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SOME FINDS OF CHAROPHYTES FROM EAST-AFRICA (ZAMBIA, TANZANIA, KENYA AND SOMALIA)

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Abstract. The present work is based on herbarium studies in two herbaria in Nairobi, Kenya (EA and NAI). A total of 11 species of charophytes have been found in Somalia, Tanzania, Kenya and Zambia. The species are *Chara braunii*, *C. socotrensis*, *C. vulgaris*, *C. globularis*, *C. setosa* (and *C. setosa* f. *tanganyikae*), *C. chrysospora*, *C. zeylanica*, *C. tanyglochis*, *C. kraussiana*, *Nitella knightiae*, *N. mucronata*. A description is given for each species, based on the specimens studied. Collector, place of collection and date have been added. Finally ecological information recorded on the label has also been added. A short discussion of the charophyte flora in the area is presented.

■ Charophytes, Characeae, *Chara, Nitella*, Somalia, Tanzania, Kenya, Zambia.

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Introduction

The first comprehensive work on African charophytes was written by Alexander Braun in his "Characeen Afrika's" (Braun 1868). Later publications have mostly been concentrated on South Africa (Nordstedt in Wille 1903, Groves and Stephens 1926, 1933 and references in Wood 1978) and in North Africa (Corillion and Guerlesquin 1971, 1972, Corillion 1973, 1978). Articles connected to the area described here are Braun in Schweinfurth (1867), H. H. Groves and J. Groves in Rendle (1907)., Migula in Schröder (1914) and Wood (1955). In this article 11 species are recorded.

This present article is based on material from the East African Herbarium, National Museums of Kenya, Nairobi, Kenya (EA) and Herbarium, Botany Department, University of Nairobi, Nairobi, Kenya (NAI). Herbaria are abbreviated according to the Index herbariorum (http://sweetgum.nybg.org/ih).

Results

Chara braunii C. C. Gmelin

Syn. *C. coronata* Ziz ex Bischoff, *C. braunii* f. *braunii* (C. C. Gmelin) R.D. Wood

The species has been found in ten localities in Kenya and Tanzania (Text.-fig. 3).

Description of specimens examined:

Most of the examined specimens were typical *Chara braunii* (Text-fig. 1). Plants are monoecious and up to 30 cm high. The axis is 650–1200 µm in diameter and is without cortex and spine-cells. Stipulodes are in 1 tier with 1 cell per branchlet and 500–750 µm long, broad, acute. Branchlets are 8–9, 1–3x as long as the internodia and up to 20 mm long, with 4–5 segments, the end-segment having a corona. Bract-cells and bracteoles are slightly shorter, or as long as mature oogonia. The gametangia are conjoined and the oogonia are commonly in pairs, at the lowest two branchlet nodes. The oogonia are 500–600 µm long (incl. coronula), 300–350 µm wide. The coronula is 100 µm high and 150 µm wide, divergent. The oospores are black to dark brown, c. 500 µm long and 300–350 µm wide, with 6–8 ridges (Text-fig. 1). The antheridia are 250 µm in diameter. Normally the species are richly fertile.

Distribution: *Chara braunii* is a cosmopolitan species (Wood and Imahori 1959).

Ecology: This is a freshwater species found in pools, ponds and in slow running streams with soft water, as is common for *Nitella*. It is found up to an altitude of 1600 m (5400 ft.). Specimens with ripe oospores have most commonly been found in autumn (August – November).

The examined herbaria specimens are (all from EA):

KENYA

1. **14 Falls, Thika**, Leg. D. Napper, 11.09.1955. Det G.O. Allen 10.11.1957, conf. 06.03.2005 A. Langangen.
   On the label of this collection: In pools – running water – not stagnant. In river below falls.
2. **14 Falls, Athi**. Leg. Verdcourt, 27.08.1956. Det. 06.03.2005 A. Langangen.

TANZANIA

3. **Arusha- chini**, Leg. Mr. Crossland, 02.08.1960. Det. 26.02.2005 A. Langangen.
   On the label to this collection: Water weed.
4. **Lake Magadi**, W-side of Ngorongori Crater, 5400 ft. altitude, Leg. P.J. Greenway and Kamari, 05.07.1966. Det. 26.3.2005 A. Langangen.

Text-fig. 1. *Chara braunii* from Lake Magadi, Tanzania. a – top of plants with gametangia, b – oospore with 6 ridges, 400 µm long.

On the label of this collection: Charophyte. A much branched dark green submerged aquatic herb with leaves in whorls up the stems and minute brilliant scarlet fructifications produced in a single open row up each leaf segment and making quite a show in small patches through the water when viewed from above. A dominant aquatic with occasional *Utricularia – Lemna* – stands of aquatic *Cynodon dactylon – Panicum repens- Leersia hexandra* – occasional *Cyperus* in pools about 1 ft. deep marginal to Aeschynomene swamp.

