

CHARA HELLENICA SPEC. NOV.
AND OTHER CHAROPHYTES COLLECTED IN CORFU
AND AMORGOS ISLANDS (GREECE) IN 2008

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In Corfu charophytes were found both in fresh-, brackish water and salt lakes. The three freshwater lakes are highly eutrophic with a rich vegetation of phanerogams. In two of them *Chara globularis* was the only species and in the third only *C. hellenica* was found. Several other eutrophic lakes were without charophytes. In one slightly brackish water lake I found *Chara vulgaris* and in the salt works (Alykes) in the south part of the island I found salt lakes filled with *Lamprothamnium papulosum*. The newly described, *Chara hellenica* has unique characters in cortex structure, bract-cells and the sexual organs. The type locality, Lake Bertonou is an unusual lake, with interesting chemical parameters. In Amorgos *Chara vulgaris* was found in two springs.

Key words: *Chara hellenica*, charophytes, Corfu, Greece, new species

INTRODUCTION

The island of Corfu was visited in the last week of May, and the island of Amorgos in June 2008. The purposes of these visits were mainly to collect charophytes. Most of the plants mentioned in this article are deposited in the Botanical Museum, University of Oslo (Herb. O) and at the Hungarian Natural History Museum (Herb. BP). The scientific names of the charophytes are in accordance with KRAUSE (1997) and BLAŽENČIĆ and BLAŽENČIĆ (2003).

MATERIALS AND METHODS

This work is based on material collected in the given localities in 2008. The salt content of the water was measured with a Hack conductivitymeter (Model 44600/CND/TDS). pH was measured with a Milwaukee pH meter, type pH 52. The calcium and chloride content was measured with Aquamerck test kits.

RESULTS

Corfu

Table 1 provides abiotic parameters and species present for each of the water bodies examined. All the investigated lakes are perennial.

In Corfu island several water bodies were surveyed, and charophytes were found in five of them. The lakes in the Paleokastrites area and Lake Kounoupina were all highly eutrophic and were more or less filled with stands of *Phragmites* and without charophytes. Figure 1 gives the location of each locality.

Table 1. The measured abiotic parameters; specific conductivity, pH, calcium and chloride content and the charophytes (*Chara*, *Lamprothamnium*) found in each locality. In the last column the coordinates for each locality are given

Locality	Specific conductivity $\mu\text{S}/\text{cm}$	pH	Ca^{2+} mg/L	Cl- ppm	Charophyte found	Coordinates
Skotini	250	7.8	34	16	<i>C. globularis</i>	39° 38' 37.61" N 19° 49' 40.32" E
Bertonou	1,200	7.3	170	56	<i>C. hellenica</i>	39° 38' 56.09" N 19° 48' 43.45" E
Gavrolimni	350	7.8	52	20	<i>C. globularis</i>	39° 39' 18.32" N 19° 48' 09.90" E
Korisia	–	8.3	130	1,120	<i>C. vulgaris</i>	39° 26' 43.53" N 19° 55' 28.23" E
Alikes. Res. 1	–	–	–	19,200	<i>L. papulosum</i>	39° 26' 51.20" N 20° 03' 51.05" E
Alikes. Res. 2	–	–	–	24,000	<i>L. papulosum</i>	39° 26' 57.65" N 20° 03' 59.80" E
Amorgos	1,420	–	120	180	<i>C. vulgaris</i>	36° 49' 35.29" N 25° 53' 04.87" E

Lake Skotini

This is a highly eutrophic lake dominated by *Phragmites australis*, with the result that only a small area is open water. Here the bottom is covered with different plants, *Ceratophyllum submersum*, *Zannichellia palustris* subsp. *polycarpa*, *Veronica anagallis-aquatica* and the mosses *Calliergon cordifolium* and *Fontinalis hypnoides*. *Chara globularis* was found growing in dense stands intermingled with the other plants. Specimens of *C. globularis* were up to 15 cm long, very richly fertile and had ripe, black oospores.

The lake has abundant animal life; insects, fishes, frogs and birds.

