ANNALI DI BOTANICA
Ann. Bot. (Roma), 2013, 3: 51–85
Journal homepage: http://annalidibotanica.uniroma1.it

THE FRESHWATER ALGAL FLORA OF THE "GIARA DI GESTURI" (SARDINIA, ITALY)

ALFINITO S.*, IBERITE M.

Department of Environmental Biology, Sapienza, University of Rome. 00185 Rome, Italy
**Corresponding author: Telephone: +39 077350734; e-mail: silvia.alfinito@uniroma1.it*

(RECEIVED 15 MARCH 2013; RECEIVED IN REVISED FORM 02 APRIL 2013; ACCEPTED 03 APRIL 2013)

ABSTRACT – The "Giara di Gesturi" is a basaltic plateau placed in the central-southern part of Sardinia Island. The present study involves the algal flora of seven ephemeral ponds named "Paulis" present in the Giara. A total of 213 algal *taxa* were identified, distributed as follows in the different classes: Cyanophyceae: 16; Xanthophyceae: 1; Bacillariophyceae: 110; Dinophyceae: 4; Euglenophyceae: 10; Chlorophyceae: 42; Klebsormidiophyceae: 2; Zygnematophyceae: 28. From a qualitative point of view the Bacillariophyceae clearly predominate. The high biodiversity of these environments shows the extreme importance of the ephemeral pools in the Mediterranean environment. This study proves to be extremely promising and further researches are to be hoped.

KEYWORDS: FRESHWATER ALGAE, MEDITERRANEAN EPHEMERAL PONDS; SARDINIA, ITALY

INTRODUCTION

Ponds are recognized as particularly important biotopes for many organisms (Nicolet et al., 2004). They support large numbers of species and several rare and threatened animal and plant species (Della Bella et al., 2008; Grillas et al., 2004a, b), and they strongly contribute to freshwater biodiversity especially in the Mediterranean region (Williams et al., 2004).

Very few studies involving the algal flora of the large, ephemeral ponds named "Paulis" of the "Giara di Gesturi" were carried out: a preliminary account (108 *taxa*) was reported in Fumanti & Cavacini (1997). More recentely, in an extensive study on the diatom flora of Sardinia, Lange-Bertalot et al. (2003) described several new species, two new genera, a new subgenus, a new subspecies and a new variety, mostly from the same Paulis of the Giara.

The present study has been based on several samples collected in 1993 and 1994 from seven Paulis, where the water depth was suitable for the algal growth.

MATERIALS AND METHODS

Study area

The "Giara di Gesturi" is a basaltic plateau placed in the central-southern part of Sardinia Island (Fig. 1). It covers more than 40 Km^2 with an average altitude of 550 m a.s.l.

The Giara is identified morphologically by a frame whose height varies from 10 to 30 cm. From a geological point of view the base is composed of Miocenic sedimentary series, characterized by sandstone and marl covered by basaltic lavas. There are two main reliefs modest in size: Mtn. Zepparedda (609 m a.s.l.) and Mtn. Zeppara Manna (580 m a.s.l.) (Marchi et al., 1989). The rainfall is 741.5 mm per year on average; the average temperature is 14.7 °C with a minimum of about 3.8 °C in January and maximum in July (30.6 °C) (data for Mandas, 421 m a.s.l., Silvano et al., 1998). The climate is Mediterranean with hot, dry summers and mild, rainy winters.

The tableland has several large ponds called "Paulis" that cover about 120 ha (2.18% of the total surface of the Giara). These ponds are characterized by a wet period (October-June) in which they are tilled with rain water that is

doi: 10.4462/annbotrm-10242

Fig. 1. - "Giara di Gesturi", Central Sardinia, Italy. Maps of the area showing studied Paulis' localization (stars).

not absorbed by the basaltic ground, and a dry period (June-October) in which the smaller pools are completely dried, and in the larger ones the water level decreases from 100 to 1 cm (Lange-Bertalot et al, 2003).