5. **Serengeti, Seronera River,** 4600 ft. altitude, Leg. P.J. Greenway, 16.03.1962. Det. 03.02.2001 A. Langangen
   On the label of this collection: A green aquatic herb with branches in whorls and small dark green oval buds or fruits produced along the branches. A very exclusive dominant in a very temporary water hole about 1 ft. deep and about 2 yards square, covering the whole of the pool which was rapidly drying up in a dark gray cracking clay in closed *Cynodon dactylon – Chloris gayana – Themeda triandra* grassland marginal to *Acacia xanthophloea* open woodland on the Seronera River.
6. Reise nach dem Kilimandjaro und Meru. **Kilimanjaro, Meni**. In dem kleinen, flachnfrigen Bach zw. Garanga und Idernіveren, höhe c. 1000 m. [In the small, slow flowing brook between Garanga and Iderivere, altitude 1000 m]. Leg. Dr. C. Uhling, 03.11.1901. Det. 1957 G.O. Allen, conf. 25.03.2005 A. Langangen
7. Reise nach dem Kilimandjaro und Meru. **Ententeich Steppe** zw. b.d. Viehboma, höhe c. 1000m. [Ententeich Steppe near Viehboma, altitude 1000 m]. Leg. Dr. C. Uhling, 05.11.1901. Det. 11. 1957 G.O. Allen, conf. 25.03.2005 A. Langangen.
8. **Ngurdoto Crater Gate**, entrance, Arusha Nat. Park, Leg. P.J. Greenway and D.V. FitzGerald, 08.01.1972. Det. 25.03.2005 A. Langangen.
   On the label of this collection: A bright brownish-green submerged aquatic with reticulate whorls of transparent stems and branches and minute scattered brown to black globular fructifications. Very common in a fresh water pool with *Ceratophyllum demersum – Zanchenella palustris* – 2 spp. of *Utricularia – Nymphaea coerulea – Scirpus* and Cyperaceae.
9. **A.N.P. Ngurdoto- Seneto gravel pit**, altitude 5100 ft., Leg. D. Vesey FitzGerald, 24.05.1969. Det. 25.03.2005 A. Langangen.
   On the label of this collection: Pool fed by seepage redistributed soil only one clan seen here. Aquatic with whorls of jointed branches at interval along stems bearing minute ovoid brown capsules.
10. **Viti, Shume**, Lushoto Dist. Tanga Prov. Altitude 6000 ft. Leg. Carmichael, 13.08.1958. Det. JN 04.1959. Conf. 06.03.2005 A. Langangen.
    On the label of this collection: Habitat: Natural pond. Description: Yellow spots on young growing shoots.

Chara socotrensis Nordstedt in Kühn

Syn.***Chara socotrensis*** f. ***socotrensis*** (Nordstedt in Kühn) R.D. Wood

The species has been found in one locality in Somalia (Text-fig. 3).

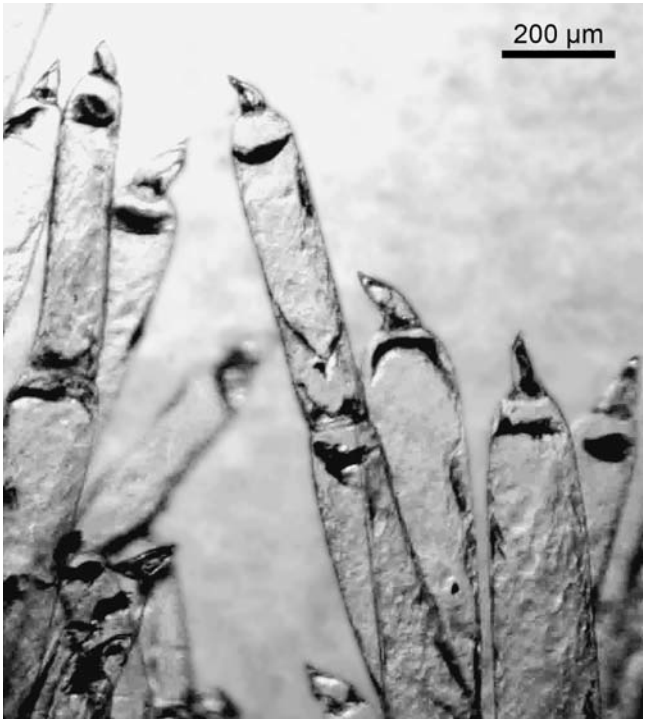
Description of specimens examined:

Plants are monoecious, 2–3 cm high (full length not attained as the plants were partly broken) and strongly encrusted. The axis is c. 500 µm in diameter and the internodes are much shorter than the branchlets (only upper part of plants). Stem and branchlets are ecorticated and spine cells are missing. Stipulodes are well developed, both haplo- and diplostephanous, two cells per branchlet (bistipulate) in the upper tier, pointing upwards, up to 400–500 µm long. In diplostephanous specimens the lower tier cells are short (50 µm) to papillous.

Branchlets are 10 in a whorl and up to 17 mm long, 2–5x the length of internodes, segments 2, basal segment short (250 µm), terminal segment 2–4 celled, constricted.

End cells are mucronate (Text-fig. 2), up to 250 µm long. Bract-cells are short to papillous. Bracteoles 2, up to as long as the oogonium. Gametangia are conjoined at branchlet nodes, unripe. The oogonia are up to 750 µm long (including coronula). The coronula is divergent. The antheridia are 300 µm in diameter.

The specimens described here clearly fit the original description of *Chara socotrensis*. As noted by Nordstedt in Kuhn (1883), the stipulodes were partly diplostephanous, which he found very interesting. This phenomen was not seen by Wood and Imahori (1965) in their study of the type



Text-fig. 2. *Chara socotrensis*. Branchlet segments with mucronate end cells.

material. In icon 119 in Wood and Imahori (1964). the stipulodes are haplostephanous, unistipulate and alternate. Allen (1888) used one of Nordstedt's drawings to illustrate a set of three stipulodes (tristipulate) (Allen 1888: fig. 28, p. 22), which in my opinion is two tiers. *Chara socotrensis* can therefore be refered to the diplostephanous species of *Chara*. In this group it will be the only totally ecorticated species.