Lake Bertonou

This is another highly eutrophic lake, surrounded by shrubs and different water plants. My observations were made in an open place at the northwestern part of the lake (Fig. 2), where the bottom was limegyttja. At the time of sampling up to 10–20 m of the lake bottom was dry. Dense stands of charophytes covered the bottom in shallow water, 0–20 cm approximate. In deeper water the charophytes also grew in dense stands, mixed with *Ranunculus eradicatorum* and *Veronica anagallis-aquatica*. The charophyte found is a new species which I have named *Chara hellenica*.



Fig. 1. Map of Corfu with the location of each lake

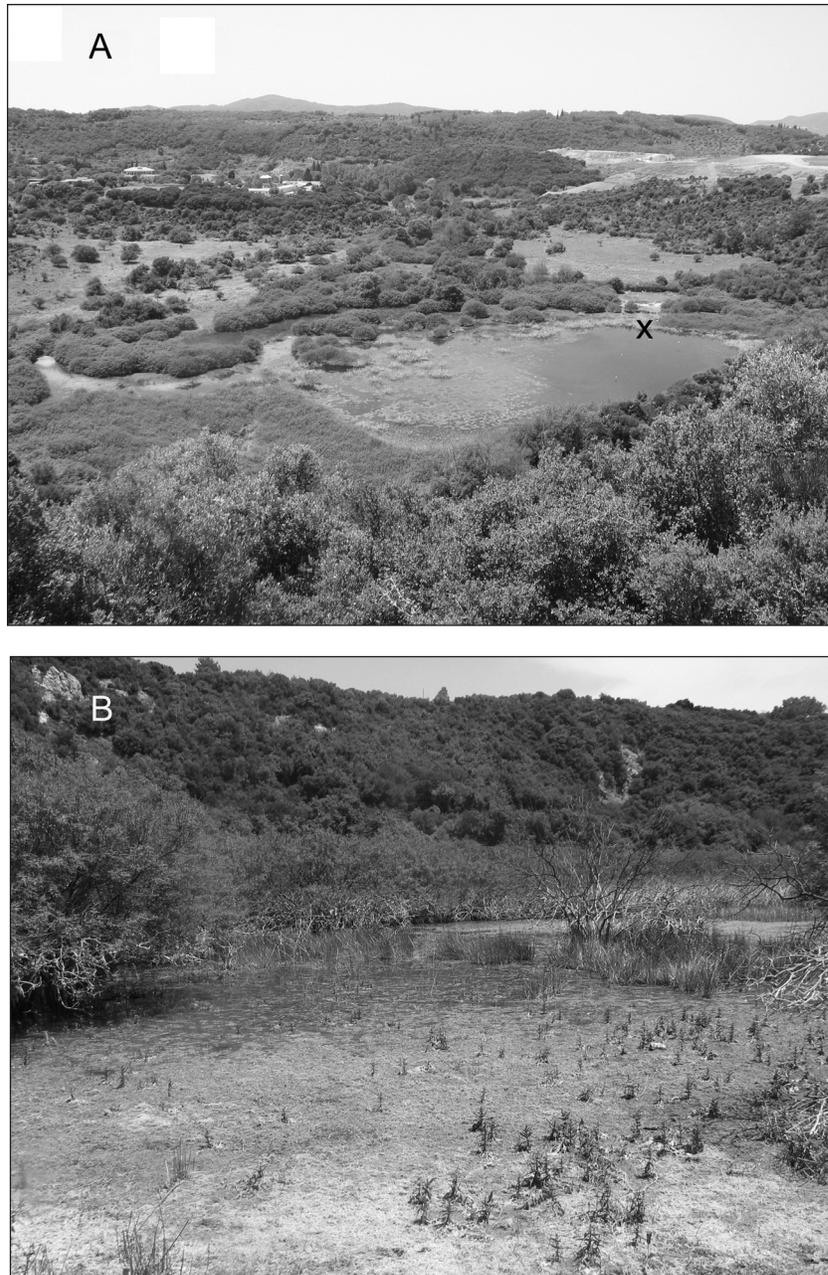


Fig. 2. Lake Bertonou. – A. The × marks the examined part of the shore. – B. In shallow water the bottom is covered with the new species. Photo 26.05.2008

