



A revision of the cichlid fishes of the genus *Aulonocara* REGAN, 1922 from Lake Malawi, with descriptions of six new species

(Pisces, Perciformes, Cichlidae)

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With 7 plates, 49 figures and 20 tables.

Introduction

In the first revision of the cichlid fishes of former Lake Nyassa (= Lake Malawi) REGAN (1922) described the haplochromine genus *Aulonocara* with the single new species *A. nyassae*. This genus is characterized by large channels with wide openings on frontal, nasal, orbital, preopercular, and mandibular bones. Additionally described species of this genus are *A. rostratum* TREWAVAS, 1935, *A. macrochir* TREWAVAS, 1935, *A. maylandi* TREWAVAS, 1984, *A. baenschi* MEYER & RIEHL, 1985, and *A. stuartgranti* MEYER & RIEHL, 1985. All these species of *Aulonocara* show an acoustic system on the enlarged suborbital bones which consists of swollen pit organs.

In the second synopsis of the cichlid fishes of Lake Malawi TREWAVAS (1935) erected the genus *Trematocranus* with the three new species *brevirostris*, *microstoma*, and *auditor*. This genus was defined on the basis of slightly swollen otic region of skull, mucus cavities of suborbital bones not greatly swollen, and cheek with 2 to 4 series of scales. *Trematocranus* is closely related to *Aulonocara* which has a single series of scales or none; furthermore in *Aulonocara* the otic region is more bullate, the suborbital bones are more enlarged and also the other mucus channels of the head are larger.

Descriptions of two other species of the genus *Trematocranus* have been published in aquarist magazines, namely *T. peterdaviesi* BURGESS & AXELROD (1973) and *T. jacobfreibergi* JOHNSTON (1974).

While the definitions of the genera *Aulonocara* and *Trematocranus* still hold good for the listed species (with the exception of *peterdaviesi* which does not belong to *Trematocranus* and must be referred to *Lethrinops* REGAN, 1922), six new species which are described in this paper, have morphological criteria of both genera in variable combinations. Thus, it seems to be no longer possible to distinguish clearly *Aulonocara* and *Trematocranus*, as they can no longer be defined on the basis of pit organs, scales on cheek and coloration. Therefore *Trematocranus* must be assigned to *Aulonocara*.

Based on comparative morphological studies of different populations of certain *Aulonocara* species we found that the pharyngeal dentition is not a constant specific criterium.

Furthermore the genus *Aulonocara* shows a close relationship to different species of the *Cyrtocara* BOULENGER, 1902 complex (see GREENWOOD, 1979). STAUFFER & MCKAYE (1985) placed their new species *macrocleithrum* in *Cyrtocara*, tentatively in *Trematocranus*. As *Cyrtocara* is not a defined genus and is referred as a replacement name for a so-called polyphyletic group of Malawian haplochromine taxa, we placed *macrocleithrum* to *Aulonocara* on the basis of its enlarged infraorbital cavities.

All species of the genus *Aulonocara* are endemic in Lake Malawi.

Abbreviations, measurements and counts fig. 1

Standard length (SL); the length from the anterior end of the upper lip to the base of the caudal fin.

Body length (BL); the length from the bony opercular edge to the base of the caudal fin.

Depth of body (BD); the vertical maximum distance between the back and ventral surface of the abdomen.

Length of head (HL); the length from the anterior end of the upper lip to the posterior part of the opercular edge.

Length of snout (SNL); measured along the same line to the anterior edge of the orbit.

Length of hypural plate (HPL); measured from the anterior edge of the hypural to the origin of the upper median caudal ray.

Depth of preorbital bone (POD); measured from the middle of the orbital edge of the bone to its oral edge along a line continuing the radius of the orbit.

Interorbital width (IOW); the least distance between the bony rims of the orbits.

Length of upper jaw (UJL); the distance between the tip of the right maxillary and the distal end.

Length of lower jaw (LJL); measured from the mandibular symphysis to the posterior edge of the jaw.

Orbit of eye (OD); the horizontal maximum diameter of the orbit.

Length of caudal peduncle (CPL); from the base of the last soft ray of the dorsal to the base of the upper central caudal fin ray, along a line crossing the upper half of the hypural plate.

Depth of caudal peduncle (CPD); between the base of the last dorsal fin soft ray and base of the last anal fin soft ray.

Distance between orbit and first spine of the dorsal fin (DOD); from the posterior edge of the orbit to the base of the first dorsal fin spine.

Distance between orbit and origin of the ventral fin (DOV); from the posterior edge of the orbit to the origin of the ventral.

Length of dorsal fin (DFL); the distance between the base of the first dorsal fin spine and the base of the last dorsal soft ray.

Length of anal fin (AFL); the distance between the base of the first anal fin spine and the base of the last anal soft ray.

Gap between the anus and the first anal fin spine (GAA); the distance between the anterior edge of the anus and the base of the first anal spine.

Length of last dorsal fin spine (DSL); from the origin of the spine to the tip.

Length of last anal fin spine (ASL); from the origin of the spine to the tip.

Length of premaxillary (PML); from the distal tip of the right pedicel to the base of the anterior tooth.

Width of head (HW); the maximum horizontal distance, measured directly behind the orbits.

Distance between the ventral fin and the anal fin (DVA); from the origin of the ventral fin spine to the base of the first spine of the anal fin.

Distance between the second vertebra and the first dorsal spine (DVD); from the middle of the 2. vertebra to the origin of the first dorsal fin spine.

Width of mouth (MW); the maximum distance between the outer edges of the upper and lower jaw.

Length of pectoral fin (LP); from the upper origin of the fin to the tip of the longest ray of the pectoral.

Length of ventral fin (VL); from the origin of the fin to the tip of the longest ray of the ventral.

Width of lower pharyngeal bone (PW); the maximum distance between the outer edges of the pharyngeal horns.

Length of lower pharyngeal bone (PL); the distance from the outer edge of the first midpoint tooth to the last tooth of the bone, along the median line, measured of the right half.

Depth of lower pharyngeal bone (PW); the maximum width of the bone, including teeth of the bone.

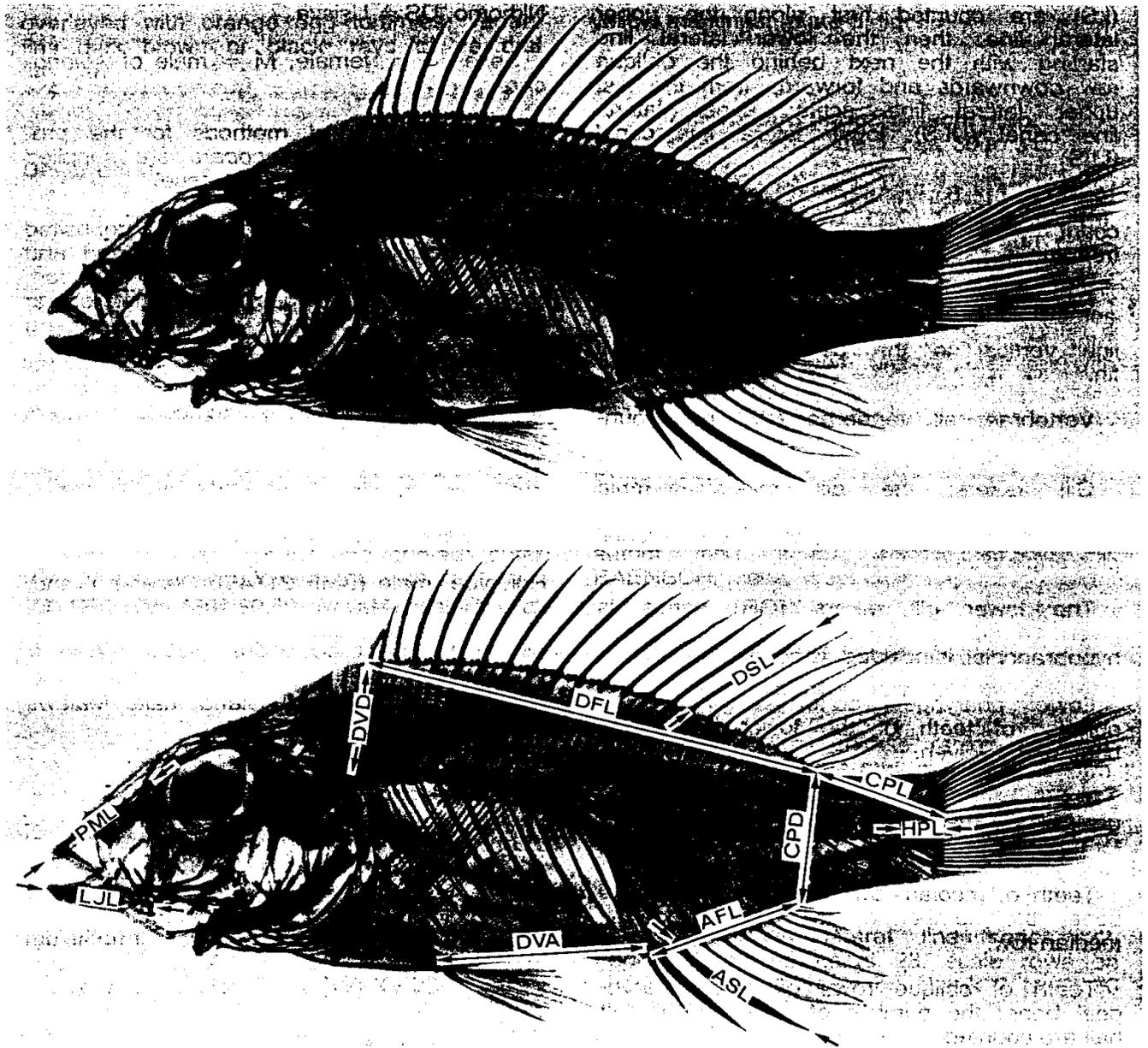


Fig.1. Radiograph of *Aulonocara* to show methods of measurements.