Distribution: *Chara socotrensis* is presently known from Socotra (Yemen) and Berbera (Somalia, this article) and Bolivia (South America) (Guerlesquin 1981).

Ecology: On the label is written – Water-weed. Floating in swamps. The locality is situated at c. 1000 m. altitude, and must be lime-rich as the alga is strongly encrusted. In Bolivia it is found in brackish water.

The examined herbarium specimen is (from EA):

SOMALIA

1. Berbera: **Binhindula**, Leg P.R.O. Bally, 31.05.1949. Det. 1952 G.O. Allen, conf. 18.01.2001 A. Langangen.

Chara vulgaris L. var. ***longibracteata*** (KÜTZING in REICHENBACH) J. GROVES et BULLOCK-WEBSTER

Syn. *Chara foetida* A. BRAUN

The species has been found in three localities in Kenya and Somalia (Text-fig. 3).

Description of specimens examined:

Plants are fragmented, with the longest pieces c. 10 cm. The stem diameter is up to 1 mm and the internodes are up to 2.5 cm long. The specimens are medium encrusted. The cortex is regularly diplostichous and slightly aulacanthous, while older parts are almost isostochous. The spine- cells are very short to papillous. The stipulodes are in two tiers and with two cells per branchlet (in each tier), short to 50–150 µm long. The branchlets number 11 in each whorl, up to 14 mm long which is 1/3 – 1x the length of internode. The branchlets have 3–4 segments of which 2–3 are corticated and the end cell is ecorticated. The end segment is 3–4 celled, short (300 µm), acute, slightly swollen and up to 2x the length of corticated segments. There are two anterior bract-cells which are up to 6–7 mm long. The posterior bract-cells are papillous. The specimens are monoecious, conjoined. The fertility is good, but the gametangia are not mature. All gametangia are in corticated segments. This form is an extreme variant of *Chara vulgaris*, characterized by long bracteoles and anterior bract-cells.

Distribution: *Chara vulgaris* is a cosmopolitan species (Wood and Imahori 1959).

Ecology: The species is found in freshwater or slightly brackish, lime rich water.

The examined herbarium specimens are (from EA):

KENYA

1. **Katumani Experimental Farm,** Machakos, Leg. D.M. Napper, 05.10.1958. Det. 23.01.2001 A. Langangen
   On the label of this collection: In a stagnant pool. Bright green growth with conspicuous orange ? antheridia. Thicket on the banks of a river with many pools but no running water.

SOMALIA

2. **Tidali spring**, Leg. P.E. Glover and H.B. Gilliland, 17.04.1945. Det. 1957 G.O. Allen, conf. 05.03.2005 A. Langangen (Native name of the plant is Sarok).
   On the label of this collection: Growing in the water of Tidali spring.
3. **Debrawen**, 3200 ft., Leg. J.B. Gillet, 30.11.1932. Det. 1957 G.O. Allen, conf. 06.03.2005 A. Langangen.

Chara globularis THUILLER var. ***hedwigii*** (AGARDH in BRUZELIUS) J.S. ZANEVELD

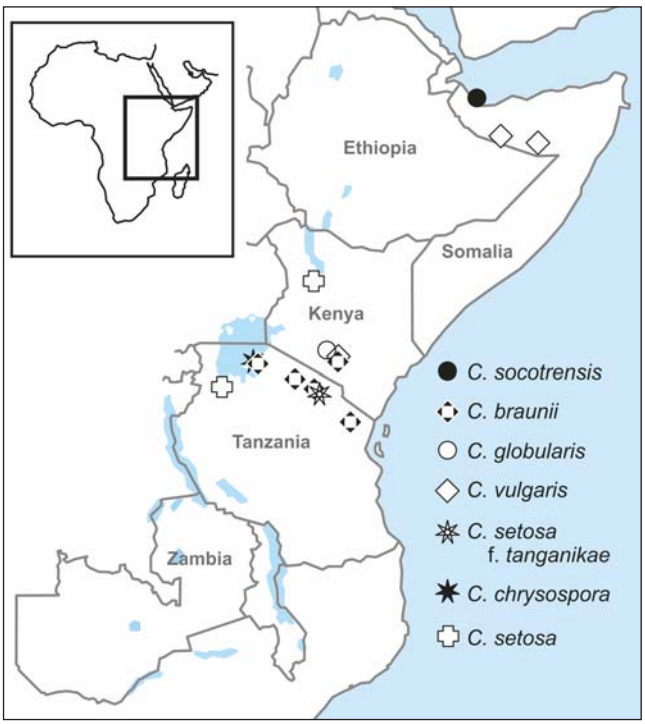
Syn. *Chara fragilis* DESVAUX

The species has been found in one locality in Kenya (Text-fig. 3).

Description of specimens examined:

The specimens determined are a coarse form of *C. globularis* with stiff, straight branchlets.

Plants are monoecious and up to 25 cm high, slightly encrusted. The stem is up to 800 µm in diameter. The cortex is regularly triplostichous and isostochous. The spine cells are not developed or are papillous. The stipulodes are very short, acute in upper row and obscure in lower row. The number of branchlets are 8–9, in a whorl, with length up to 20 mm, 0.5–2x the internodes. The branchlets have 9 segments of which 7–8 have normal diplostichous cortex, and



Text-fig. 3. Distribution of examined species.

