales particularly near root.

Female with left ovary atrophied. Both testes of male functional. Female broods eggs and young in mouth.

Alimentary canal long and convoluted.

Colour of « typical » female as that of *L. fuelleborni*. In 5 of the

10 female specimens available the fishes exhibited what is here called an « orange blotch » pattern, which consisted of large blotches of black and orange pigment on a rather dirty white ground colour. This is similar to, but quite distinct from, the peppered pattern seen in one of the available specimens of *L. fuelleborni*.

Male in breeding dress not particularly studied as not recognised as distinct during field studies, but certainly not greatly different from that of *L. fuelleborni*.

*Occurrence* : So far collected only on rocky shores at Nkata Bay and Ruarwe in the northern part of the lake where it co-exists with *L. fuelleborni*.

I take pleasure in naming this species after Dr. E. TREWAVAS whose grouping of the Nyasan cichlids paved the way for future research, and as a token of appreciation of her interest in my work on the Nyasan fauna. The holotype — a female, standard length 8.12 cm, exhibiting « typical » coloration, collected at Nkata Bay, — and several paratypes, are deposited in the collection of the British Museum (Natural History), London.

## THE DISTINCTION BETWEEN *L. FUELLEBORNI* AHL AND *L. TREWAVASAE* SP. NOV.

The most obvious distinction between these two species is that of body depth in relation to standard length, *L. fuelleborni* being deeper in the body than specimens of *L. trewavasae* of similar length. As shown in the graph (fig. 3) there is apparently no overlap in this characteristic. Certain other morphological characteristics are apparently correlated with this difference. Thus, although there is an overlap in each case, the mean number of spines in the dorsal fin and the number of scales in the longitudinal series is distinctly greater in *L. trewavasae* than it is in *L. fuelleborni* (fig. 4), and from the small numbers studied from this point of view it seems that a large proportion of specimens can be separated on these characteristics alone.

There is also a difference in the relative width of the body of the two species, specimens of *L. trewavasae* being wider than individuals of *L. fuelleborni* of the same length. In *L. trewavasae* the maximum depth of the body is generally less than twice the maximum width whereas in *L. fuelleborni* it is more than twice the width. The maximum width, however, does not lend itself to precise measurement and is not mentioned in the descriptions.

The proportions of the head also vary in the two species (figs 1 & 2), but these differences, like those of the body width, do not lend themselves to precise measurement, and there seems to to be a fair amount of individual variation.

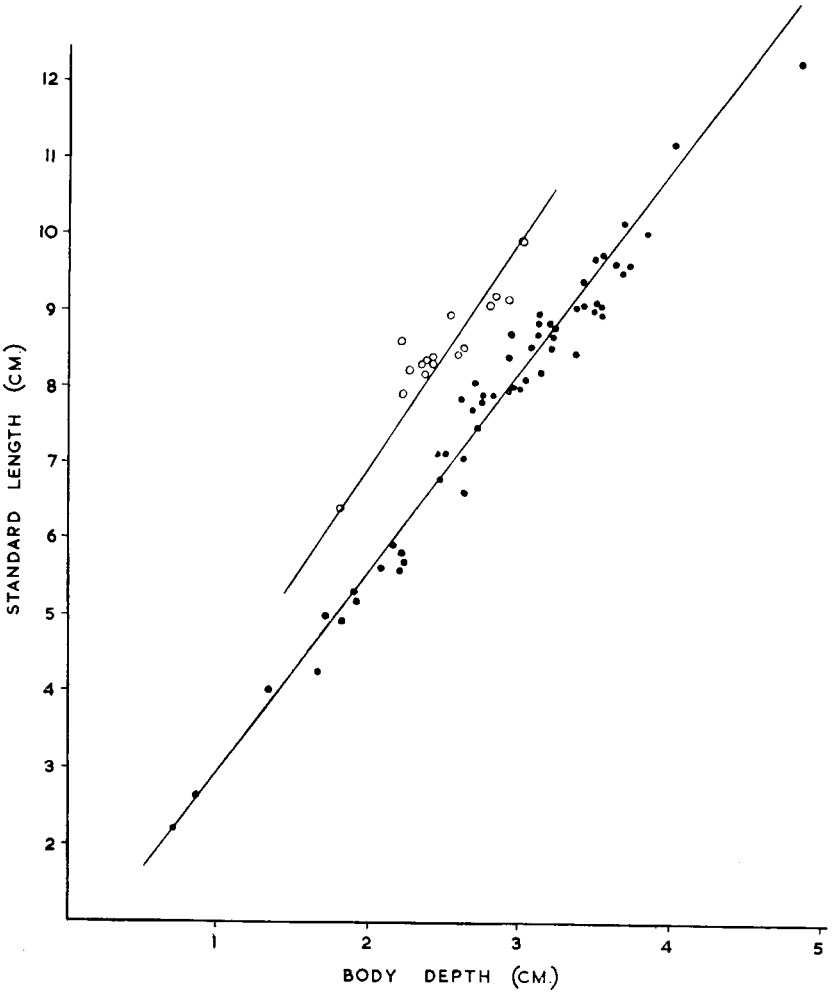



Fig. 3. — Ratio of standard length to body depth in the two species of *Labeotropheus*. Black dots *L. fuelleborni*; open circles *L. trewavasae*.