Fin ray counts; the last ray of dorsal and anal fin is regarded as double ray. Abbreviations: DSP = dorsal spines; DSR = dorsal soft rays; D = dorsal fin (including spines and soft rays); ASP = anal spines; ASR = anal soft rays; A = anal fin (including spines and soft rays); CBR = branched caudal rays; C = caudal fin (including the unbranched rays); P = pectoral fin; V = ventral fin.

Scales; Scales in the lateral line series (LS) are counted first along the upper lateral line, then the lower lateral line starting with the next behind the oblique row downwards and forwards from the last upper lateral line scale; upper lateral line canal (ULS); lower lateral line canal (LLS)

Scales around caudal peduncle (SCP); the count is started with about the second from the last scale in the lateral series.

Scale rows on shoulder (STD); the count is started with the first scale of lateral line vertical to the base of the dorsal fin.

Vertebrae; all vertebrae (VE) are counted including the hypural plate.

Gill rakers; the gill rakers formula (GFR) of the first right branchial arch is recorded in three sections, epibranchial plus angle plus ceratobranchial.

The lower gill rakers (GR) series is given without the raker at the angle, the hypobranchial, if included, is counted.

Lower pharyngeal bone teeth; the total number of teeth of the lower pharyngeal bone (PT) is given.

Teeth of posterior rows of lower pharyngeal bone; the number of teeth is counted for the left posterior row.

Teeth of median rows of lower pharyngeal bone; the number of teeth from the left median row.

Teeth of oblique rows of lower pharyngeal bone; the number of rows for the left half are counted.

Coloration; vertical bars (S) which occur under the dorsal fin base, present on body sides, are counted from the right side.

Teeth; teeth of the middle region of lower pharyngeal bone: m = molariform, s = submolariform, e = enlarged, f = fine.

Taxa: bae = *A. baenschii*, eth = *A. ethelwynnae*, han = *A. hansbaenschii*, hue = *A. hueseri*, kor = *A. korneliae*, may = *A. maylandi*, sau = *A. saulosi*, spe = undescribed *Aulonocara* population, ste = *A. steveni*, stu = *A. stuartgranti*.

Localities: CH = Chipoka, CI = Chitendi Island, CM = Chisumulu Island, CU = Chilumba, EC = Eccles Reef, KA = Kande Island, LI = Likoma Island, MA = Masinje, MB = Mbenji Island, MI = Maleri Island, NK = Nkhomo, US = Usisya.

Sexes: F = female, M = male of *Aulonocara*.

Abbreviations and methods for the proportion-analysis of *Aulonocara* are supplied by MEYER & JAKUBUS (this issue).

Material examined: Samples are deposited in the Senckenberg Museum, Frankfurt and British Museum of Natural History, London; holotype and paratypes are registered in the fish collection of the Senckenberg Museum Frankfurt = SMF.

***Aulonocara ethelwynnae* n.sp.**
plate 1, figs. 3 to 4; plate 4, fig. 27.

Holotype: male (SMF 21145); Chitendi Island, Lake Malawi, Malawi; 06.08.1985, STUART M. GRANT and collaborators leg.

Paratypes: 7 males (SMF 21146), 5 females (SMF 21146); Chitendi Island, Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour Dr. ETHELWYNN TREWAVAS, London, Great Britain.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone submolariform or molariform, teeth of posterior rows 16, median rows 9 to 10, oblique rows 5 to 7, total number of teeth 180; teeth of jaws with 3 to 6 irregular inner rows, teeth tricuspid, rarely mixed in with bicuspid; GFR = 3 to 4 - 1 - 9.

b) Scales in lateral line series 32 to 33, upper lateral line canal 26, scale rows on shoulder 7, scale rows on cheek 1 to 2; vertebrae 31.

c) Body of adult males brown yellow, 7 dark vertical bars occur under the dorsal fin, breeding males with blue between the bars; lower head blue. Dorsal fin violet or blue, lappets black, soft rays with orange markings; caudal fin dark, anal fin blue, black in the soft ray region and overlaid with orange egg-dummies; ventral fins dark brown or black; rays of pectoral fins dark.

Description

Body moderately elongated and compressed; profile of head rounded, angle 50 to 55° (adult males), head with pit organs; mouth small.

Longitudinal scale series 32 to 33, upper lateral line canal 26 (25 to 28), lower lateral line canal 15 (14 to 16); scale rows on shoulder 7; scales around caudal peduncle 16; scale rows on cheek 1 to 2.

Number of vertebrae 31 (30 to 32, rarely 30). Gill rakers formula 3 to 4 - 1 - 9.

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 3 to 6 irregular inner rows, teeth tricuspid, rarely mixed in with bicuspid, those of the outer edges unicuspid; tricuspid teeth with large major cups (plate 1, fig. 3).

Lower pharyngeal bone (plate 1, fig. 4) with a total of 180 teeth (160 to 190), posterior rows 16 (15 to 17), median rows 9 to 10 (8 to 10, rarely 8), oblique rows 5 to 7; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region submolariform.

Fin ray formula: D = XVI-XVII/8-9 (rarely XVII and 8), A = III/7-8, C = 21-23, CBR = 14; V = I/5; P = 14.

Meristic characters are given in table 5.d. A proportion-analysis is given in table 2, p. 76-77 and measurements in tables 5.a-c.

Body of adult males brown yellow, 7 (7 to 8, rarely 8) dark vertical bars occur under the dorsal fin, in breeding males the zones

between the bars are blue; lower head blue. Dorsal fin violet or blue, lappets black, soft rays with orange markings; caudal fin dark; anal fin blue, soft ray region black and overlaid with orange egg-dummies; ventral fins dark brown or black; rays of pectoral fins dark; (plate 4, fig. 27).

Adult females colored brown, 7 (7 to 8, rarely 8) dark bars occur under the dorsal fin; pectoral fins clear, all other fins colored dark; soft ray region with a few yellow markings; (plate 5, fig. 35).

Aulonocara hansbaenschi n.sp.

plate 1, fig. 5; plate 5, figs. 30 to 31.

Holotype: male (SMF 21136); 8 km south of Masinje, east coast of Lake Malawi, Malawi; 11.11.1985, STUART M. GRANT and collaborators leg.

Paratypes: 9 males (SMF 21137), 2 females (SMF 21137); 8 km south of Masinje, east coast of Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour the author and editor HANS ALBRECHT BAENSCH, Melle, West Germany.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone enlarged or submolariform, teeth of posterior rows 14, median rows 7 to 8, oblique rows 5 to 6, total number of teeth 170; teeth of jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 9.

b) Scales in lateral line series 32, upper lateral line canal 28, scale rows on shoulder 7, scale rows on cheek 2 to 3; 30 vertebrae.

c) Body of adult males with blue, red band directly behind the head, breast orange, 7 dark vertical bars occur under the dorsal fin; head blue. Dorsal fin blue with a small black band and white lappets; caudal fin dark blue and small blue lines; anal fin blue and brown, red egg-dummies; ventral fins orange and yellow, leading edges white; rays of pectoral fins dark.

Description

Body moderately elongated and compressed; profile of head straight, angle 40 to 50° (adult males); head with pit organs; mouth small.

Longitudinal scale series 32 (32 to 33, rarely 33), upper lateral line canal 28 (28 to 30), lower lateral line canal 14 (13 to 16); scale rows on shoulder 7 to 8 (rarely 8); scales around caudal peduncle 16; scale rows on cheek 2 to 3.

Number of vertebrae 30 (29 to 31, rarely 29 and 31). Gill rakers formula 3 to 4 - 1 - 9 (8 to 9, rarely 8).

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid.

Lower pharyngeal bone (plate 1, fig. 5) with a total of 170 teeth (150 to 195), posterior rows 14 (12 to 16), median rows 7 to 8, oblique rows 5 to 6; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region enlarged or submolariform.

Fin ray formula: D = XV-XVI/9-10, A = III/7-8, C = 21-22, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 6 d. A proportion-analysis is given in table 3, p. 78-79 and measurements in tables 6.a-c.

Body of adult males blue, red band directly behind the head, breast orange, 7 vertical dark bars occur under the dorsal fin; head blue. Dorsal fin blue with a small black band and white lappets; caudal fin dark blue with small blue lines; anal fin blue and brown, small red egg-dummies; ventral fins orange and yellow, leading edges white; rays of pectoral fins dark; (plate 5, fig. 30).

