

# *Trochiscia hamzaoglui* (Chlorellales): A New Species from Central Anatolia (Turkey)

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## Abstract

A new species, *Trochiscia hamzaoglui* Atıcı sp. nova, determined from freshwater habitat, Kesikköprü Dam Lake on the Kizilirmak River (Kirşehir, Central Anatolia), and the sample was taken from plankton. This new species was first found in the study of algal samples from the area. Light microscope indicated a clear relationship with the species in the genus *Trochiscia*. Some of the characteristic features of the new taxon include a spine and an irregular cell wall. A comparison with closely related taxa is given on.

## Keywords

Kesikköprü Dam Lake, New Species, Phytoplankton, Turkey, *Trochiscia*

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## 1. Introduction

*Trochiscia* Kütz. (Oocystaceae, Chlorellales) was first detected by Kützing as four species: *T. solitaria* Kützing, *T. dimidiata* Kützing, *T. quadrijuga* (Turpin) Kützing and *T. elliptica* Kützing [1]. *Trochiscia* is not widespread worldwide and occurs in the phytoplankton of bogs, ponds and lakes, especially in acidic waters. Almost all taxa are freshwater, although a few marine species have been reported [2]. *Trochiscia* species have shown variations in pyrenoid number, construction, cell size and shape, indicating that the genus is much more morphologically diverse than previously thought.

Cells are spherical to sub-spherical and solitary (sometimes gregarious). The cell wall is thick and bears spines or is irregular and variously sculptured (e.g. ridged and sharp spines). The chloroplast is parietal, usually lobed and has one pyrenoid (spine-bearing species), or one to several parietal disks and one pyrenoid (sculptured species). The same species occur in snow and also terrestrially. They are fairly common, with different species colonising aquatic, terrestrial and snow habitats [3]-[6].

*Trochiscia* plankton is permanent or semi-permanent in freshwater systems, especially in temperate waters of

the Northern Hemisphere, with numerous reports from Europe and North America. The genus is also placed in Oocystaceae by some authors.

## 2. Methods

Kesikköprü Dam Lake is located in Kırşehir above 750 m elevation and is 650 ha in size. The maximum depth is 30 m [7] [8]. The lake was built in 1959 on the Kızılırmak River in the Central Anatolian region of Turkey for irrigation and power generation purposes. Study area have continental climate which is relatively dry climate with hot summers and cold winters. The study area lies at 39°22'53E to 39°22'54E longitude and 33°25'14N to 33°28'13N latitude.

The aquatic samples were collected from Kesikköprü Dam Lake in May 2009-2010. Collections were from different localities in the dam lake and from depths ranging from 50 cm near the shore to 25 m at the centre. Each sample was kept in a plastic container filled with the lake water to which 5 mL of 4% formalin was added [9].

Plankton samples were collected twice a month from selected stations of the Dam Lake (Figure 1) and transferred to the laboratory for microscopic studies. The phytoplankton samples were collected with Nansen water collecting by Hydrokiel (45 µ mesh size) apparatus. Water samples for measuring environmental parameters were collected by filling one litre plastic jar with the lake water.

Determination of some physical and chemical properties (pH, temperature, oxygen and light porous effect) was reported (Table 1). Water temperature, oxygen, light porous and pH were measured at the time of sampling, with a portable tester YSU using YSI 6600 multiple probe [10]. Freshwater samples of the materials were stored in formaldehyde solution, and herbarium numbers of the species of algae examined are listed in Gazi MACC (Gazi University Microalgal Culture Collection) [11]. Identification of species was carried out by examination