1–2 end-segments are ecorticate. The end segments are up to 750 µm long, and the end–cells are acute and up to 300 µm long. There are 2 anterior bract cells, up to 750 µm long, and the posterior bract cells are small and obscure. The bracteoles are 2, up to 800 µm long. The gametangia are at the 2nd–3rd lowest branchlet nodes.

The plants are richly fertile, with oogonia up to 1000 µm long, 500 µm wide and with 10 convolutions. The coronula is 300 µm long, 250 µm wide and connivent. The oospores are black, ovoid, 550 µm long, 350 µm wide and with 10 ridges. The fossae is 55 µm,and the membrane is fine granulate. The antheridium is 350 µm (unripe) in diameter.

Distribution: *Chara globularis* is a cosmopolitan species (Wood and Imahori 1959). The variety is found scattered within the distribution area of *C. globularis*.

Ecology: The species is found in freshwater and in many types of localities, lakes, ponds and also in rivers. The actual locality in Nairobi river is eutrophic according to the collected plants.

The examined herbarium specimen is (from EA):

KENYA

1. **Nairobi river below Coryndon Museum** (Notes from Dr. Teesdale's Bilharzia work), Leg. Verdcourt, 26.01.1961. Det. 29.01.2001 A. Langangen
   On the label of this collection: Submerged water weed. *Potamogeton richardi, Ceratophyllum* sp., *Elodea densa.* Stream running through what was an original forest cover of *Croton megalocarpus*, *Markhamia hildebrantii* (...). True aquatics: *Potamogeton richardi, Ceratophyllum* sp., *Elodea densa* (...) more.

Chara setosa KLEIN ex WILLDENOW

Syn. *Chara brachypus* A. BRAUN

The species has been found in two localities in Kenya and Tanzania (Text-fig. 3).

Description of specimens examined:

Specimens from the two collections are more or less typical *C. setosa*.

Plants are monoecious and from 4 to 10 cm high. The stem diameter is c. 600 µm and the internodes are up to 2 cm long. The plants are only slightly encrusted. Specimens from lake Burigi (loc. 1) have root bulbils. The cortex is triplostichous, isostichous to slightly tylacanthous. The spine cells are short, from 100 to 300 µm long, scattered on old internodes and denser on younger internodes. The spine cells are acute and bend downwards. The stipulodes are in two tiers, two cells per branchlet (in each tier), pressed against the internodes and the lowest branchlet segments. Cells in the upper row are as long as the lowest branchlet segments (up to 550 µm), and in the lower row shorter, up to 100 µm long. There are 10–11 branchlets in each whorl, up to 14 mm long, which is 1–2x the length of the internodes. The branchlets have 7–8 segments, end-segments are ecorticated. The lowest segments are short and discoloured. Anterior bract cells are up to 500 µm, posterior bract cells rudimentary to 150 µm long. Bracteoles 2, similar to the bract cells, and in size up to the length of the oogonium.

The plants are very fertile, with oogonia up to 800 µm long and 500 µm wide and with 11 ridges. The coronula is up to 100 µm high and 200 µm wide. The oospores are black, 500 µm long and 350 µm wide. The antheridia are up to 350 µm in diameter.

Distribution: *Chara setosa* is found in Africa (see H. Groves and J. Groves in Rendle (1907).), Asia and Australia (Wood and Imahori 1959).

Ecology: *Chara setosa* is a freshwater species. The find in Kenya is from an altitude of 5400 m.

The examined herbarium specimens are (from EA):

TANZANIA

1. **Kagera: Lake Burigi,** 23.10.1975, leg. R. Kiss. Det. 18.02.2001 A. Langangen

KENYA

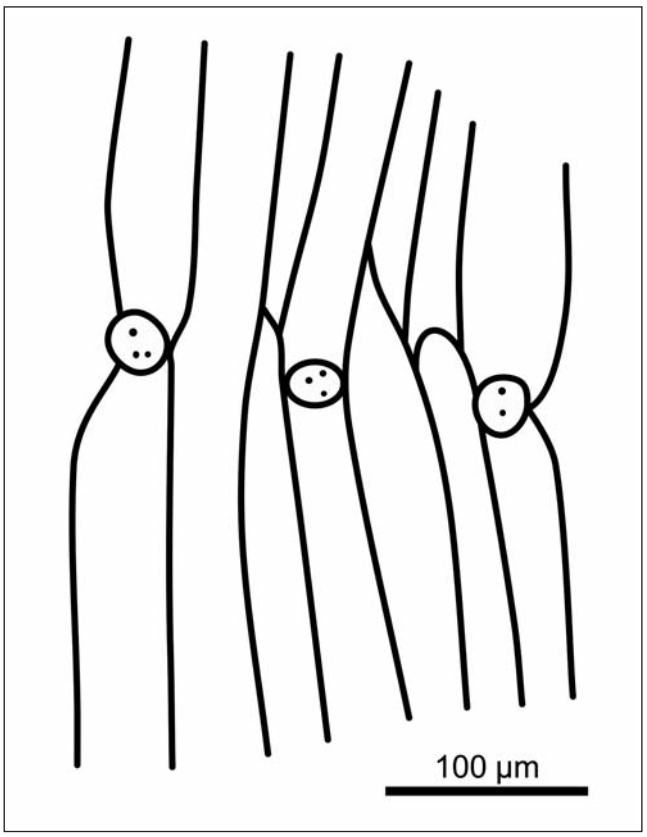
2. **Moeys Bridge,** Nzoia area, 15.08.1963, Leg. K. Smith and S. Paolo. Det. 27.01.2001 A. Langangen
   On the label of this collection: Small water plant in swamp. Abundant. Small yellow fruits. Altitude 6000ft.