Description of *Chara hellenica* spec. nov.,
found in Lake Bertonou (Fig. 3)

Plantae dioecia, ad 20 cm altae, modice/maxime incrustatae. Caulis corticatus, 1 mm in diametro. Internodia ad 4 cm longa, 1–3 × longa quam phylloidiis, 1.2–1.5 cm longa. Cortex plerumque diplostichus, tylacanthous (cellulae primariae cortis valde prominentes). Aciculae solitariae vel binae, raro trinae, num 2 longae et 1 brevis, acutae, ad 1.5 mm longae. Bi-stipulata, stipulae aequales, brevis vel obscurus vel absens. Verticillii ad 7–8 in nodio, ad 1.2–1.5 cm longi, 5–6 articulari. Articuli terminale acorticales, 2–3 cellulati.

Plantae femineae: Bracteae anteriores 2, ad 1–3 mm longae, bracteae posteriores papilliformae, bracteolae 2, ad 1–1.5 mm longae. Bractlet simule bracteolae. Oogonia 800 µm longa (matura?). Oosporae nigre, 700 µm longae, 500 µm latae, striae 10.

Plantae masculae: Bracteolae 2, bracteae anteriores 2 (absens in compluribus plantis), aequae vel breviter elongatae antheridii. Bractlet absens. Antherida 600–750 µm in diametro.

Plants dioecious, to 20 cm high, medium to heavily incrustated. Axes moderately stout, to 1 mm in diameter. Internodes 1–3 times as long as the branchlets, which are 1.2–1.5 cm long. Cortex commonly diplostichous (1-corticate on some internodes and 3 corticate on some old internodes), strongly tylacanthous. Spine-cells commonly single or in pair, or three together, if so, the third one is short, acute. Spine-cells are densely abundant in young internodes, pointing upwards in the lowest and downwards in the upper part of the internodes. Old internodes have few spine-cells. The spine-cells are as long as the axes diameter, or longer, up to 1.5 mm long. Stipulodes in two tiers, 2 sets per branchlet, short and obscure, missing in many specimens. Branchlets 7–8 in a whorl, 1.2–1.5 cm long, segments 5–6 of which 4–5 are 2-corticate, end segment 2–3-celled, naked. Gametangia on separate plants, at 3–4 lowest branchlet nodes.

Female plants: Anterior bract-cells 2, to 1–3 mm long. Posterior bract-cells papillous or short to 100 µm long. Bracteoles 2, 1–1.5 mm long. Bractlet as long as the bracteoles. Oogonia 800 µm long (ripe?). Oospores black, 700 µm long, 500 µm wide, striae of 10 ridges.

Male plants: Bracteoles 2, anterior bract-cells 2 (not developed in all plants), as long as or shortly longer than the antheridia. Bractlet not seen. Antheridia 600–750 µm in diameter.

Holotype: Greece, Corfu: Lake Bertonou, 26.05.2008, Anders Langangen. Deposited in Botanical Museum, Oslo (Herb. O).

Additional specimens from the same collection have also been examined.

Distribution: Only known from the type locality.

Gavrolimni

This lake is strongly eutrophic and surrounded by dense shrub vegetation of a spiky species of *Rhamnus*. Consequently it was very difficult to reach the lake, except at a drinking place for donkeys. Here there was an opening with abundant charophyte (*Chara globularis*) and moss (*Fontinalis hypnoides*) growth. *C. globularis* was richly fertile, fragile and with anterior bracts as long as the oogonium and rudimentary posterior bracts.