As regards the vascular flora, this area has a strong Mediterranean component with 32% of Steno-Mediterranean and 24% of Eury-Mediterranean species. Of particular value is the endemic component represented by 12% of the total *taxa* (Mossa et al., 1989). The woodland vegetation is dominated by *Quercus ilex* L. and, in the cooler areas, by *Q. pubescens* Willd. In general, human action was decisive promoting the wooded pastures with *Q. suber L.* The Maquis is fairly widespread; it connects the different types of wood and is locally dominated by typical Mediterranean species (*Phillyrea latifolia* L., *Arbutus unedo* L., *Pistacia lentiscus* L. *Olea europaea* L. var. *sylvestris* Brot., *Mirtus communis* L. *Cistus monspeliensis* L. e *C. salvifolius* L.). The meadows that occupy areas with deeper soils are generally dominated by many species of Fabaceae and Poaceae. In the more arid areas, with shallow soils, prevail therophytic mediterranean species of small value forage. Where grazing is excessive *Asphodelus microcarpus* Salzm. et Viv. tends to prevail, because it not liked by cattle. The vegetation of Paulis presents large variations depending on the size of the reservoir of water. In spring there are extensive communities characterized by white blooms of *Ranunculus aquatilis* L., this species is together with *Baldellia ranunculoides* (L.) Parl., while Cyperaceae and Juncaceae of small size surround the ponds (Mossa et al., 1989).

The "Giara di Gesturi" is defined as " biotopes of national value' due to the peculiar ecological, botanical and zoological characteristics. Now it is a SAC for the Natura 2000 Network (ITB041112).

Samplings

Samplings were carried out as follows:

Pauli Bartili, Pauli Camise, Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli S'Ala de Mengianu: 11.05.1993 (B. Fumanti and S. Alfinito); Pauli Oromeo, Pauli Perdosu: 25.05.1994 (A. Bardi).

Due to the extremely low depth of the most of Paulis, the samples were collected mainly by squeezing aquatic plants and scraping off different natural substrata. All the samples were immediately fixed with 4% neutral formaldehyde.
As regards diatoms, the material was treated with a mix of sulphuric and nitric acid and rinsed several times with distilled water. The cleaned material was mounted in Hyrax for light microscope (LM) studies.
In this paper the classification of the algae, given in van den Hoek et al. (1995), was followed at classes level. For *taxa* nomenclature checking references used were:
Cyanophyceae: Anagnostidis & Komárek (1989; 1990); Komárek & Anagnostidis (1999; 2005)
Xanthophyceae: Ettl (1978)
Dinophyceae: Popovský & Pfiester (1990)
Euglenophyceae: Huber-Pestalozzi (1955)
Chlorophyceae, Volvocales: Huber-Pestalozzi (1961)
Chlorophyceae, Chlorococcales: Komárek & Fott (1983)
Chlorophyceae, Oedogoniales: Mrozińska (1985)
Klebsormidiophyceae: Prescott (1951)
Zygnematophyceae: Coesel & Meester (2007); Croasdale et al. (1983); Förster (1982); Prescott et al. (1972; 1975; 1977; 1981; 1982); Růžička (1977; 1981)

As regards the Bacillariophyceae, the terminology used in this paper is that suggested by Anonymous (1975), Krammer & Lange-Bertalot (1986; 1988; 1991a; 1991b; 2000) and Round et al. (1990). The classification follows Simonsen (1979), Round et al. (1990) and Krammer & Lange-Bertalot (2000). The ecological characteristics of the species are taken, among others, from Lange-Bertalot & Metzeltin (1996); Torrisi & Dell'Uomo (2009) and Hofmann et al. (2011).
For each *taxon* a reference to the author we followed for identification, cell dimensions, striae density and other LM characteristics are given, together with the distribution in the Paulis of Giara.

RESULTS

Taxonomic account

CYANOPHYCEAE

CHROOCOCCALES

Fam. Synechococcaceae Komárek et Anagnostidis 1995

Johannesbaptistia De Toni 1934

Johannesbaptistia pellucida (Dickie) Taylor et Drouet 1938
Komárek & Anagnostidis (1999) fig. 151
Remarks: cells 2.5 x 5 µm.
Distribution: Pauli Oromeo. Rare.