Adult females greyish silver, 7 vertical dark bars occur under the dorsal fin; pectoral fins clear, all other fins with black and yellow color, soft rays of dorsal and anal fin with black, yellow and white comma markings; (plate 5, fig. 31).

Aulonocara hueseri n.sp.

plate 1, fig. 6; plate 5, fig. 35.

Holotype: male (SMF 21138); east coast of Likoma Island, Lake Malawi, Malawi; 21.09.1985, STUART M. GRANT leg.

Paratypes: 6 males (SMF 21139), 3 females (SMF 21139); east coast of Likoma Island, Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour Mr. EBERHARD HÜSER, Hildesheim, West Germany.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone molariform or submolariform, teeth of posterior rows 14, median rows 7, oblique rows 5 to 6, total number of teeth 150; teeth of jaws with 3 to 5 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 32, upper lateral line canal 27, scale rows on shoulder 7, scale rows on cheek 1 to 2; vertebrae 30.

c) Adult males with blue and yellow colored body, breast yellow, 7 to 8 dark vertical bars occur under the dorsal fin; head blue; dorsal fin blue and a black band, lappets white, soft ray region with yellow comma markings; caudal fin with yellow and blue line markings; anal fin yellow, overlaid with black, large yellow egg-dummies; ventral fins light yellow and sheeted, leading edges white; rays of pectoral fins dark.

Description

Body moderately elongated and compressed; profile of head rounded, angle 45 to 50° (adult males), head with pit organs; mouth small.

Longitudinal scale series 32 (32 to 33), upper lateral line canal 27 (26 to 30 rarely 29 to 30), lower lateral line canal 15 (14 to 17, rarely 17); scale rows on shoulder 7; scales around caudal peduncle 16; scale rows on cheek 1 to 2.

Number of vertebrae 30 (30 to 31). Gill rakers formula 3 to 4 - 1 - 8 to 9.

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 3 to 5 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid teeth.

Lower pharyngeal bone (plate 1, fig. 6) with a total of 150 teeth (140 to 165), posterior rows 14 (12 to 16); median rows 7 (7 to 9, rarely 9); oblique rows 5 to 6; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region molariform or submolariform.

Fin ray formula: D = XVI-XVII/8-9 (rarely XVII and rarely 9), A = III/8, C = 20-23, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 7.d. A proportion-analysis is given in table 4, p. 80-81 and measurements in tables 7.a-c.

Body of breeding males blue and yellow, breast yellow, 7 to 8 dark vertical bars occur under the dorsal fin; head blue. Dorsal fin on basis blue, followed with a black band and white lappets, soft rays with yellow comma markings, which integrate sometimes a few of the spines; caudal fin with yellow and blue line markings; anal fin yellow and overlaid with black, large yellow or orange egg-dummies are dominant in the soft ray region; ventral fins light yellow and sheeted, leading edges white; rays of pectoral fins dark; (plate 5, fig. 35).

Adult females greyish silver to brown, 7 to 8 vertical dark brown bars occur under the dorsal fin; dorsal and caudal fin with brown and white comma markings; anal fin with faint yellow markings; pectoral and ventral fins clear.

***Aulonocara korneliae* n.sp.**

plate 1, figs. 7 to 8; plate 5, fig. 34.

Holotype: male (SMF 21143); east coast of Chisumulu Island, Lake Malawi, Malawi; 12. 02.1985, STUART M. GRANT and collaborators leg.

Paratypes: 8 males (SMF 21144), 5 females (SMF 21144); east coast of Chisumulu Island, Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour Mrs. KORNELIA MEYER, Bad Nauheim, West Germany.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone enlarged, teeth of posterior rows 15, median rows 9 to 10, oblique rows 5 to 7, total number of teeth 160; teeth of jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid teeth; GFR = 3 to 4 - 1 - 9 to 10.

b) Scales in lateral line series 32, upper lateral line canal 28, scale rows on shoulder 7 to 8, scale rows on cheek 1 to 2; vertebrae 30.

c) Adult males with blue colored body and orange or yellow band behind the head (mostly sheeted), breast orange or yellow, 8 to 9 dark vertical bars occur under the dorsal fin; head blue; dorsal fin yellow or orange, lappets light blue or white, soft ray region with yellow comma markings; caudal fin with yellow or orange and blue line markings; anal fin yellow, egg-dummies orange; ventral fins yellow orange, leading edges white; rays of pectoral fins dark.

Description

Body moderately elongated and compressed; profile of head straight to faintly rounded angle 40 to 50° (adult males), head with pit organs; mouth small.

Longitudinal scale series 32 (31 to 32, rarely 31), upper lateral line canal 28 (26 to 29, rarely 26), lower lateral line canal 15 (14 to 17, rarely 17); scale rows on shoulder 7 to 8; scales around caudal peduncle 16; scale rows on cheek 1 to 2.

Number of vertebrae 30 (29 to 30, rarely 29). Gill rakers formula 3 to 4 - 1 - 9 to 10 (8 to 10, rarely 8).

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid teeth (plate 1, fig. 7).

Lower pharyngeal bone (plate 1, fig. 8) with a total of 160 teeth (130 to 175), posterior rows 15 (14 to 17); median rows 9 to 10; oblique rows 5 to 7; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of middle region enlarged.

Fin ray formula: D = XV-XVI/8-9 (rarely XV and 8), A = III/7-8 (rarely 8), C = 21-23, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 8.d. A proportion-analysis is given in table 5, p. 82-83 and measurements in tables 8.a-c.

Body of adult males blue, orange or yellow band directly behind the head, mostly sheeted; breast orange or yellow, 8 to 9 vertical dark bars occur under the dorsal fin; head blue. Dorsal fin yellow or orange and light blue or white lappets, soft rays with yellow comma markings; caudal fin with yellow or orange and blue line markings; anal fin yellow with yellow or sometimes orange egg-dummies; ventral fins light yellow, leading edges white; rays of pectoral fins dark; (plate 5, fig. 34).

Adult females greyish brown, 8 to 9 vertical dark brown bars occur under the dorsal fin; dorsal and caudal fin with brown and yellow or white comma markings; anal fin with faint yellow markings; pectoral and ventral fins clear.

***Aulonocara saulosi* n.sp.**

plate 1, fig. 9; plate 5, fig. 33.

Holotype: male (SMF 21149); 8 km south of Masinje, east coast of Lake Malawi, Malawi; 12.11.1984, STUART M. GRANT and collaborators leg.

Paratypes: 6 males (SMF 21150), 3 females (SMF 21150); 8 km south of Masinje, east coast of Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour Mr. SAULOS MWALE, Salima, Malawi.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone fine, teeth of posterior rows 13, median rows 9, oblique rows 5 to 6, total number of teeth 160; teeth of jaws with 4 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 33, upper lateral line canal 28, scale rows on shoulder 8 to 9, scale rows on cheek 2; vertebrae 31.

c) Body of adult males brown and blue, nape orange, 7 to 8 dark vertical bars occur under the dorsal fin; lower head blue. Dorsal fin blue, lappets white, soft ray region with dark comma markings; caudal fin dark, zones between the rays with brown and violet fine markings; anal fin dark brown, small greyish yellow egg-dummies; ventral fins orange with a black border, leading edges white; pectoral fins clear.

Description

Body moderately elongated and compressed; profile of head straight, angle 35 to 40° (adult males), head with pit organs; mouth small.

Longitudinal scale series 33 (33 to 34), upper lateral line canal 28 (27 to 29, rarely 27), lower lateral line canal 15 (13 to 19, rarely 16 to 19); scale rows on shoulder 8 to 9; scales around caudal peduncle 16, scale rows on cheek 2.

Number of vertebrae 31 (30 to 31, rarely 30). Gill rakers formula 3 to 4 - 1 - 8 to 9 (rarely 8).

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 4 to 6 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid teeth.

Lower pharyngeal bone (plate 1, fig. 9) with a total of 160 teeth (150 to 170), posterior rows 13 (12 to 14), median rows 9 (8 to 10, rarely 10), oblique rows 5 to 6; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region fine.

Fin ray formula: D = XV-VXII/8-10 (rarely XV, XVII, 8 and 10), A = III/8, C = 22-23, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 16.d. A proportion-analysis is given in table 7, p. 87-88 and measurements in tables 16.a-c.

Body of adult males brown and blue, nape orange, 7 to 8 vertical dark bars occur under the dorsal fin; lower head blue. Dorsal fin blue, lappets white, soft rays

with dark comma markings; caudal fin zones between the rays with brown and violet fine markings; anal fin dark brown and small greyish yellow egg-dummies; ventral fins orange with a black border, leading edges white; pectoral fins clear (plate 5, fig. 33).

Adult females colored greyish, 7 to 8 (rarely 8) vertical dark bars occur under the dorsal fin; pectoral fins clear, all other fins with fine yellow markings.

Aulonocara spec.

plate 2, figs. 12, 13; plate 5, figs. 28, 29.