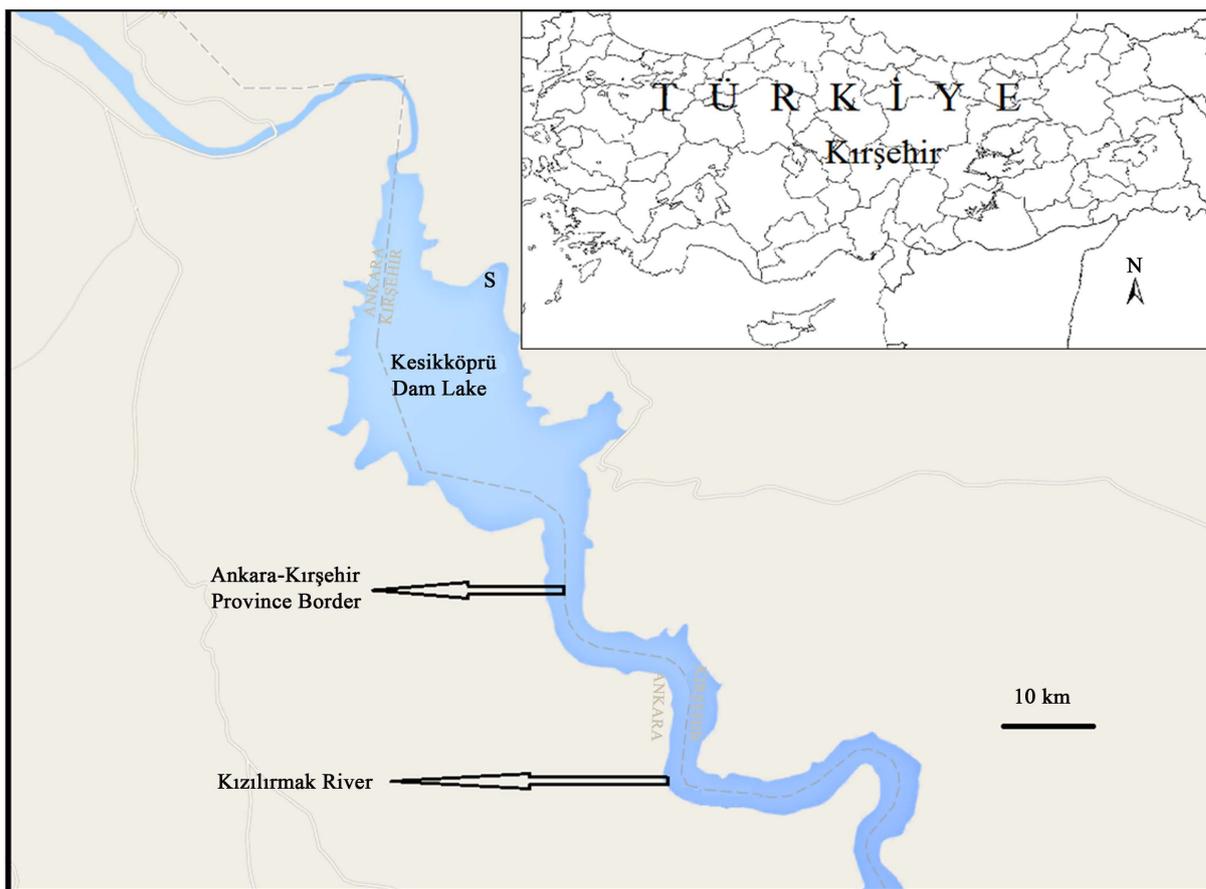


Figure 1. Location of Kesikköprü Dam Lake in Turkey (S: Station).

**Table 1.** Some physical and chemical parameters of Kesikköprü Dam Lake.

Months (2009-2010 monthly average values)	pH	Water temperature (°C)	Oxygen (mg·l <sup>-1</sup> )	Light porous effect (m)
April	8.14	13.6	9.48	7
May	8.5	17.2	9.36	6.1
June	7.76	19.8	8.62	7.7
July	7.84	22.2	8.04	8.9
August	8.12	23	8.28	9.6
September	8.16	18.4	8.36	7.1
October	8.8	14.5	8.7	6.6
November	8.24	9.7	9.9	7.6
December	8.04	5.2	9.72	8.6
January	7.8	4	10.6	10.8
February	7.8	4.4	11.2	9.2
March	8.04	10.4	9.06	7

under a research light microscope (LM) [3]-[6], slides and preserved material were examined with a Nikon FX microscope equipped with a Nikon DXM 1200 (Nikon, Tokyo, Japan), and photographs were taken.

### 3. Results

#### 3.1. Environmental Parameters

The water of Kesikköprü Dam Lake is highly alkaline (pH 8.10) with water temperature being between 4°C - 22.2°C and oxygen level between 8.04 - 11.2 mg·l<sup>-1</sup> (Table 1). According to some physical-chemical properties, this species can exist in a wide range of temperatures, and prefers high-level oxygen and alkaline areas. Kesikköprü Dam Lake waters take in freshwater from high mountains and also from snow.

#### 3.2. Specimens of Related Species Examined

*Trochiscia hamzaoglu* was described (Figure 2) from a freshwater planktonic habitat, Kesikköprü Dam Lake in the Central Anatolian region of Turkey, and was under observation for two years. Using morphological, cytological and ecological characters [12]-[14], this species was shown to have some differences from the other *Trochiscia* members [15]-[19].

The species is differentiated by details of cell morphology, especially the structure and ornamentation of the cell walls (Table 2). Many descriptions of *Trochiscia* species require culturing to confirm their assignment to this genus, as many taxa may represent zygospores or aplanospores of the other Chlorophycean algae.

#### 3.3. New Species Description

##### Classification

**Empire** Eukaryota

**Kingdom** Plantae

**Phylum** Chlorophyta

**Class** Trebouxiophyceae

**Order** Chlorellales

**Family** Oocystaceae

**Genus** *Trochiscia* Kütz., 1834.

*Trochiscia hamzaoglu* Atıcı sp. nova (Figure 2)

**Holotype**

Turkey-Kırşehir: Kesikköprü Dam Lake, 29°23.283'N-33°25.593'E. Permanent samples deposited in the Gazi. MACC (Gazi University, Ankara, Turkey) are materials collected as phytoplankton (known only from type locality).