Fam. Merismopediaceae Elenkin 1933

Gomphosphaeria Kützing 1836

Gomphosphaeria aponina Kützing 1836
Komárek & Anagnostidis (1999) fig. 290
Remarks: cells 8-9 x 4-4.5 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.

Merismopedia Meyen 1839

Merismopedia warmingiana Lagerheim 1883
Komárek & Anagnostidis (1999) fig. 218

Remarks: cells 1-1.2 μm in diameter.
Distribution: Pauli Maiori. Rare.

Snowella Elenkin 1938

Snowella lacustris (Chodat) Komárek et Hindák 1988
Komárek & Anagnostidis (1999) fig. 270
Remarks: cells 2-2.5 x 2 μm.
Distribution: Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli S'Ala de Mengianu. Frequent.

Fam. Chroococcaceae Nägeli 1849

Chroococcus Nägeli 1849

Chroococcus dispersus (Keissler) Lemmermann 1904
Komárek & Anagnostidis (1999) fig. 373
Remarks: cells 4-5 μm in diameter.
Distribution: Pauli Oromeo. Not frequent.

Chroococcus microscopicus Komárková-Legnerová et Cronberg 1994
Komárek & Anagnostidis (1999) fig. 367
Remarks: cells very small, 0.8-1 μm in diameter.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo. Quite frequent.

Chroococcus obliteratus Richter 1886
Komárek & Anagnostidis (1999) fig. 394
Remarks: cells 8 μm in diameter.
Distribution: Pauli Bartili, Pauli Maiori. Not frequent.

OSCILLATORIALES

Fam. Pseudanabaenaceae Anagnostidis et Komárek 1988

Spirulina Turpin ex Gomont 1892

Spirulina major Kützing 1843
Komárek & Anagnostidis (2005) fig. 173
Remarks: trichomes 1.8-2 μm in diameter.
Distribution: Pauli S'Ala de Mengianu. Rare.

Fam. Pseudanabaenaceae Anagnostidis et Komárek 1988

Geitlerinema (Anagnostidis et Komárek) Anagnostidis 1989

Geitlerinema acutissimum (Kuffer.) Anagnostidis 1989
Komárek & Anagnostidis (2005) fig. 133
Remarks: length 2.5 μm; breadth 1 μm.
Distribution: Pauli Murtas. Rare.

Oscillatoria Vaucher ex Gomont 1892

Oscillatoria princeps Vaucher ex Gomont 1892
Komárek & Anagnostidis (2005) fig. 883
Remarks: length 3-3.5 μm; breadth 18-20 μm.
Distribution: Pauli S'Ala de Mengianu. Quite frequent.

Oscillatoria sancta (Kütz.) Gomont 1892
Komárek & Anagnostidis (2005) fig. 890
Remarks: length 2.5-3 μm; breadth 18-21 μm.
Distribution: Pauli Bartili, Pauli Camise, Pauli Maiori. Quite frequent.

NOSTOCALES

Fam. Nostocaeae Eichler 1886

Anabaena Bory ex Bornet et Flahault 1886

Anabaena oscillarioides Bory ex Bornet et Flahault 1888
Huber-Pestalozzi (1938) Fig. 125
Remarks: length 4-5 μm; breadth 3.5- 4 μm; heterocysts 8 x 4 μm; akinetes 34-40 x 8-10 μm.
Distribution: Pauli Bartili, Pauli Oromeo, Pauli Perdosu. Frequent.

Nodularia Mertens ex Bornet et Flahault, 1886

Nodularia harveyana (Thw.) Thuret 1875
Huber-Pestalozzi (1938) Fig. 105
Remarks: length 6-6,5 μm; breadth 2 μm; heterocysts 6.5 x 5 μm; akinetes 7-8 μm in diameter.
Distribution: Pauli Bartili, Pauli Oromeo. Quite frequent.