Types: 8 males (SMF 20082) and 3 females (SMF 20082); Likoma Island, Lake Malawi, Malawi; 11.11.1985, STUART M. GRANT.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone enlarged, teeth of posterior rows 14, median rows 8, oblique rows 5 to 6, total number of teeth 150; teeth of jaws with 4 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 32, upper lateral line canal 27, scale rows on shoulder 7, scale rows on cheek 2 to 3; vertebrae 30 to 31.

c) Adult males with blue colored body and orange band behind the head, sometimes overlaid blue, 7 dark vertical bars occur under the dorsal fin; head blue. Dorsal fin blue, small black band, lappets white; caudal fin dark blue with blue lines; anal fin with blue and brown color, orange egg-dummies; ventral fins with yellow and sheeted, leading edges white; pectoral fins dark.

Description

Body moderately elongated and compressed; profile of head straight, angle 35 to 45° (adult males); head with pit organs; mouth small.

Longitudinal scale series 32 (31 to 33, rarely 31), upper lateral line canal 28 (27 to 29), lower lateral line canal 15 (14

dark, to 17, rarely 17); scale rows on shoulder 8; scales around caudal peduncle 16; scale rows on cheek 2 to 3.

Number of vertebrae 30 to 31 (29 to 31, rarely 29). Gill rakers formula 3 to 4 - 1 - 8 (8 to 9, rarely 9).

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 4 to 6 irregular inner rows (plate 1, fig. 10; plate 2, fig. 11) teeth uni- and bicuspid, rarely mixed in with bicuspid teeth (plate 2, fig. 12).

Lower pharyngeal bone (plate 2, fig. 13) with a total of 150 teeth (135 to 165), posterior rows 14 (12 to 15), median rows 7 to 8, oblique rows 5 to 6; teeth bicuspid, those of posterior rows higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region enlarged.

Fin ray formula: D = XV-XVI/9-10, A = III/7-8, C = 21-22, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 17.d. A proportion-analysis is given in table 8, p. 89-90 and measurements in tables 17.a-c.

Body of adult males blue, orange band directly behind the head, breast yellow or orange, overlaid sometimes with blue color, 7 vertical dark bars occur under the dorsal fin; head blue. Dorsal fin blue and with a small black band and white lappets; caudal fin dark blue with blue lines; anal fin blue and brown colored, orange egg-dummies; ventral fins yellow and sheeted, leading edges white; rays of pectoral fins with pigment; (plate 5, figs. 28 and 29).

Adult females greyish silver, 7 vertical dark bars occur under the dorsal fin; pectoral fins clear, all other fins with black and yellow color, soft rays of dorsal and anal fin with black, yellow and white comma markings.

***Aulonocara steveni* n.sp.**

fig. 2; plate 2, fig. 14.

Holotype: male (SMF 21151); Kande Island, Lake Malawi, Malawi; 14.07.1985, STUART M. GRANT and collaborators leg.

Paratypes: 6 males (SMF 21152), 4 females (SMF 21152); Kande Island, Lake Malawi, Malawi; together with holotype.

Etymology

The new taxon is named to honour Mr. STEVEN LONGWE, Salima, Malawi.

Combining Diagnosis

a) Teeth of the middle region of lower pharyngeal bone fine, teeth of posterior rows 18, median rows 9 to 10, oblique rows 6 to 7, total number of teeth 185; teeth of jaws with 3 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 7 to 8.

b) Scales in lateral line series 32 to 33, upper lateral line canal 26, scale rows on shoulder 7, scale rows on cheek 1 to 2, vertebrae 31.

c) Body of adult males greyish yellow, back light blue, 7 dark vertical bars occur under the dorsal fin; head blue. Dorsal fin blue and with a black band, lappets white, soft ray region with yellow markings; caudal fin with yellow and blue; anal fin blue, basis black, soft ray region with small yellow egg-dummies; ventral fins yellow and sheeted, leading edges white; pectoral fins light yellow.

Description

Body moderately elongated and compressed; profile of head rounded, angle 40 to 45° (adult males), head with pit organs; mouth small.

Longitudinal scale series 32 to 33, upper lateral line canal 26 (24 to 27, rarely 27), lower lateral line canal 15 (14 to

16); scale rows on shoulder 7 (6 to 7, rarely 6); scales around caudal peduncle 16, scale rows on cheek 1 to 2.

Number of vertebrae 31. Gill rakers formula 3 to 4 - 1 - 7 to 8.

Teeth of jaws slender and curved; outer row of upper and lower jaw with uni- and bicuspid teeth; jaws with 3 to 6 irregular arranged inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid teeth.

Lower pharyngeal bone (plate 2, fig. 14) with a total of 185 teeth (170 to 195), posterior rows 18 (16 to 20), median rows 9 to 10, oblique rows 6 to 7; teeth bicuspid, those of posterior rows somewhat higher than those directly in front, the two median teeth of posterior rows enlarged; teeth of the middle region fine.

Fin ray formula: D = XV-VXI/8-9 (rarely XV), A = III/7-8, C = 22-23, CBR = 14, V = I/5, P = 14-15.

Meristic characters are given in table 18.d. A proportion-analysis is given in table 9, p. 91-92 and measurements in tables 18.a-c.

Body of adult males greyish yellow, back light blue, 7 vertical dark bars occur under the dorsal fin; head blue. Dorsal fin blue and with a black band, lappets white, soft ray region with yellow markings; caudal fin with yellow and blue line markings; anal fin blue, basis black, soft ray region with small yellow egg-dummies; ventral fins yellow and sheeted, leading edges white; pectoral fins light yellow.

Adult females colored greyish, 7 vertical dark bars occur under the dorsal fin; pectoral fins clear, all other fins with fine yellow or dark markings.



Fig. 2. *Aulonocara steveni* n.sp., male holotype (SMF 21151).

Definition of the genus *Aulonocara*

A haplochromine genus with small mouth; compressed body; enlarged infraorbital lateral line cavities; scales on cheek 0 to 4 rows; orbits enlarged.

Comparison and relationship

Four of the newly described species, namely *A. hansbaenschi* n.sp., *A. hueseri* n.sp., *A. korneliae* n.sp. and *A. saulosi* n.sp. are members of a formation with a slight caudal notch, together with *A. baenschi*, *A. nyassae* and *A. stuartgranti*. A deep caudal notch is found in *A. jacobfreibergi* (JOHNSTON, 1974), *A. macrocleithrum* (STAUFFER & MCKAYE, 1985), *A. microstoma* (TREWAVAS, 1935) and *A. rostratum* (TREWAVAS, 1935).

Scale rows on cheek 0 to 2: *A. baenschi* (Nkhomo), *A. baenschi* (Usisya), *A. ethelwynnae* n.sp., *A. hansbaenschi* n.sp., *A. hueseri* n.sp., *A. korneliae* n.sp., *A. macrocleithrum*, *A. maylandi* TREWAVAS, 1985 (Eccles Reef), *A. maylandi* (Kande Island), *A. nyassae*, *A. rostratum*, *A. saulosi* n.sp., *A. steveni* n.sp., *A. stuartgranti* (Chilumba) and *A. stuartgranti* (Mbenji Island); 2 to 4 scale rows: *A. auditor* (TREWAVAS, 1935), *A. baenschi* (Maleri Island), *A. brevirostre* (TREWAVAS, 1935), *A. jacobfreibergi* and *A. microstoma*: 0 to 3 scale rows *A. baenschi* (Chipoka).

Gill rakers on the lower arch 7 to 8: *A. baenschi* (all 4 populations), *A. steveni* n.sp.; 8 to 9 gill rakers: *A. ethelwynnae* n.sp., *A. hansbaenschi* n.sp., *A. hueseri* n.sp., *A. maylandi* (Eccles Reef), *A. maylandi* (Kande Island), *A. stuartgranti* (Chilumba), *A. stuartgranti* (Mbenji Island); 9 to 10 gill rakers: *A. jacobfreibergi*, *A. korneliae* n.sp., *A. nyassae*; 10 to 13 gill rakers: *A. auditor*, *A. brevirostre*, *A. macrocleithrum* and *A. microstoma*.

Inner teeth of jaw rows with tricuspid teeth: *A. auditor*, *A. ethelwynnae* n.sp.; all other known *Aulonocara* taxa with uni- and bicuspid teeth.

Jaws with 1 to 2 inner tooth rows: *A. macrocleithrum* and *A. brevirostre* (known only for two young specimens); all other known *Aulonocara* with 3 to 7 rows.

Teeth of the middle region of pharyngeal bone of males with three morphological

variants (molariform, submolariform and enlarged): *Aulonocara baenschi* (Usisya), *A. stuartgranti* (Chilumba) and *A. stuartgranti* (Mbenji Island); two morphological variants (molariform and submolariform): *A. baenschi* (Chipoka), *A. baenschi* (Nkhomo), *A. ethelwynnae* n.sp., *A. hueseri* n.sp., *A. maylandi* (Eccles Reef) and *A. maylandi* (Kande Island); two morphological variants (submolariform and enlarged): *A. baenschi* (Maleri Island), *A. hansbaenschi* n.sp. and *A. korneliae* n.sp.; one morphological variant (molariform): *A. microstoma*; one morphological variant (submolariform): *A. rostratum*; one morphological variant (enlarged): *A. nyassae*; one morphological variant (fine): *A. macrocleithrum*, *A. saulosi* n.sp. and *A. steveni* n.sp..