Chara setosa KLEIN ex WILLDENOW f. ***tanganyikae*** R.D.WOOS

The species has been found in one locality in Tanzania (Text-fig. 3).

Description of specimens examined:

This form differs by having papillous spine cells (Text-fig. 4). The lowest branchlet segments are 2–3x shorter



Text-fig. 4. Part of stem cortex of *Chara setosa* f. *tanganyikae*.

Text-fig. 5. *Chara chrysospora*. Oogonium with orange oospore. Length of oogonium is 400 µm.

than the next above. The degree of cortication in the branchlets varies greatly , with 6–7 ecorticated segments or up to 4 corticated. The bract-cells and the bracteoles are verticillated and up to 250 µm long. The gametangia are at the 1st–3rd lowest branchlet nodes and also on ecorticated nodes. The specimens found here are up to 30 cm long. Wood (1955); Wood and Imahori (1965) give the height as up to 11 cm.

Distribution: *Chara setosa* f. *tanganyikae* is only found in Africa, in Rwanda, Zaire and Tanzania (Wood 1955).

Ecology: The examined specimens of *Chara setosa* f. *tanganyikae* is found in shallow running water in a river.

The examined herbarium specimen is (from EA):

TANZANIA

1. **Lake Manyara** Nat. Park: Mdala River, 3000 ft. altitude. Leg. P. Greenway and Kanuri. Det. 10.02.2001 A. Langangen.
   <u>*On the label of this collection*</u>: green submerged aquatic with whorls of filamentous leaves up the stem – forming a dark green trailing mat in shallow running water on the side of a sandy river bed, but not common found only in one place, not apparently in flower or fruit."

Chara chrysospora J. Groves et Stephens

The species has been found in one locality in Tanzania (Text-fig. 3).

Description of specimens examined:

Plants are monoecious and up to 9 cm high (but specimens were partly fragmented) and slightly encrusted. The cortex is triplostichous, isostichous to slightly tylacanthous. Spine cells are single, acute, scattered and from papillous up to 150 µm long. The stipulodes are in two rows, two sets per branchlet. Upper row are with cells up to 250 µm long, lower row are not fully developed, and have cells from papillous up to 50 µm long.

The branchlets are 9–10 in a whorl, and up to 14 mm long, and 1–2x the length of internodes. The branchlets in a whorl are both corticated (1–3 segments) and totally ecorticated. Some whorls have only ecorticated segments. The end segments are 2–4 celled, up to 9 mm long and ecorticated. The end-cells are acute, mucronate and up to 250 µm long. The bract cells are 5–6 in number, anterior 2, bracteoles 2 to 1000 µm long. Bractlets below some of the antheridia, up to 400 µm long. Posterior bract cells are shorter, up to 100 µm long. The gametangia conjoined on the 2–3 lowest branchlet nodes, both corticated and ecorticated. The oogonia are 500–600 µm long. The coronula is connivent, to 100 µm high and 150 µm wide. The oospores are 400 µm long, yellow brown (orange) with 11 ridges (Text-fig 5). Fossa 37.5–45 µm across. The antheridia are 350–450 µm in diameter.

Distribution: Only found in Africa, in South Africa and Tanzania (this article).

Ecology: *Chara chrysospora* is a freshwater species, and the studied specimens are found in a river at high altitude (ca. 1500 m).

The examined herbarium specimen is (from EA):

TANZANIA

1. Musoma district: **Titushi river,** 4900 ft. alt. Leg 27.04.1961 P.J. Greenway. Det. 04.02.2001 A. Langangen. <u>*On the label of this collection*</u>: Growing with *Zanichellia palustris* L.

Chara zeylanica WILLDENOW

The species has been found in two localities in Kenya and Zambia (near the border to Tanzania) (Text-fig. 8).

Description of specimens examined:

Plants are monoecious, up to 6 cm high and slightly to moderate encrusted. The stem diameter is up to 1 mm and the length of the internodes is up to 2 cm. The cortex is regularly triplostichous. The spine cells vary in length from short to 500–600 µm long, dense in young internodes and scattered in old internodes. The stipulodes are in two tiers, two sets per branchlet. Cells in upper row are up to 800 µm long, longer than the lowest branchlet segment. Cells in lower row are up to 500 µm long. The number of branchlets is 9–11 in a whorl, with length up to 15 mm and up to 2x the length of the internodes. The branchlets have 7–10 segments of which the lowest are ecorticated and very short (up to 500 µm). The next segments are up to 8 times longer. The end-segments are one celled, acuminate and ecorticated, up to 600 µm long. The anterior bract cells are 2, up to 1250 µm long, and the posterior bract cells are from papillous to 500 µm long. The bracteoles are 2, up to 1000 µm long. The gametangia are conjoined at the 2nd–4th lowest branchlet nodes. The plants are richly fertile, with oogonia up to 850 µm long and 500 µm wide and with 11 convolutions. The coronula is divergent, 200 µm high and 250 µm wide. The oospores are dark brown to brown, ovoid, 650 µm long and 350 µm wide, and with 11 ridges. The antheridium is 350 µm in diameter.

Distribution: *Chara zeylanica* is a widespread species (Wood and Imahori 1959). It is not found in Europe.