Nostoc Vaucher ex Bornet et Flahault, 1886

Nostoc cfr. ***spongiaeforme*** Agardh v. ***tenue*** Rao 1936
Desikachari (1959) Pl. 68 fig.2
Remarks: cells 3.5-4 μm in diameter; heterocysts 6-7 x 7 μm. No akinetes were found so the identification is doubtful.
Distribution: Pauli Bartili, Pauli Camise, Pauli Murtas, Pauli Oromeo. Quite frequent

Fam. Rivulariaceae Kützing 1843

Gloeotrichia Agardh ex Bornet et Flahault 1886

Gloeotrichia longiarticulata G. S. West 1907
Huber-Pestalozzi (1938) fig. 72
Remarks: trichomes 5 μm in diameter; heterocysts globose to broadly elliptic, 11 x 8-11 μm.
Distribution: Pauli Bartili. Rare.

Gloeotrichia natans (Hedwig) Rabenhorst 1847
Huber-Pestalozzi (1938) fig. 70
Remarks: trichomes 6-7 μm in diameter; heterocysts 8-9 x 8 μm; akinetes 80-110 x 18-20 μm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli S'Ala de Mengianu. Frequent.

DINOPHYCEAE

PERIDINIALES

Fam. Peridiniaceae Ehrenberg 1838

Peridinium Ehrenberg 1832

Peridinium cinctum Ehrenberg 1838
Popovský & Pfiester (1990) fig. 172
Remarks: length 48-50 µm; breadth 45 µm.
Distribution: Pauli Bartili. Rare.

Peridinium umbonatum Stein 1883
Popovský & Pfiester (1990) fig. 200
Remarks: length 20-24 µm; breadth 18-19 µm.
Distribution: Pauli Bartili, Pauli S'Ala de Mengianu. Sporadic.

Peridinium lomnickii Woloszynska 1916
Popovský & Pfiester (1990) fig. 186
Remarks: length 32-34 µm; breadth 24 µm.
Distribution: Pauli Oromeo. Sporadic.

DINOCOCCALES

Fam. Dinococcaceae Fott 1960

Cystodinium Klebs 1912

Cystodinium cornifax (Schilling) Klebs 1912
Huber-Pestalozzi (1950) fig. 283
Remarks: length 38-48 µm; breadth 15-19 µm.
Distribution: Pauli Murtas, Pauli Oromeo. Sporadic.

XANTHOPHYCEE

MISCHOCOCCALES

Fam. Ophiocytiaceae Lemmermann 1899

Ophiocytium Nägeli 1849

Ophiocytium majus Naegeli 1849
Ettl (1978) fig. 501
Remarks: length 38-60 µm; breadth 5-6 µm.
Distribution: Pauli Maiori, Pauli S'Ala de Mengianu. Rare.

EUGLENOPHYCEAE

EUGLENALES

Euglena Ehrenberg 1830

Euglena spirogyra Ehrenberg 1838
Huber-Pestalozzi (1955) fig. 81
Remarks: length 86-88 µm; breadth 10 µm.
Distribution: Pauli Camise, Pauli Murtas. Rare.

Trachelomonas Ehrenberg 1835

Trachelomonas dybowskii Drezelpolski 1922
Huber-Pestalozzi (1955) fig. 465
Remarks: length 20 µm; breadth 16-17 µm.
Distribution: Pauli Maiori. Sporadic.

Trachelomonas granulosa Playfair 1916
Huber-Pestalozzi (1955) fig. 641
Remarks: length 21 µm; breadth 18-19 µm.
Distribution: Pauli Maiori. Sporadic.

Trachelomonas intermedia Dangeard 1902
Huber-Pestalozzi (1955) fig. 467
Remarks: length 20-21 µm; breadth 15-18 µm.
Distribution: Pauli Maiori, Pauli Murtas. Sporadic.

Trachelomonas stokesi Drezelpolski emend. Deflandre 1926
Huber-Pestalozzi (1955) fig. 476
Remarks: length 15-16 µm; breadth 13-14 µm.
Distribution: Pauli Murtas. Rare.