Mean value of vertebrae number 30: *A. baenschi* (all populations), *A. brevirostre*, *A. hansbaenschi* n.sp., *A. hueseri* n.sp., *A. korneliae* n.sp., *A. macrocleithrum* and *A. stuartgranti* (both populations); vertebrae number 31, *A. auditor*, *A. ethelwynnae* n.sp., *A. maylandi* (both populations), *A. nyassae*, *A. saulosi* n.sp. and *A. steveni* n.sp.; vertebrae number 32: *A. microstoma* and *A. rostratum*; (mean value not clear by *A. microstoma* and *A. macrocleithrum*).

Dark spot series on body (referred by TREWAVAS, 1984 for *Trematocranus*) known for *A. auditor*, *A. brevirostre*, *A. jacobfreibergi* (not in breeding males), *A. microstoma*, *A. ethelwynnae* n.sp. and *A. stuartgranti* (mostly in young, not in breeding males).

Dark vertical bars which occur under the dorsal fin, 9 to 10: *A. korneliae* n.sp. and *A. nyassae*, all other known taxa with 6 to 8.

A comparison of proportions for fifteen *Aulonocara* populations including nine described taxa is given by MEYER & JAKUBUS (this issue).

On the basis of synapomorphs the species of *Aulonocara* show close relationships. The analysis of a first diagram demonstrates the existence of a *A. nyassae* complex with *auditor*, *baenschi*, *ethelwynnae*, *hansbaenschi*, *hueseri*, *korneliae*, *nyassae*, *maylandi*, *saulosi*, *steveni* and *stuartgranti*.

The branching point for the genus *Aulonocara* is based on the enlarged infraorbital lateral line cavities referred to as a synapomorph, for explanation see MEYER (this issue).

A synapomorphic diagram is given by MEYER (this issue).

All described *Aulonocara* species show a reproductive isolating mechanism, known for coloration of males and breeding behavior.

In this study the members of the genus *Trematocranus* and *Cyrtocara macrocleithrum* are referred to *Aulonocara*, because a taxa specificity of synapomorphs is present and the branching point for the genus is based on the enlarged infraorbital lateral line cavities. *T. peterdaviesi* BURGESS & AXEL-ROD, 1973 does not show enlarged infra-orbital cavities and must be referred to the *Lethrinops* REGAN, 1922 genus complex.

Aulonocara macrochir TREWAVAS, 1935 is a synonym of *Aulonocara rostratum*, because the difference of both are not significant (pers. comm., TREWAVAS) and no reproductive isolating mechanism is known.

Synopsis to species of *Aulonocara*

- a) Teeth of jaws with 3 irregular inner rows, teeth tricuspid; GR = 11 to 12.
- b) Scales in lateral line series 33, scale rows on cheek 2 to 4; vertebrae 31.
- c) Body with a series of spots at base of dorsal fin, another series on upper lateral line, and a third series below and parallel to the second.

Remarks: Only three specimens are known.

.....*Aulonocara auditor*

- a) Teeth of the middle region of lower pharyngeal bone enlarged, submolariform or molariform, teeth of posterior rows 14, median rows 7 to 8, oblique rows 5 to 6, total number of teeth 160; teeth of jaws with 4 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 7 to 8.
- b) Scales in lateral line series 31 to 32, upper lateral line canal 27, scale rows on shoulder 7 to 8, scale rows on cheek 0 to 4; vertebrae 30.
- c) Body of adult males yellow, 7 dark vertical bars occur under the dorsal fin, breeding males with blue between vertical bars; head with blue color; dorsal fin yellow, lappets white, soft ray region with blue markings, sometimes orange; caudal fin

with yellow or orange and blue markings; anal fin yellow; ventral fins yellow, leading edges white; pectoral fins clear. The *Usisya* variant shows a black band in the dorsal, anal and ventral fin, lappets of dorsal fin blue.

.....*Aulonocara baenschi*

- a) Teeth of jaws with 2 irregular inner rows, teeth unicuspid or (young) tricuspid; GR = 9 to 11.
- b) Scales in lateral line series 32 to 33, scale rows on cheek 2 to 4; vertebrae 30.
- c) body with a dark spot on upper lateral line below spinous dorsal fin, one below soft dorsal fin and a third at base of caudal fin; one opercular spot.

Remarks: Only two specimens are known.

.....*Aulonocara brevirostre*

- a) Teeth of the middle region of lower pharyngeal bone submolariform or molariform, teeth of posterior rows 16, median rows 9 to 10, oblique rows 5 to 7, total number of teeth 180; teeth of jaws with 3 to 6 irregular inner rows, teeth tricuspid, rarely mixed in with bicuspid; GFR = 3 to 4 - 1 - 9.
- b) Scales in lateral line series 32 to 33, upper lateral line canal 26, scale rows on shoulder 7, scale rows on cheek 1 to 2; vertebrae 31.
- c) Body of adult males colored brown yellow and blue, 7 dark vertical bars occur under the dorsal fin, breeding males with blue between the bars; lower head blue; dorsal fin violet or blue, lappets black, soft ray region with orange markings; caudal fin dark; anal fin blue, black in the soft ray region and overlaid with orange egg-dummies; ventral fins dark brown or black; rays of pectoral fins dark.

.....*Aulonocara ethelwynnae* n.sp.

- a) Teeth of the middle region of lower pharyngeal bone enlarged or submolariform, teeth of posterior rows 14, median rows 7 to 8, oblique rows 5 to 6, total number of teeth 170; teeth of jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 32, upper lateral line canal 28, scale rows on shoulder 7, scale rows on cheek 2 to 3; 30 vertebrae.

c) Body of adult males with blue, red band directly behind the head, breast orange, 7 dark vertical bars occur under the dorsal fin; head blue; dorsal fin blue with a small black band and white lappets; caudal fin blue and small blue lines; anal fin blue and brown, red egg-dummies; ventral fins orange and yellow, leading edges white; rays of pectoral fins dark.

.....*Aulonocara hansbaenschi* n. sp.

a) Teeth of the middle region of lower pharyngeal bone molariform or submolariform, teeth of posterior rows 14, median rows 7, oblique rows 5 to 6, total number of teeth 150; teeth of jaws with 3 to 5 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 32, upper lateral line canal 27, scale rows on shoulder 7, scale rows on cheek 1 to 2; vertebrae 30.

c) Adult males with blue and yellow colored body, breast yellow, 7 to 8 dark vertical bars occur under the dorsal fin; head blue; dorsal fin blue, black band, lappets white, soft ray region with yellow comma markings; caudal fin with yellow and blue line markings; anal fin yellow, overlaid with black, yellow egg-dummies; ventral fins light yellow and sheeted, leading edges white; rays of pectoral fins dark.

.....*Aulonocara hueseri* n.sp.

a) Teeth of the middle region of lower pharyngeal bone enlarged, teeth of posterior rows 17, median rows 9 to 10, oblique rows 6 to 7; teeth of jaws with 4 to 7 irregular inner rows, teeth uni- and bicuspid; GFR = 4 to 6 - 1 - 9 to 12.

b) Scales in lateral line series 31 to 33; scale rows on cheek 2 to 4.

c) Adult males with blue and orange color, breast orange, sometimes blue, 7 dark vertical bars occur under the dorsal fin; spot series of body present; head with blue; dorsal fin orange on basis, followed a broad blue band, anal fin orange, egg-dummies orange; ventral fins orange, leading edges white.

.....*Aulonocara jacobfreibergi*

a) Teeth of the middle region of lower pharyngeal bone enlarged, teeth of posterior rows 15, median rows 9 to 10, oblique rows 5 to 7, total number of teeth 160; teeth of jaws with 4 to 5 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 9 to 10.

b) Scales in lateral line series 32, upper lateral line canal 28, scale rows on shoulder 7 to 8, scale rows on cheek 1 to 2; vertebrae 30.

c) Adult males with blue colored body and orange or yellow band behind the head (mostly sheeted), breast orange or yellow, 8 to 9 dark vertical bars occur under the dorsal fin; head blue; dorsal fin yellow or orange, lappets light blue or white, soft ray region with yellow comma markings; caudal fin with yellow or orange and blue line markings; anal fin yellow, egg-dummies orange; ventral fins yellow, leading edges white; rays of pectoral fins dark.

.....*Aulonocara korneliae* n.sp.

a) Teeth of the middle region of lower pharyngeal bone molariform or submolariform, teeth of posterior rows 13, median rows 7 to 8, oblique rows 4 to 5, total number of teeth 160; teeth of jaws with 2 to 5 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 32 to 33, upper lateral line canal 27, scale rows on shoulder 7, scale rows on cheek 1 to 2; vertebrae 31.

c) Adult males with brown and black colored body, 7 dark vertical bars occur under the dorsal fin; sides of head with dark color, forehead, nape and snout yellow or white; dorsal fin black or brown with a broad white or yellow band, including the lappets, soft ray region sometimes with light yellow comma markings; caudal fin dark with a white upper comet; anal fin dark and with large yellow egg-dummies which integrate into the region of the spines; ventral fins black with white leading edges; pectoral fins clear.