**Type material**

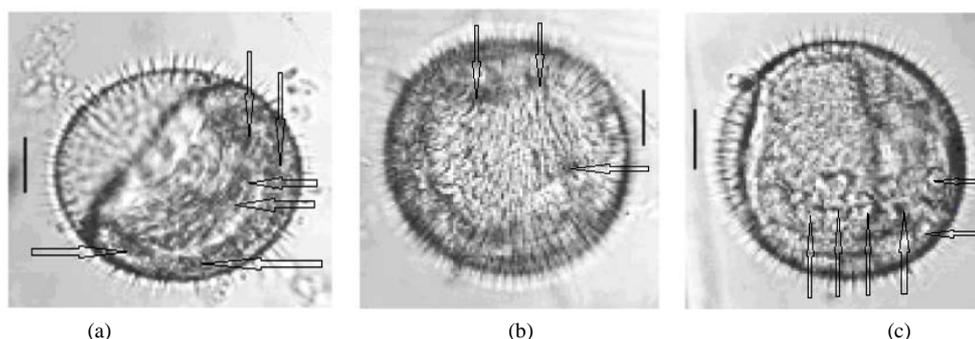
Planktonic sample, collected in June 12, 2010.

**Etymology**

This new species is named in honour of the Turkish Botanist Prof. Dr. Ergin Hamzaoğlu (Biology Education Department, Gazi University, Ankara).

**Morphometry**

*Trochiscia hamzaoglui* is described in **Figure 2**. It is shown to have some differences from the other *Trochiscia* members [20]-[23]. The key of the genera *Trochiscia* is consolidated in this new species (**Table 3**).



**Figure 2.** *Trochiscia hamzaoglui* Atıcı sp. nova' s discoid pyrenoids, nuclei and autospore or zoospore photos (scales 10  $\mu$ ). (a) Discoid pyrenoids; (b) Nuclei; (c) Autospores or zoospores.

**Table 2.** Comparison of characters for selected members of *Trochiscia*.

	<i>Trochiscia hamzaoglui</i>	<i>Trochiscia granulate</i>	<i>Trochiscia verrucosa</i>	<i>Trochiscia hystrix</i>	<i>Trochiscia planctonica</i>
Habitat	planktonic	planktonic	epiphytic + planktonic	epiphytic + planktonic	planktonic
Cell type	spherical unicellular	spherical	discoid	spherical	discoid
Diameter ( $\mu$ m)	35 - 52	20 - 35	32 - 40	42 - 63	48 - 70
Pyrenoid	several	several	big one	small one	several
Nuclei	one or several	several	one	one	one
Spine length ( $\mu$ m)	3 - 5	2 - 4	8 - 12	4 - 7	8 - 13
Spine type	sharp	soft and smooth	long , strict	sharp, thornlike	soft and long
Mucilage thickness ( $\mu$ m)	2 - 5	1 - 3	6 - 8	2 - 3	4 - 6
Reproduction	protoplast division or autospore and zoospore	protoplast division	autospore and zoospore	protoplast division or autospore and zoospore	protoplast division
Color of species	Light green	Green	Green	Green	Light green

**Table 3.** Key of genera *Trochiscia* (close species of *T. hamzaoglui*).

1. Cells with reticulate ornamentation without mucilaginous envelope.	2
1.Cells with reticulate ornamentation and mucilaginous envelope, often within short spines	3
2.Cells with reticulate on surface and surface granules	<i>Trochiscia granulate</i>
2.Cells with reticulate on surface and including long spines and papilla	4
3.Cells with reticulate on surface covered with mucilage and short sharp spines	<b><i>Trochiscia hamzaoglui</i></b>
3.Cell with reticulate covered with fine short spines and wide spines like thorn	<i>Trochiscia verrucosa</i>
4.Cells with reticulate ornamentation and long spines including lots of pyrenoid	<i>Trochiscia hystrix</i>
4.Cells with reticulate covered papillae, often within a thin mucilaginous envelope	<i>Trochiscia planctonica</i>

**According to the custody**

Unicellular cells usually exist as chromatophores;  
 Covered with fairly large spines;  
 Has several discoid pyrenoids (**Figure 2(a)**);  
 One or several nuclei (**Figure 2(b)**);  
 Solitary, spherical and with cells of 35 - 52 µm in diameter;  
 Asexual reproduction by division of the protoplast into 2 - 8 to many autospores or zoospores (**Figure 2(c)**);  
 Sexual reproduction unknown;  
 In addition, the cell wall is covered with sharp spines 3 - 5 µm long.

**4. Conclusion**

The aquatic samples were collected from Kesikköprü Dam Lake in May 2009-2010. Collections were from different localities in the dam lake and from depths ranging from 50 cm near the shore to 25 m at the centre. Each sample was kept in a plastic container filled with the lake water to which 5 mL of 4% formalin was added. *Trochiscia hamzaoglu* was described (**Figure 2**) from a freshwater planktonic habitat, Kesikköprü Dam Lake in the Central Anatolian region of Turkey, and was under observation for two years. Using morphological, cytological and ecological characters, this species was shown to have some differences from the other *Trochiscia* members. The present study records the presence *Trochiscia hamzaoglu* as a new species.

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