Trachelomonas volvocina Ehrenberg 1833
Huber-Pestalozzi (1955) fig. 349
Remarks: length 11-12 µm; breadth 10-11 µm.
Distribution: Pauli Maiori, Pauli Murtas, Pauli S'Ala de Mengianu. Quite frequent..

Fam. Phacaceae Kim, Triemer et Shin 2010

Phacus Dujardin 1841

Phacus brachykentron Pochmann 1952
Huber-Pestalozzi (1955) fig. 234
Remarks: length 25 µm; breadth 20 µm.
Distribution: Pauli Camise. Rare.

Phacus caudatus Hübner 1886
Huber-Pestalozzi (1955) fig. 236
Remarks: length 19-21 µm; breadth 16 µm.
Distribution: Pauli Camise. Rare.

Phacus lemmermannii (Swirenko) Skvortzov 1928
Huber-Pestalozzi (1955) fig. 266
Remarks: length 37-38 µm; breadth 30 µm.
Distribution: Pauli Maiori. Sporadic.

Phacus tortus (Lemm.) Skvortzov 1928
Huber-Pestalozzi (1955) fig. 309
Remarks: length 80 µm; breadth 42 µm.

Distribution: Pauli Murtas. Rare.

BACILLARIOPHYCEAE

MELOSIRALES

Fam. Melosiraceae Kützing, 1844

Melosira Agardh 1827

Melosira varians Agardh 1827

Hofmann et al. (2011) Pl. 1 figs 6-9

Remarks: valve diameter 12-23 µm.
Distribution: Pauli S'Ala de Mengianu. Frequent.
Ecology: species characteristic of β mesotrophic environments.; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: xenosaprobic-α mesosaprobic.

THALASSIOSIRALES

Fam. Thalassiosiraceae Lebour, 1930 emend. Hasle, 1973

Cyclotella (Kütz.) Brébisson, 1838

Cyclotella meneghiniana Kützing, 1844

Krammer & Lange-Bertalot (1991a) Pl. 44: 1-10

Syn. *Cyclotella kuetzingiana* Thwaites, 1848
Remarks: valve diameter 10-18 µm; c. 7 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: Species characteristics of meso-eutrophic environments; pH: alkaliphilous; salinity: halophilous; saprobiety: β-α mesosaprobic.

FRAGILARIALES

Fam. Fragilariaceae Hustedt, 1930

Fragilaria Lyngbye, 1819

Fragilaria acus (Kütz.) Lange-Bertalot 2000

Hofmann et al. (2011) Pl. 5 figs 1-5

Syn. *Synedra acus* Kützing 1844
Ulnaria acus (Kütz.) Aboal in Aboal et al., 2003
Remarks: length 78-125 µm; breadth 5-6 µm; 12-13 striae in 10 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: salinity: oligohalobe (indifferent); pH: alkaliphilous; saprobiety: β-α mesosaprobic

Fragilaria vaucheriae (Kütz.) Petersen 1938

Hofmann et al. (2011) Pl. 9 figs 1-7

Syn. *Fragilaria capucina* v. *vaucheriae* (Kütz.) Lange-Bertalot, 1980
Remarks: length 15-22 µm; breadth 4 µm; c. 10 sytiae in 10 µm.
Distribution: Pauli Maiori, rare.

Ecology: salinity: oligohalobe (indifferent); pH: circumneutral; saprobiety: β-α mesosaprobic.

Ulnaria (Nitzsch) Compère, 2001

Ulnaria ulna (Nitzsch) Compère, 2001
Hofmann et al. (2011) Pl. 5 figs 1-5
Syn. *Synedra ulna* (Nitzsch) Ehrenberg, 1832
Fragilaria ulna (Nitzsch) Lange-Bertalot, 1980
Remarks: length 155-220 μm; breadth 9-9,5 μm; 11-12 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo. Frequent.
Ecology: species characteristic of meso-eutrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic.