Remarks: The population of Kande Island shows a very massive lower pharyngeal bone; forehead, nape and snout are colored white; body dark blue to black.

.....*Aulonocara maylandi*

a) Teeth of the middle region of lower pharyngeal bone fine, teeth of posterior

rows 21, median rows 10 to 11, oblique rows 5 to 6; teeth of jaws with 1 inner row, teeth uni- and bicuspid, GR = 11 to 13.

b) Scales in lateral line series 30 to 32, scale rows on cheek 2; ventral protuberance (caused by the cleithrum).

c) Body white ventrally and light brown dorsally, 6 to 7 dark vertical bars occur under the dorsal fin; head brown dorsally, fading to white ventrally; median fins are for the most part clear; ventral fins clear; pectoral fins pale yellow.

.....*Aulonocara macrocleithrum*

a) Teeth of the middle region of lower pharyngeal bone molariform; teeth of jaws with 6 to 8 irregular inner rows, teeth uni- and bicuspid; GR = 10 to 11.

b) Scales in lateral line series 32 to 34; scale rows on cheek 2 to 4; vertebrae 31, 32.

c) A dark blotch on nape, one on upper lateral line below spinous dorsal fin, one below soft dorsal fin and a fourth, often faint or absent, at base of caudal fin; opercular spot.

.....*Aulonocara microstoma*

a) Teeth of the middle region of lower pharyngeal bone submolariform, teeth of posterior rows 14, median rows 9, oblique rows 5 to 6; teeth of jaws with 4 to 7 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 9.

b) Scales in lateral line series 32 to 33, scale rows on shoulder 6; scale rows on cheek 0 to 2; vertebrae 31.

c) 8 to 9 dark vertical bars occur under the dorsal fin.

.....*Aulonocara nyassae*

a) Teeth of the middle region of lower pharyngeal bone submolariform; GR 8 to 9.

b) Scales in lateral line series 32 to 33, upper lateral line canal 27, scale rows on cheek 0 to 1; vertebrae 31 to 32; snout elongated.

c) 6 to 7 dark vertical bars occur under the dorsal fin.

.....*Aulonocara rostratum*

a) Teeth of the middle region of lower pharyngeal bone fine, teeth of posterior rows 13, median rows 9, oblique rows 5 to 6, total number of teeth 160; teeth of jaws with 4 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 33, upper lateral line canal 28, scale rows on shoulder 8 to 9, scale rows on cheek 2; vertebrae 31.

c) Body of adult males colored brown and blue, nape orange, 7 to 8 dark vertical bars occur under the dorsal fin; lower head blue; dorsal fin blue, lappets white, soft ray region with dark comma markings; caudal fin dark, zones between the rays with brown and violet fine markings; anal fin brown with small greyish yellow egg-dummies; ventral fins orange with a black border, leading edges white; pectoral fins clear.

.....*Aulonocara saulosi* n.sp.

a) Teeth of the middle region of lower pharyngeal bone fine, teeth of posterior rows 18, median rows 9 to 10, oblique rows 6 to 7, total number of teeth 185; teeth of jaws with 3 to 6 irregular inner rows, teeth uni- and bicuspid; GFR = 3 to 4 - 1 - 7 to 8.

b) Scales in lateral line series 32 to 33, upper lateral line canal 26, scale rows on shoulder 7, scale rows on cheek 1 to 2, vertebrae 31.

c) Body of adult males colored greyish yellow, back light blue, 7 dark vertical bars occur under the dorsal fin; head blue; dorsal fin blue and with a black band, lappets white, soft ray region with yellow markings; caudal fin yellow and blue; anal fin blue, basis black, soft ray region with small yellow egg-dummies; ventral fins yellow and sheeted, leading edges white; pectoral fins light yellow.

.....*Aulonocara steveni* n.sp.

a) Teeth of the middle region of lower pharyngeal bone enlarged, submolariform or molariform, teeth of posterior rows 16, median rows 8, oblique rows 6 to 7, total number of teeth 180; teeth of jaws with 3 to 5 irregular inner rows, teeth uni- and bicuspid, rarely mixed in with bicuspid; GFR = 3 to 4 - 1 - 8 to 9.

b) Scales in lateral line series 31 to 32, upper lateral line canal 28, scale rows

on shoulder 7 to 8, scale rows on cheek 0 to 1; vertebrae 30.

c) Adult males with blue colored body, breast yellow, mostly sheeted, 7 dark vertical bars occur under the dorsal fin; head blue. Dorsal fin blue, lappets white, soft ray region sometimes with yellow comma markings; caudal fin yellow and blue line markings; anal fin blue and with a few small orange egg-dummies; ventral fins blue, leading edges white; rays of pectoral fins dark.

.....*Aulonocara stuartgranti*

Summary

The following new species of the genus *Aulonocara* were described: *Aulonocara ethelwynnae* n.sp., *Aulonocara hansbaenschii* n.sp., *Aulonocara hueseri* n.sp., *Aulonocara korneliae* n.sp., *Aulonocara saulosi* n.sp., and *Aulonocara steveni* n.sp..

The examination of these six new species reveals that *Aulonocara* and *Trematocranus* can no longer be defined on the basis of the degree of swelling of the mucus cavities of the infraorbital bones, 0 to 2 or 2 to 4 scale rows on the cheek and the absence or presence of spot series on the body sides, because these characteristics are found in variable combinations.

From this study *Trematocranus auditor*, *T. brevirostris* = *brevirostre*, *T. jacobfreibergeri*, *T. microstoma* and *Cyrtocara macrocleithrum* are assigned to the genus *Aulonocara*; *A. macrochir* TREWAVAS, 1935 is a synonym of *A. rostrata* = *rostratum* TREWAVAS, 1935; *T. peterdaviesi* BURGESS AXELROD, 1973 should be included in the complex of *Lethrinops* REGAN, 1922.

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Plate 1

Fig. 3. Teeth of upper jaw of *Aulonocara ethelwynnae* n.sp. (Chitendi Island). Fig. 4. Lower pharyngeal bone of *Aulonocara ethelwynnae* n.sp. (Chitendi Island). Fig. 5. Lower pharyngeal bone of *Aulonocara hansbaenschii* n.sp. (Masinje). Fig. 6. Lower pharyngeal bone of *Aulonocara hueseri* n.sp. (Likoma Island). Fig. 7. Teeth of upper jaw of *Aulonocara korneliae* n.sp. (Chisumulu Island). Fig. 8. Lower pharyngeal bone of *Aulonocara korneliae* n.sp. (Chisumulu Island). Fig. 9. Lower pharyngeal bone of *Aulonocara saulosi* n.sp. (Masinje). Fig. 10. Teeth of lower jaw of *Aulonocara spec.* (Likoma Island).

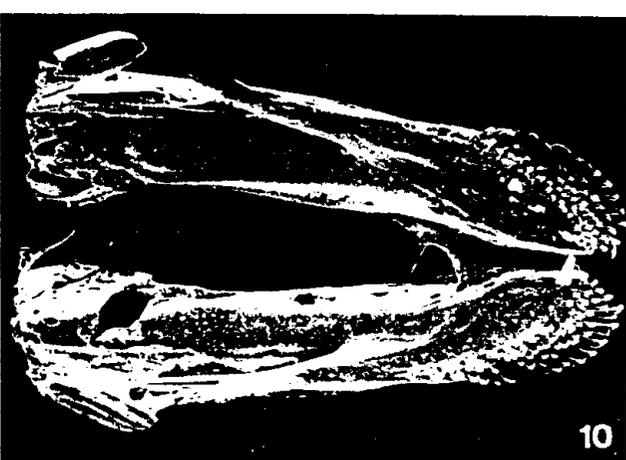
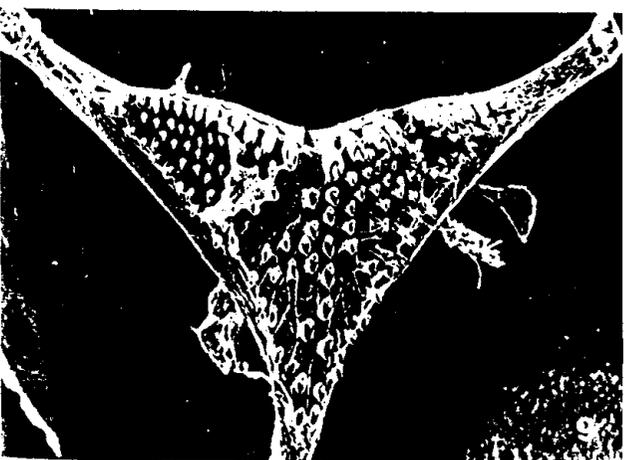
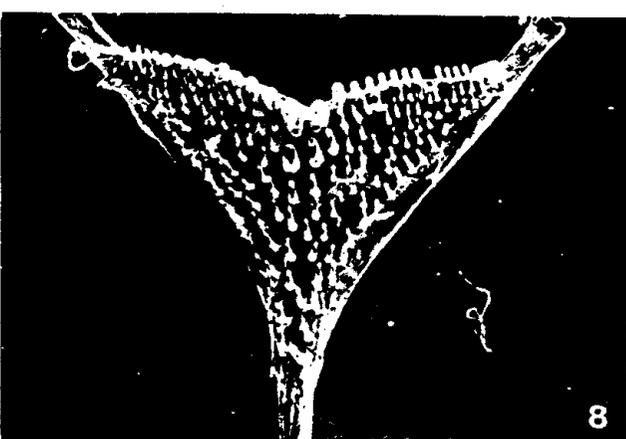
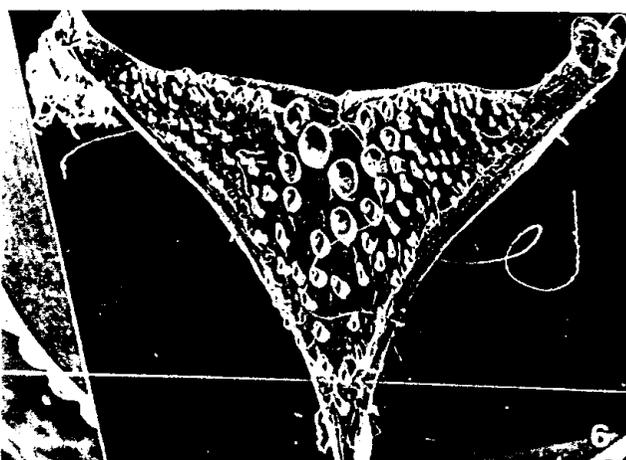
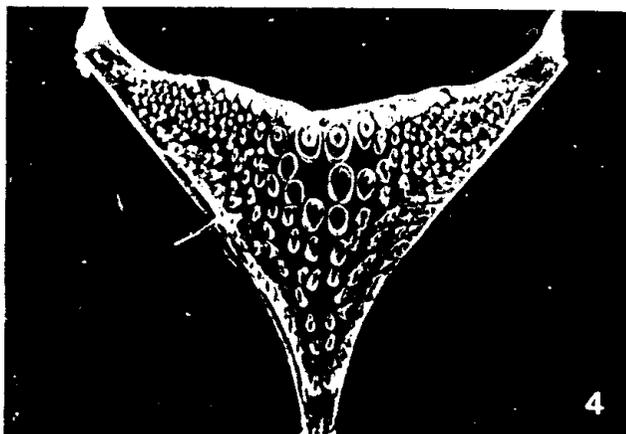