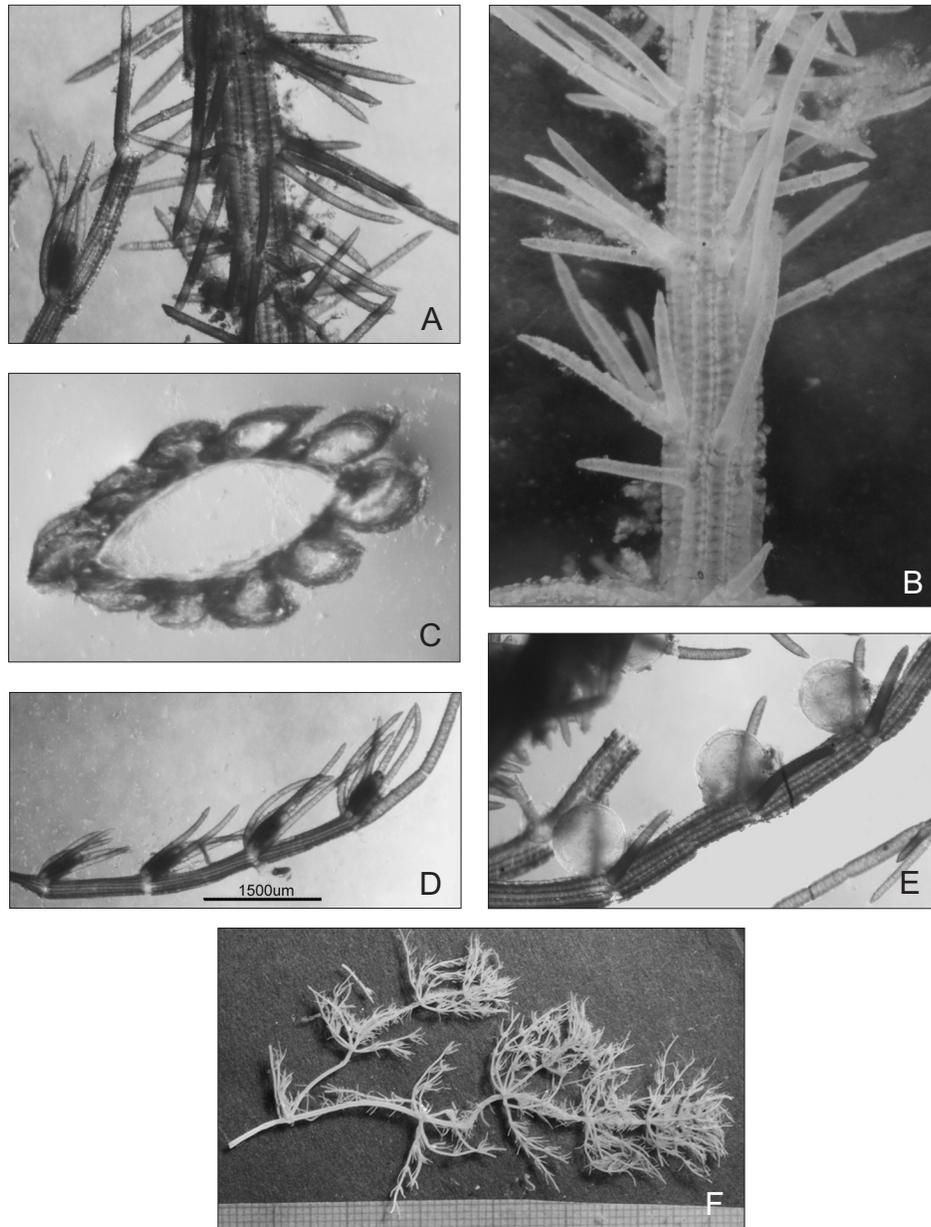


Fig. 3. Important features for *Chara hellenica*. – A, B = Details of stem cortex and spine-cells (stem diameter 650 μm). C = Cross section of stem (600 μm). D = Branchlet with oogonia and long bract-cells, bracteoles and bractlets. E = Branchlet with antheridia (diameter 600 μm). F = Upper part of a specimen, 7 cm long

Lake Korisia

This is a large brackish water lake. In the lake itself I found only *Ruppia maritima*. The lake is surrounded by low grass vegetation or dense stands of *Phragmites australis* and various shrubs. In the grass and the *Phragmites* communities there were several hollows and depressions filled with water. In such places *Chara vulgaris* var. *longibracteata* grew in dense stands. The specimens were up to 15 cm long, richly fertile and with ripe, black oospores. In many of these locations the water level was low, and the exposed charophytes had more or less dried out.