Ecology: *Chara zeylanica* is a freshwater species, found in rice fields and in different types of lakes. In Lake Tanganyika it was found at a depth of 1 meter and on muddy sandbottom.

The examined herbarium specimen is (from EA):

KENYA

1. Kirinyaga Distr., **Tebere, Mwea Rice** Scheme, 04.09.1971 Leg. Mrs. S.A. Robertson. Det. 03.02.2001 A. Langangen. <u>*On the label of this collection*</u>: Flooded but unplanted rice field.

ZAMBIA

2. Mpulungu, **Lake Tanganyika,** 20.10.1947 Leg. P.J. Greenway and J.P.M. Brenan. Det G.O. Allen 11.1957, conf. 03.02.2001 A. Langangen.
<u>*On the label of this collection*</u>: A perennial much branched submerged aquatic herb with dark green filmy leaves. Common in about 3 ft. of water in the sandy mud of the lake near the shore.

Chara tanyglochis H. GROVES et J. GROVES

The species has been found in one locality in Zambia (Text-fig. 8).

Description of specimens examined:

Plants are monoecious and up to 30 cm high. The stem diameter is from 750 to 1000 µm and the internodes are up to 5 cm long. The plants are medium encrusted. The cortex is regularly triplostichous, isostichous. The spine cells are single, acute scattered and from papillous up to 150–250 µm long. The stipulodes are developed in two rows and acute. In the upper row the cells are up to 1000 µm long and in the lower row up to 500 µm long. The number of branchlets in each whorl is 8–9, up to 2,4 cm long. The number of segments is 7–8, the end segments are 1–2 celled and ecorticated, up to 1 mm long. Bract cells are 8, unilateral (and not verticillate), anterior bract cells and bracteoles are up to 600 µm long, bractlets are papillous up to 200 µm long. Posterior bract cells are 4 in number and short. The gametangia are conjoined at most or all branchlet nodes. The oogonia are up to 1 mm long, with 11–12 convolutions. The oospores are dark brown. The antheridia are small (unripe).

Distribution: *Chara tanyglochis* is found in central and southern Africa (Wood 1978).

Ecology: *Chara tanyglochis* is a freshwater species.

The examined herbarium specimen is (from EA):

ZAMBIA

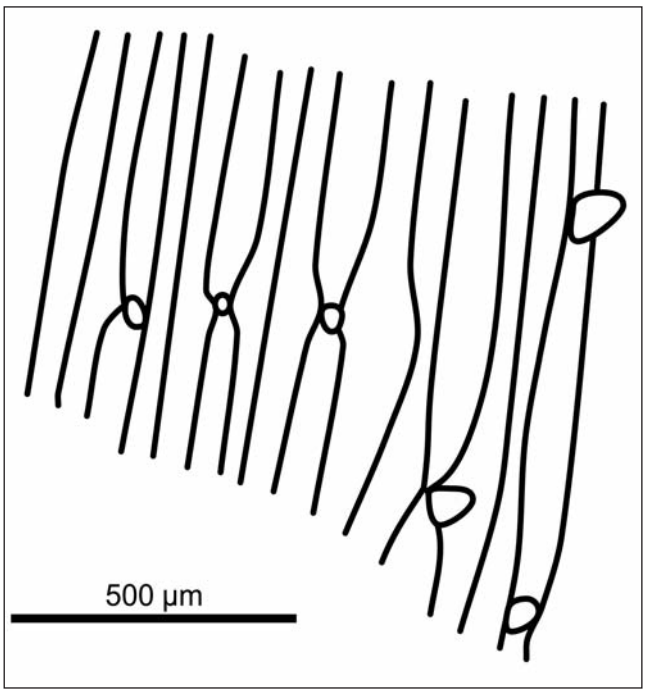
1. Southern Province: **Livingstone,** 31.08.1947 Leg. J.P.M. Brenan and P.J. Greenway. Det. 1957 G.O. Allen (as *C. brachypus*). Det. 14.02.2001 A. Langangen.
<u>*On the label of this collection*</u>: Dark green, submerged. In dense masses in the Silent Pool, near the Victoria Falls.

Chara kraussiana J. GROVES et STEPHENS

The species has been found in four localities in Kenya and Tanzania (Text-fig. 8).

Description of specimens examined:

The plants are dioecious, 10–30 cm high and only slightly encrusted. The stem diameter is 650–900 µm and the internodes are up to 4.5 cm long. The cortex is regularly triplostichous, tylacanthous (Text-fig. 6) to irregularly (2)–3 corticated. The spine cells are papillous to short, 50–75 µm high, and acute. The spine cells are most dense in young internodes. The stipulodes are in two rows of which both are more or less developed, the upper row has cells up to 500 µm long and the lower has cells up to 300 µm long. The stipulodes are often obscure in older nodes. The number of branchlets is 8 in a whorl. They are up to 3 cm long and from 0.5x to 2x the length of the internodes. The branchlets are often connivent and have 7–9 segments, the first segment is very short, the end segment is 1-celled and ecorticated. The cortex of the branchlets is normal. Bract cells are 4–5, in female plants up to 650 µm long and posterior cells are short, up to 100 µm long. The two bracteoles and the one bractlet in



Text-fig. 6. *Chara kraussiana*. Part of stem cortex.

female plants are as long as the oogonium. In male plants all the bract cells are obscure. The gametangia are on separate plants, and on the 3rd–5th lowest branchlets nodes. All specimens examined were richly fertile. The oogonia are up to 750 µm long, 350 µm wide and with 9–11 convolutions. The coronula is up to 200 µm wide and 150 µm high, divergent. The oospores are ovoid, up to 500 µm long and 300 µm wide, dark brown to black and with 9 convolutions. Fossa 55–60 µm across. The antheridia are 650–800 µm in diameter.