Plate 2

Fig. 11. Upper jaw of *Aulonocara* spec. (Likoma Island). Fig. 12. Teeth of upper jaw of *Aulonocara* spec. (Likoma Island). Fig. 13. Lower pharyngeal bone of *Aulonocara* spec. (Likoma Island). Fig. 14. Lower pharyngeal bone of *Aulonocara steveni* n.sp. (Kande Island). Fig. 15. Lower pharyngeal bone of *Aulonocara baenschi* (Nkhomo). Fig. 16. Lower pharyngeal bone of *Aulonocara baenschi* (Chipoka). Fig. 17. Lower pharyngeal bone of *Aulonocara baenschi* (Chipoka). Fig. 18. Lower pharyngeal bone of *Aulonocara baenschi* (Usisya).

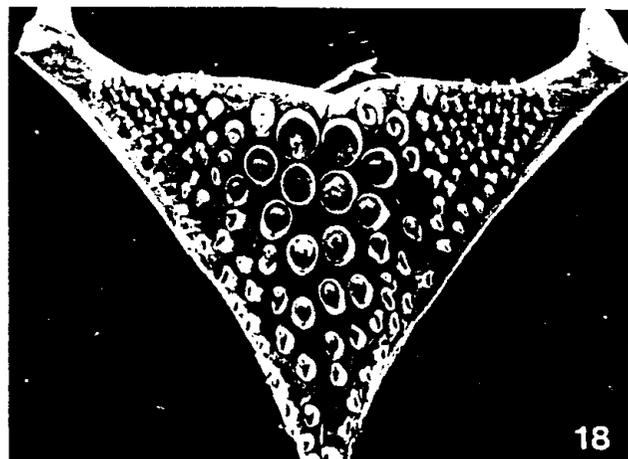
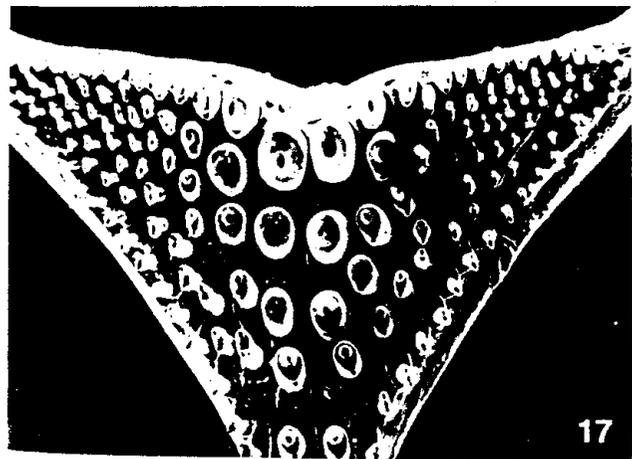
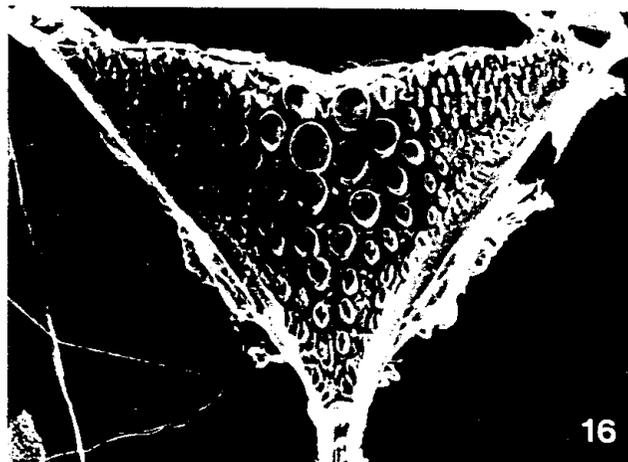
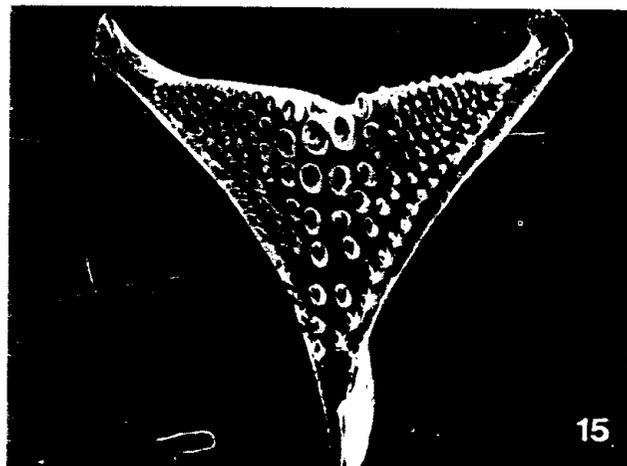
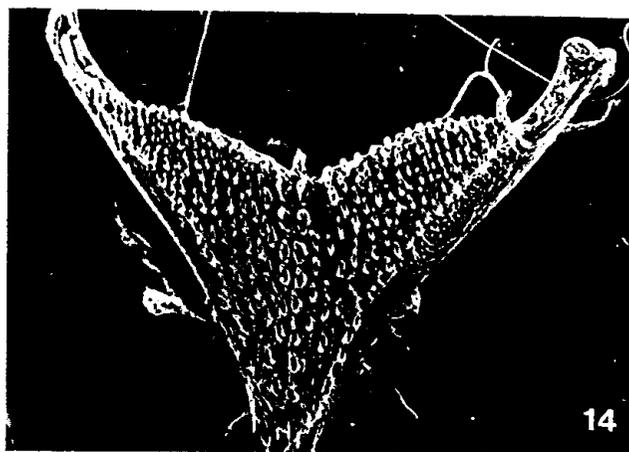
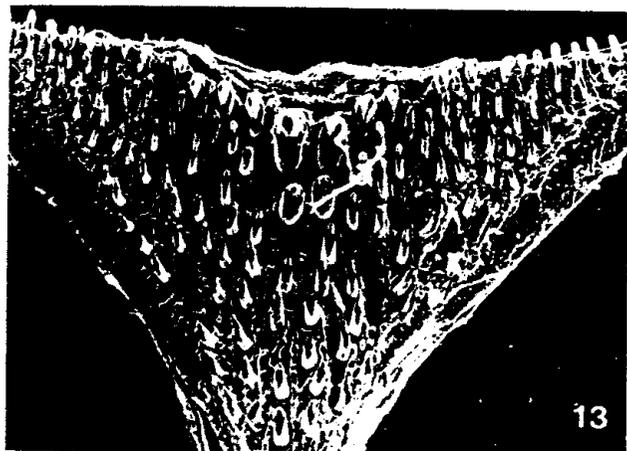


Plate 3

Fig. 19. Middle region of lower pharyngeal bone of *Aulonocara baenschi* (Chipoka). Fig. 20. Lower pharyngeal bone of *Aulonocara maylandi* (Eccles Reef). Fig. 21. Lower pharyngeal bone of *Aulonocara maylandi* (Kande Island). Fig. 22. Lower pharyngeal bone of *Aulonocara maylandi* (Kande Island). Fig. 23. Posterior teeth of lower pharyngeal bone of *Aulonocara maylandi* (Kande Island). Fig. 24. Lower pharyngeal bone of *Aulonocara nyassae* (SE Lake Malawi). Fig. 25. Lower pharyngeal bone of *Aulonocara stuartgranti* (Chilumba). Fig. 26. Lower pharyngeal bone of *Aulonocara rostratum* (Monkey Bay).