EUNOTIALES

Fam. Eunotiaceae Kützing, 1944

Eunotia Ehrenberg, 1837

Eunotia pectinalis (Kütz.) Rabenhorst 1864
Hofmann et al. (2011) Pl.12 figs 1-6
Remarks: length 45-48 μm; breadth 6,5 μm; c. 8 striae in 10 μm.
Distribution: Pauli Oromeo. Rare.
Ecology: species characteristic of oligotrophic environments. pH: circumneutral till acidophylous; salinity: halophobous, tolerant.

Eunotia sardiniensis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 1 figs 1-9
Remarks: length 25-66 μm; breadth 7-10 μm; 12-15 striae in 10 μm. Described as new by Lange-Bertalot et al. (2003), this species, known for the type habitat (Paulis of the Giara) was recently found also in Sierra Nevada, SE Spain (Lange-Bertalot et al., 2011, p. 211).
Distribution: Pauli Maiori, Pauli Oromeo, Pauli Murtas. Quite frequent.
Ecology: ecologically unknown species.

Eunotia soleirolii (Kütz.) Rabenhorst 1864
Hofmann et al. (2011) Pl. 12 figs 7-12
Remarks: length 35-38 μm; breadth 6 μm; c. 9 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Perdosu, Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: species characteristic of oligotrophic environments. pH: circumneutral.

ACHNANTHALES

Fam. Achnanthidiaceae D. G. Mann 1990

Achnanthidium Kützing, 1844

Achnanthidium minutissimum (Kütz.) Czarnecki 1994
Hofmann et al. (2011) Pl. 23 figs 15-19
Syn. *Achnanthes minutissima* Kützing, 1844
Remarks: Length 15-21 μm; breadth 3-3.5 μm; striae c. 26-28 in 10 μm.
Distribution: Frequent in all examined Paulis.
Ecology: species characteristic of oligotrophic environments; pH: circumneutral till alkaliphilous; salinity: oligoahalobous; saprobiety: oligosaprobic.

Lemnicola Round et Basson, 1997

Lemnicola hungarica (Grunow) Round et Basson, 1997
Hofmann et al. (2011) Pl. 25 figs 68-74
Syn.: *Achnanthes hungarica* (Grun.) Grunow in Cleve, Grunow, 1880
Remarks: length 15-20 µm; bradth 5 µm; c. 20 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: Salinity: oligohalobe (indifferent) pH: alkaliphilous; saprobiety: β-α mesosaprobic.

Planothidium Round et Bukhtiyarova, 1996

Planotidium lanceolatum (Bréb. ex Kütz.) Lange-Bertalot 1999
Hofmann et al. (2011) Pl. 24 figs 41-47
Syn. *Achnanthes lanceolata* (Bréb.) Grunow in Cleve, Grunow, 1880
Remarks: length 11-20 µm; breadth 5-7 µm; c. 13 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Frequent.
Ecology: species characteristic of oligotrophic environments; pH: circumneutral till alkaliphilous; salinity: oligoahalobous; saprobiety: oligosaprobic.

Planothidium minutissimum (Krasske) Lange-Bertalot 1999
Hofmann et al. (2011) Pl. 24 figs 63-75
Syn. *Achnanthes lanceolata* v. *minutissima* Krasske, 1938
Remarks: length 6-8 µm; breadth 3 µm; c. 16 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Perdosu, Pauli Camise, Pauli Bartili. Frequent.
Ecology: species characteristic of oligotrophic environments; pH: circumneutral till alkaliphilous; salinity: oligoahalobous; saprobiety: oligosaprobic.

Fam. Cocconeidaceae Kützing, 1844

Cocconeis Ehrenberg, 1838

Cocconeis placentula Ehrenberg, 1838
Krammer & Lange-Bertalot (1991a) Pl. 51 figs 1-5
Remarks: length 15-35 µm; breadth 8-11 µm; c. 20 striae in 10 µm on the raphe valve and 26-28 on the rapheless valve.
Distribution: Frequent in all Paulis.
Ecology: species characteristic of oligotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligosaprobic.