Distribution: *Chara kraussiana* is reported as endemic to South Africa, but is here also reported from Kenya and Tanzania.

Ecology: *Chara kraussiana* is a freshwater species.

The examined herbarium specimens are:

TANZANIA

1. Arusha**: Lake Magadi**, W-side of Ngorongori Crater, 5400 ft. altitude. Leg. P.J. Greenway and Kamari, 05.07.1966. Det. 26.03.2005 A. Langangen (EA).
   On the label of this collection. Charophyte. A much branched dark green submerged aquatic herb with leaves in whorls up the stems and minute brilliant scarlet fructifications produced in a single open row up each leaf segment and making quite a show in small patches through the water when viewed from above. A dominant aquatic with occasional *Utricularia – Lemna* – stands of aquatic *Cynodon dactylon – Panicum repens- Leersia hexandra* – occasional *Cyperus* in pools about 1 ft. deep marginal to Aeschynomene swamp.
2. Kilimanjaro: Moshi district, **Mpololo**, 3500ft. altitude. Leg A. Haaser, August 1928. Det 1957 G.O. Allen, Conf. 26.03.2005 A. Langangen (EA). (Text-fig. 7).
3. Arusha: **Maji ya Chai**, 4500 ft. altitude Leg D. Vesey-Fitzgerald 27.7.1971. Det 31.01.2001 A. Langangen (EA).

Text-fig. 7. *Chara kraussiana* (loc. 2).

On the label of this collection: Main stems bear whorls of jointed processes upon which are situated the sessile fruiting bodies these appearing orange coloured in the water.

KENYA

4. Nairobi: **Vlei near Marlborough** Road behind Blencowes house, Leg. E.M. Lind 04.10.1964. Det. 02.04.2007 A. Langangen (NAI).

Nitella knightiae J. Groves et Stephens

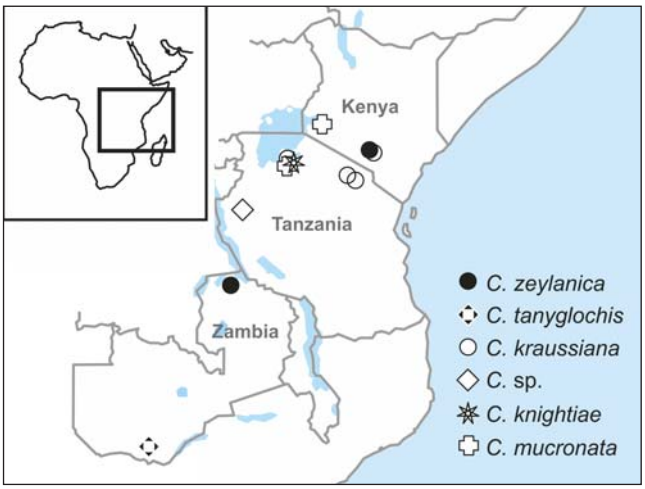
The species has been found in one locality in Tanzania (Text-fig. 8).

Description of specimens examined:

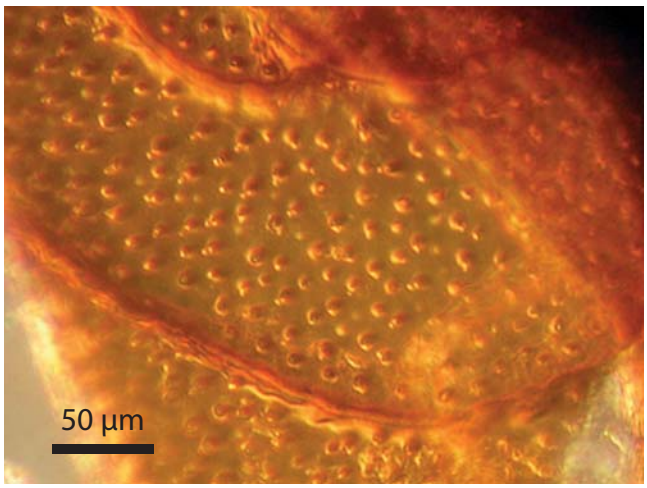
Plants are dioecious and up to 20 cm high. The stem diameter is up to 800 µm. Sterile branchlets 1-furcate, 5 in a whorl. Fertile branchlets are very short, and forming numerous, dense heads. Gametangia on separate plants and enveloped in mucus (according to collector). The oogonia are up to 800 µm long and 600 µm wide.

The oospore is brown, round and laterally compressed, up to 550 µm long and 550 µm wide, with 7 ridges. The oospore membrane is papillate, fossa 75–80 µm with 7 papilla across it (Text-fig. 9).

The antheridia are 750–850 µm in diameter (Text-fig. 10), and have dactyls with thickened cell walls.



Text-fig. 8. Distribution of examined species.



Text-fig. 9. Part of oospore membrane of *Nitella knightiae*.

Distribution: *Nitella knightiae* has only been reported from the southern part of Africa (Wood and Imahori 1965), but now also found in Tanzania.

Ecology: *Nitella knightiae* is a freshwater species (Groves and Stephens 1933).