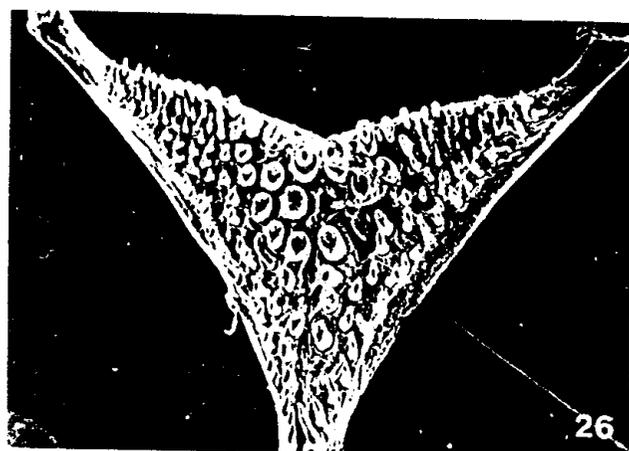
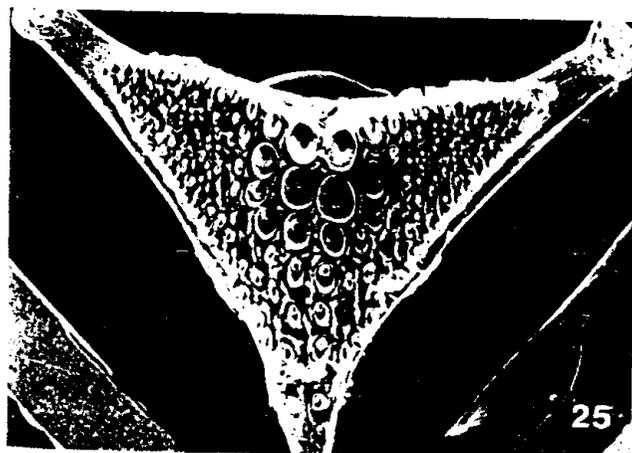
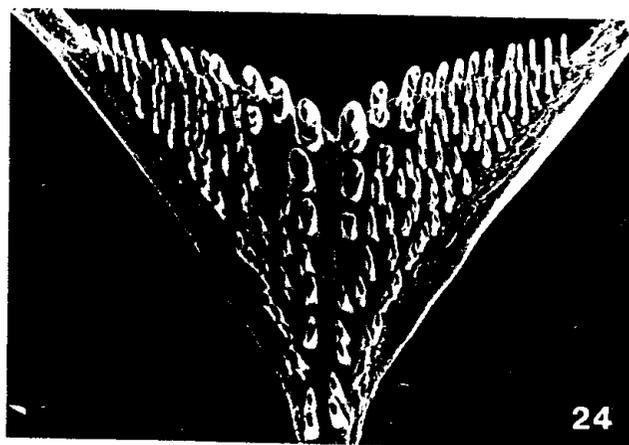
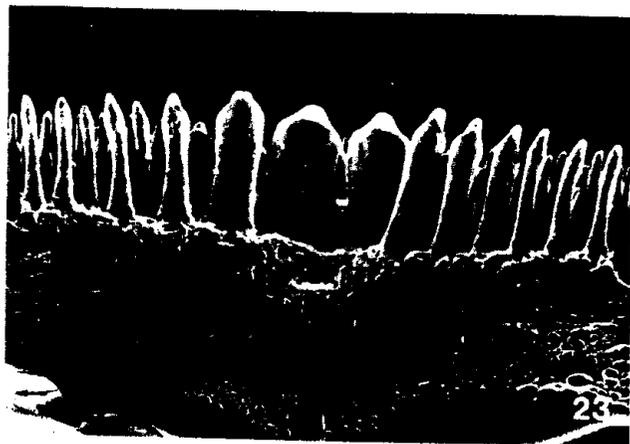
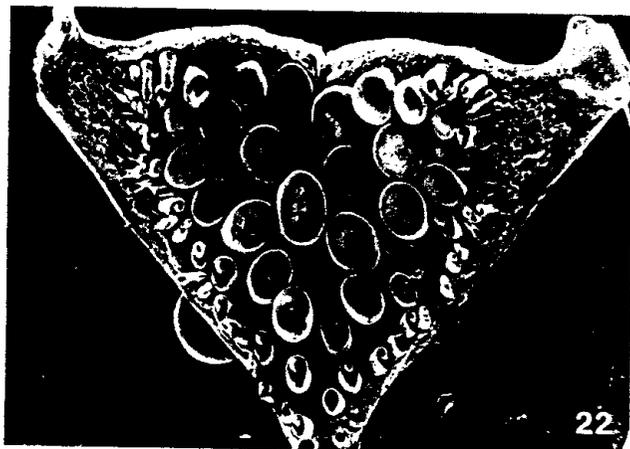
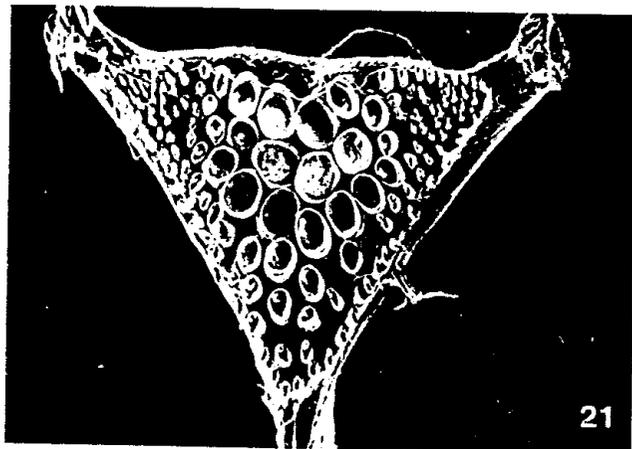
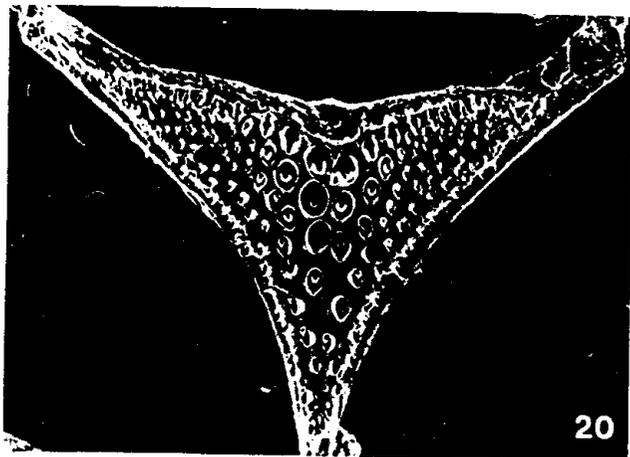


Plate 4

Fig. 27. *Aulonocara ethelwynnae* n.sp., males. This photo was taken in natural habitat.



Plate 5

Fig. 28. *Aulonocara* spec. (Likoma Island), male. Fig. 29. *Aulonocara* spec. (Likoma Island), male.
Fig. 30. *Aulonocara hansbaenschi* n.sp. (Masinje), male. Fig. 31. *Aulonocara hansbaenschi* n.sp.
(Masinje), female. Fig. 32. Introduced form of *Aulonocara* from Thumbi Island, may be conspecific
with *A. hansbaenschi* n.sp.. Fig. 33. *Aulonocara saulosi* n.sp. (Masinje), male. Fig. 34. *Aulonocara*
korneliae n.sp. (Chisumulu Island), male. Fig. 35. *Aulonocara hueseri* n.sp. (Likoma Island), male.



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Plate 6

Fig. 36. *Aulonocara* spec. (Domwe Island), male. Fig. 37. *Aulonocara baenschi* (Usisya), male. Fig. 38. *Aulonocara baenschi* (Chipoka), male. Fig. 39. *Aulonocara baenschi* (Chipoka), female. Fig. 40. *Aulonocara baenschi* (Nkhomo), male. Fig. 41. *Aulonocara baenschi* (Maleri Island), male. Fig. 42. *Cyrtocara* spec. (Jaro), male. Fig. 43. *Cyrtocara* spec. (Jaro), male.



Plate 7

Fig. 44. *Aulonocara stuartgranti* (Chilumba), male. Fig. 45. *Aulonocara stuartgranti* (Chilumba), female. Fig. 46. *Aulonocara stuartgranti* (Mbenji Island), male. Fig. 47. *Aulonocara maylandi* (Eccles Reef), male. Fig. 48. *Aulonocara maylandi* (Kande Island), male. Fig. 49. *Aulonocara maylandi* (Kande Island), female.



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