NAVICULALES

Fam. Amphipleuraceae Grunow, 1862

Frustulia Rabenhorst, 1853

Frustulia amosseana Lange-Bertalot in Rumrich et al. 2000
Lange-Bertalot (2001) Pl. 137 figs 1-12
Remarks: length 32-38 µm; breadth 5,5-6 µm; striae c. 25 in 10 µm.
Distribution: Pauli Maiori. Not frequent.
Ecology: cosmopolitan but infrequent species, mostly in intermittently wet habitats with high electric conducivity, drying out during summertime; alkaliphilous (Lange-Bertalot, 2001).

Frustulia vulgaris (Twaites) De Toni 1891
Hofmann et al. (2011) Pl. 61 figs 3-7

Remarks: length 48-50 μm; breadth 10 μm; c.28 striae n 10 μm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: Species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: oligohalobous; saprobiety: oligo-β mesosaprobic.

Fam. Brachysiraceae D. G. Mann in Round et al., 1990

Brachysira Round et D. G. Mann, 1981

Brachysira wygaschii Lange Bertalot in Lange-Bertalot et Moser 1994
Lange-Bertalot & Moser (1994) Pl. 13 figs 1-11
Remarks: length 42-46 μm; breadth 9-10 μm; c. 20-striae in 10 μm.
Distribution: Pauli Bartili, quite frequent.
Ecology: species characteristic of oligotrophic and distrophic environments; saprobiety: oligosaprobic (Lange-Bertalot & Moser, 1994).

Fam. *Diadesmidaceae* D. G. Mann in Round et al., 1990

Diadesmis Kützing, 1844

Diadesmis perpusilla (Grunow) D. Mann 1990
Hofmann et al. (2011) Pl. 49 figs 32-35
Syn. *Navicula perpusilla* Grunow, 1860
Navicula gallica v. *perpusilla* (Grun.) Lange-Bertalot in Lange-Bertalot & Metzeltin, 1996
Remarks: length 8-8.5 μm; breadth 2.5 μm; striae hard to resolve in the light microscope.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: species characteristic of oligotrophic environments. Salinity: oligohalobe (indifferent); pH: circumneutral; aerophilous.

Luticola D. G. Mann in Round et al., 1990

Luticola nivalis (Ehr.) D. Mann 1990
Hofmann et al. (2011) Pl. 45 figs 46-50
Syn. *Navicula mutica* v. *nivalis* (Ehr.) Hustedt, 1911
Remarks: length 20-22 μm; breadth 6,5-7 μm; 18 striae in 10 μm.
Distribution: Pauli Perdosu. Rare.
Ecology: species characteristic of meso-eutrophic environments; pH: circumneutral; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic.

Luticola ventricosa (Kütz.) D. Mann 1990
Lange-Bertalot et al. (2003) Pl. 73 figs 1-9
Syn. *Navicula mutica* v. *ventricosa* (Kütz.) Grunow, 1880
Remarks: length 19-23 μm; breadth 7,5-8 μm; c. 18-19 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Bartili, Pauli Murtas. Rare.
Ecology: tolerant species, found in oligotrophic till eutrophic environments; salinity: oligohalobe (indifferent); pH: circumneutral.

Fam. *Diploneidaceae* D. G. Mann in Round et al., 1990

Diploneis Ehrenberg, 1844

Diploneis elliptica (Kütz.) Cleve 1891

Hofmann et al. (2011) Pl. 65 figs 1-4
Remarks: length 32-36 µm; breadth 20-22 µm; 9-10 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Bartili. Frequent.
Ecology: species characteristic of hypo-oligotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: xeno-oligosaprobic.

Diploneis pseudovalis Husted 1930
Krammer & Lange Bertalot (1986) Pl. 108 figs 11-13
Remarks: length 20-23 µm; breadth 10 µm; 9-10 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: species characteristic of oligo-mesoeutrophic environments; pH: alkaliphilous; salinity: halophobous- oligoahalobous; saprobiety: oligosaprobic.