Alikes

This is a big, old saltwork (Alikes) with many different shallow reservoirs. Only the western parts were surveyed.

In reservoir 1 (in the southwest part) the water level was low. The grey, clayish bottom was densely covered with mats of *Lamprothamnium papulosum* and *Ruppia maritima*. *L. papulosum* was up to 7 cm long, richly fertile and with ripe, black oospores.

Reservoir 2 (in the middle part), which was very big, had also much *L. papulosum* and *R. maritima*. In this reservoir the water was deeper, more turbid and the plants were longer.

Amorgos

Chara vulgaris var. *longibracteata* was found growing abundantly in two springs coming from the mountains near the town of Katapola. Specimens were up to 20 cm long and had ripe, brown oospores. This charophyte was growing in dense masses mixed with the filamentous green algae *Oedogonium* sp. and *Mougeotia* sp.

DISCUSSION

The knowledge of the charophyte flora of Greece has been improved in the last decades. Relevant works in this respect are KOUMPLI-SOVANTZI (1997), RAABE and KOUMPLI-SOVANTZI (2000, 2002), LANGANGEN and PAVLIDES (1999), LANGANGEN (2004, 2005, 2007, 2008), and BLAŽENČIĆ *et al.* (2006a, b). In the Balkan Peninsula hitherto 47 species of charophytes have been recorded. Of these more than 80% are to some degree endangered (BLAŽENČIĆ *et al.* 2006a). Most of the species so far found in Greece correspond to the European flora (CORILLION 1957, KOUMPLI-SOVANTZI 1997, BLAŽENČIĆ and BLAŽENČIĆ 2002, BLAŽENČIĆ *et al.* 2006b). In the eastern part of the Mediterranean two eastern species of charophytes have

been recorded, *Chara fibrosa* in Italy (LANGANGEN 2000) and *Chara hydroplitus* in Albania (KASHTA 1994). It is therefore reasonable to believe that species from both distribution areas can be found in Greece.

The main reason for my visit to Corfu was to find the type locality of *Chara corfuensis*. This is a species described by FILARSZKY (1937), and the type locality is imprecisely given as Moraitika et Braganiotika, which is a large area 15–20 km south of Kerkyra. Persistent searching for suitable localities between these two places gave no results. *Chara corfuensis* is today also known from two other localities, Sifnos in Greece (LANGANGEN 2007) and Bacinska Lake in Croatia (BLAŽENČIĆ *et al.* 2006a).

STEPHANIDES (1940) has a list of freshwater algae and plants found in Corfu. Of charophytes he reports *Chara vulgaris* and *C. globularis* as common. He reports of possibly finding of *C. hispida*, which may be *C. corfuensis* or *C. hellenica*, and an interesting find of *Nitella* sp.

As can be seen from Table 1 Lake Bertonou, the type locality for *Chara hellenica* appears to be a special freshwater lake with high content of electrolytes, as can be seen from the values of specific conductivity and calcium content. This should be studied in more detail, and with better equipment than is at my disposal. The lake is highly eutrophic, and parts are overgrown with different water plants (Fig. 1).

The new species, *Chara hellenica* has unique characteristics, which separate it from other species, especially the dioecious condition of a diplostichous species. The spine-cells also exhibit key characteristics, varying from single to pairs and three together, and are commonly longer than the stem diameter. Also the features of the bract-cells are special as the anterior are long and the posterior are rudimentary.

Chara galioides has similarities with the new species, but has triplostichous, isostichous cortex, single spine-cells which are short, and verticillate bract-cells. In addition *C. galioides* has bigger antheridia (WOOD 1965, WOOD and IMAHORI 1964). Also, *C. galioides* is a brackish water species, which is not or only slightly incrustated, while *C. hellenica* is a freshwater species which is moderate to highly incrustated.

Chara vulgaris seems to be a relatively common species in Greece, the find in Amorgos seems to be a part of a larger distribution area, at least in the Aegean Sea (LANGANGEN 2004, 2007, 2008).

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