The greater relative length of *L. trewavasae* is reflected also in the ratio of standard length to depth of caudal peduncle. In *L. trewavasae* the standard length is 8 times, or sometimes more, the depth of the peduncle, whereas in *L. fuelleborni* it is only about 7 times as long.

A very striking difference, at least in the populations sampled, lies in the incidence of the orange blotch pattern. Of the 16 available specimens of *L. trewavasae* 5, or 31 %, exhibed this pattern, while of the 57 specimens of *L. fuelleborni* not a single specimen exhibited the typical orange blotch pattern and only one specimen was « peppered » with black and orange pigment. As this pattern is limited to the females the comparison is perhaps best made by reference to this sex alone. In *L. trewavasae* 50 % of the 10 females available were of this type while in *L. fuelleborni* the single « peppered » female represented only about 3 % of the females examined. This specimen came from Benji Island and not from Nkata Bay where most of the collecting

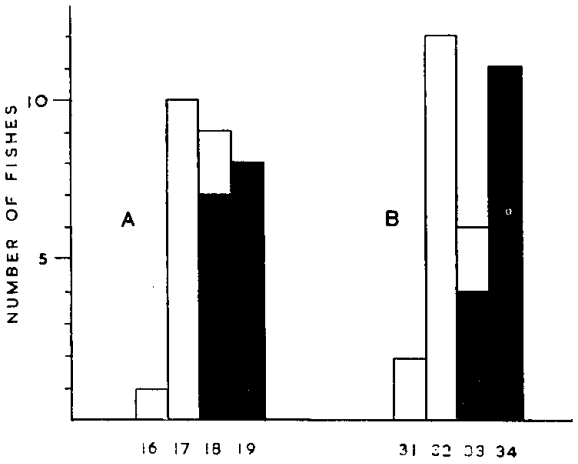



Fig. 4. — Comparison of two numerical characteristics in the two species of *Labeotropheus*. A. Number of spines in dorsal fin. B. Number of scales in longitudinal series. Black columns represent *L. trewavasae*, white columns *L. fuelleborni*.

was done. The fact that in the populations at Nkata Bay and Ruarwe, where both species co-exist, the orange blotch pattern was found only in *L. trewavasae*, which is less plentiful than *L. fuelleborni*, is a strong indication that these are distinct non-interbreeding taxa. It will be interesting to see if future collections reveal a similar state of affairs in other populations.

Unfortunately the two species were not recognised as being distinct during the field work, but it is certain that their habits are very similar, that they co-exist in the littoral zone of the lake, and that each takes exactly the same kind of food. Details of the food and feeding mechanism will be published elsewhere.

## NOTES ON THE GENUS *LABEOTROPHEUS*

*Anatomy* : The most striking anatomical characteristics of the genus *Labeotropheus* are those of the mouth and dentition which are intimately correlated with the feeding habits of the fishes, namely the scraping of algae from rock surfaces. While the dentition and the means whereby food is collected are dealt with elsewhere it is appropriate to make brief mention here of certain points of cranial anatomy and particularly the structure of the premaxillary and dentary bones.

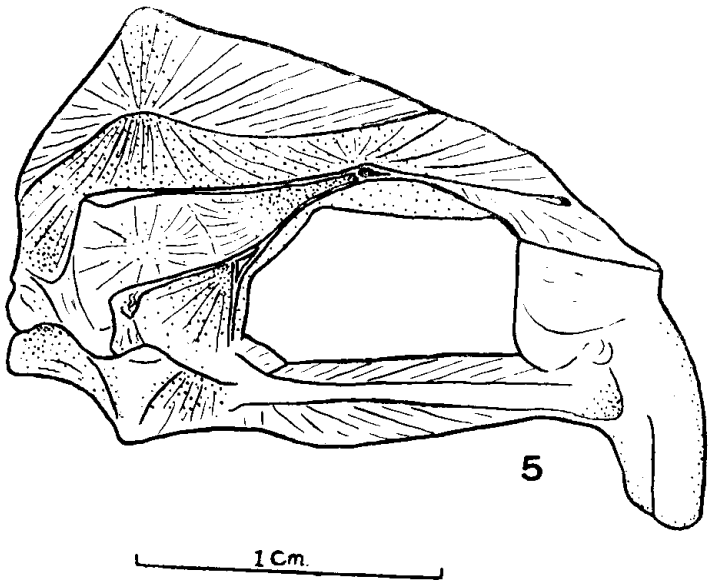


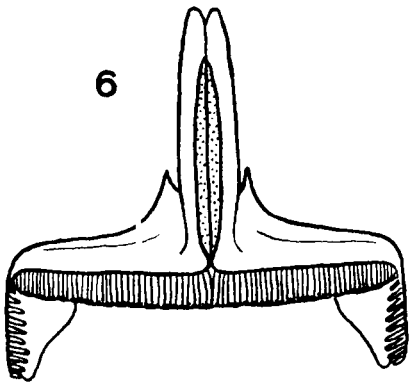

Fig. 5. — Some features of the skull of *Labeotropheus fuelleborni*. Neurocranium of specimen of standard length 9.9 cm., from right hand side.