The examined herbarium specimens are (from EA):

TANZANIA

1. Arusha: **Ngongongore**, Alt. 4600 ft. Coll. 11.07.1969 D. Vesey-Fitzgerald. Det. 24.03.2005 A. Langangen.
   On the label of this collection: A. much branched slender aquatic, short branches in whorls fertile heads composed of whorled terminal branches bearing spherical brown fruiting bodies the whole forming a sphericle head enclosed in mucilage. Colonies in several pools.

Nitella mucronata (A. Braun) Miquel

The species has been found in two localities in Kenya and Tanzania (Text-fig. 8).

Description of specimens from Lake Magadi:

Plants monoecious, to 15 cm high and stem diameter is up to 750 µm. Fertile branchlets number 7 in a whorl, 2 furcate. Dactyls 2–3, 2–3 celled with a mucronate end cell. Gametangia conjoined at the branchlet nodes, without mucus. Oogonia up to 500 µm long and 320 µm wide with 7 convolutions. The oospores are brown and have a reticulated membrane. The antheridia are 280 µm in diameter.

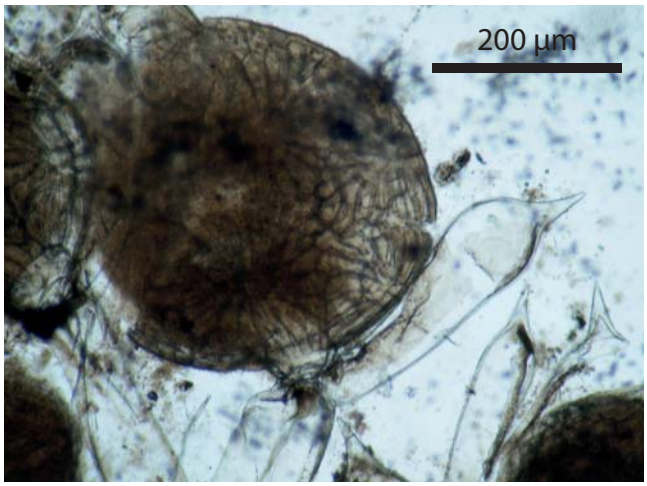
Distribution: *Nitella mucronata* is a cosmopolitan species and also widespread in Africa (Wood 1978).

Ecology: *Nitella mucronata* is a freshwater species, and found in rivers, dams and lakes (Krause 1997).

The examined herbarium specimens are:

KENYA

1. Rift Valley: **Naru river**, 5 miles SW of Kaptagat Station. Leg. Unknown. Det. 02.04.2007 A. Langangen (NAI).



Text-fig. 10. *Nitella knightiae*. Antheridium.

TANZANIA

2. **Lake Magadi**, W-side of Ngorongori Crater, 5400 ft. altitude, Leg. P.J. Greenway and Kamari, 05.07.1966. Det. 27.03.2005 A. Langangen (EA).
   On the label of this collection: Charophyte. A much branched dark green submerged aquatic herb with leaves in whorls up the stems and minute brilliant scarlet fructifications produced in a single open row up each leaf segment and making quite a show in small patches through the water when viewed from above. A dominant aquatic with occasional *Utricularia – Lemna* – stands of aquatic *Cynodon dactylon – Panicum repens- Leersia hexandra* – occasional *Cyperus* in pools about 1 ft. deep marginal to Aeschynomene swamp.

Discussion

Present knowledge of the charophyteflora of East-Africa is poor. Little has happened since Alexander Braun published his "Characeen Afrika's" in 1867 (Braun 1867a). He wrote "Noch geringer ist die Zahl der aus Ostafrika bekannten Arten". In Braun (1867b) he reported five charophytes from Ethiopia

(*Nitella mucronata*, *N. gracilis*, *Chara braunii*, *C. vulgaris* and *C. setosa*). H. Groves and J. Groves in Rendle (1907) reported two species from Tanganyika (*Chara setosa* and *C. zeylanica*). In 1914 Migula in Schröder (1914) reported three species from Kenya (*Chara braunii*, *C. schroederi* and *C. vulgaris*). *Chara schroederi* MIGULA in SCHRÖDER was described as a new species in his article. The status of this species was questioned by Wood and Imahori (1965) and they classified it as *Chara globularis* var. *leptosperma* f. *schroederi* (MIG. in SCH.) R.D.WOOD. This species could be *Chara chrysospora* because of the reduced stipulodes and posterior bract-cells (Wood and Imahori 1965) and the orange oospore (from the description). The last article refered to here is Wood (1955) in which he reported three species and one variety (*Nitella mucronata*, *Chara zeylanica*, *C. setosa* and *C. setosa* var. *tanganyikae*) from Lake Tanganyika.

Some of the species found in the actual area are cosmopolitan species such as *Chara braunii*, *C. vulgaris*, *C. globularis* and *Nitella mucronata* and are common in South Africa (Wood 1978) and in North Africa (Corillion 1973). *Chara zeylanica* is a species found in tropical and subtropical areas, including South Africa (Wood 1978) and finds also in Egypt and Senegal (Corillion (1973). *Chara setosa* is an Asian – African species (Wood 1978) and *Chara setosa* var. *tanganyikae* is endemic to central Africa (Wood 1955). *Nitella knightiae*, *Chara chrysospora*, and *C. tanyglochis* are all endemic to Africa (Wood 1978). *Chara socotrensis* is found in Somalia and Yemen but also recently in South America.

The charophytes flora of east and central Africa is only partly known, it is tropical and a more systematic survey will undoubtly produce interesting results.

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