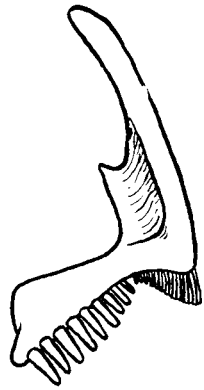
Only the skull of *L. fuelleborni* has been studied, but there can be no doubt that any differences between it and the skull of *L. trewavasae* are merely those of proportions. The mouth and dentition are identical in the two species.

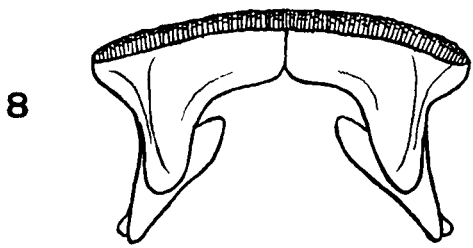
The skull is somewhat foreshortened and the anterior contour of the neurocranium is rather steeply sloping (fig. 5). At the anterior end of the neurocranium is a conspicuous snout-like ventral extension which appears to be formed from the fused parasphenoid and prevomer bones.

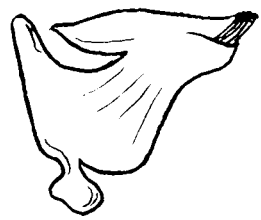
The premaxillary bone (figs. 6 & 7) is remarkable for the width and straightness of its anterior margin. Instead of curving gently as is the

case in most cichlid fishes, including the genera most closely related to *Labeotropheus*, the bone is divisible into distinct anterior and lateral limbs which lie at right angles to each other. The lateral limb is also deflected ventrally (fig. 7). The anterior limb is remarkably straight and bears the whole of the scraping dentition which is described in the specific descriptions, while the lateral limbs bear a single row of up to




Figs 6-9. — Some features of the skull of *Labeotropheus fuelleborni*.
6. Premaxilla. Anterior view. 7. Premaxilla. Lateral view.
8. Dentary. Occlusal view. 9. Dentary. Lateral view.

9 conical teeth, all, and particularly the outermost, of which are conspicuously enlarged.

The dentary (figs. 8 & 9) like the premaxilla, is enormously widened, and has an almost straight anterior margin. It is also extremely short, being indeed much shorter than it is wide : a state of affairs which is reflected in the narrow gape of the mouth in life. The teeth, which are

identical with those of the premaxilla, are confined to a narrow band along the anterior margin of the bone.

*Affinities* : While differing markedly in mouth structure and dentition from all other cichlid fishes in L. Nyasa, *Labeotropheus* has several anatomical features which, together with ecological evidence, serve to show that it is related to the group of rock-frequenting fishes of which *Pseudotropheus* constitutes a more or less central type. If one compares the premaxillary and dentary bones of *Labeotropheus* with those of other genera of these rock fishes - e.g. *Petrotilapia* and *Cynotilapia,* one is struck essentially by their dis-similarity; yet other anatomical characteristics such as the grouping of small scales on the nape, the reduction of the left ovary of the female, the existence of certain common traits of colour pattern, etc. indicate their close phyletic relationship.

The striking anatomical differences in the mouth region reflect the remarkable adaptive radiation based largely on trophic specialisation to be seen in this group of fishes. These adaptations, with their attendant effects on cranial anatomy, tend to bring about changes in those structures which would otherwise be regarded as most valuable in helping to decide affinities, and tend to give the impression of an isolated systematic position which is not entirely deserved.

What is possibly an indication of how the straight, ventrally located jaws came to be evolved is given by certain other members of this group. In *Pseudotropheus lucerna* TREWAVAS the jaws are very wide and there is a distinct tendency for the lower jaw to be shorter than the upper : both of these being, as it were, incipient *Labeotropheus* characteristics. The same is equally true of the genus *Gephyrochromis,* and particularly of an undescribed species of this genus in which the teeth have become more numerous, more slender, and somewhat forwardly directed as has happened in the case of *Labeotropheus.*

Acknowledgement.

I should like thank Dr. E. TREWAVAS for information on material in the collection of the British Museum (Natural History) and for comments on my manuscript.