Fam. Naviculaceae Kützing 1844 emend. D. G. Mann in Round et al., 1990

Caloneis P. T. Cleve, 1894

Caloneis aerophila Bock 1963
Hofmann et al. (2011) Pl 67 figs 20-22
Remarks: length 17-18 µm; breadth 4 µm; c. 20 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, rare.
Ecology: species characteristic of oligotrophic environments; aerophilous.

Caloneis amphisbaena (Bory) Cleve, 1894
Hofmann et al. (2011) Pl. 69 figs 1-5
Remarks: length 68-72 µm; breadth 24-26 µm; c. 15 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, rare.
Ecology: salinity: halophilous; saprobiety: β-α mesosaprobic.

Caloneis schumanniana (Grunow) Cleve 1894
Hofmann et al. (2011) Pl. 68 figs 5-6.
Remarks: length 38-42 µm; breadth c. 9 µm; 18-19 striae in 10 µm.
Distribution: Pauli Maiori, rare.
Ecology: species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: xenosaprobic.

Caloneis silicula (Ehr.) Cleve 1894
Hofmann et al.(2011) Pl. 68 figs 1-4
Remarks: length 47-58 µm; breadth 12-14 µm; 16-18 striae in 10 µm.
Distribution: Pauli Murtas, rare.
Ecology: species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: xenosaprobic.

Lacunicula Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lacunicula sardiniensis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 27 figs 1-15
Remarks: length 10-16 µm; breadth 3.5-4 µm; striae too fine to be resolved by the light microscope, 40-45 in 10 µm.
Distribution: Pauli Perdosu, Pauli Camise. Non frequent.
Ecology: ecologically unknown species.

Mayamaea Lange-Bertalot, 1997

Mayamaea atomus (Kütz.) Lange Bertalot v. ***permitis*** (Hustedt) Lange-Bertalot 1997
Hofmann et al. (2011) Pl. 49 figs 13-19

Syn. *Navicula atomus* v. *permitis* (Hustedt) Lange-Bertalot, 1985
Remarks: length 6,5-7 μm; breadth 3 μm; c. 30 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: salinity: oligohalobe; saprobiety: α mesosaprobic.

Mayamaea crassistriata Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 17 figs 1-10
Remarks: length 7.5-10.5 μm; breadth 3-4 μm; 18-20 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: ecologically unknown species.

Mayamaea elongata Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 17 figs 11-16
Remarks: length 12-14 μm; breadth 3-3.5 μm; 16-18 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: ecologically unknown species.

Mayamaea mediterranea Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 14 figs 1-13
Remarks: length 9-11.5 μm; breadth 3-3.6 μm; 20-21 striae in 10 μm.
Distribution: Pauli Bartili, Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Mayamaea pseudopermitis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 18 figs 1-7
Remarks: length 8-10 μm; breadth 2-2.3 μm; 29-31 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Bartili. Not frequent.
Ecology: ecologically unknown species.

Navicula Bory 1822

Navicula erifuga Lange-Bertalot 1985
Hofmann et al., (2011) Pl. 38 figs 12-16
Rermarks: length 28-33 μm; breadth 5.5-6 μm; 12-13 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: saprobiety: β-α mesosaprobic.

Navicula phyllepta Kützing 1844
Hofmann et al. (2011) Pl. 36 figs: 19-22
Remarks: length 32-33 μm; breadth 7 μm; 18 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Oromeo, Pauli Bartili. Not frequent.
Ecology: salinity: halophilous.

Navicula veneta Kützing, 1844
Hofmann et al. (2011) Pl. 31 figs 44-48
Remarks: length 22-24 μm; breadth 5.5 μm; c. 14 striae in 10 μm.
Distribution: Pauli Camise, Pauli Maiori, Pauli Bartili. Not frequent.
Ecology: species characteristic of α mesosaprobic till eutrophic environments; salinity: halophilous.

Navigiulum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Navigiulum sardiniense Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 24 figs 1-16
Remarks: length 11-16 μm; breadth 3-4 μm; 18-21 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: ecologically unknown species.

Navigiulum spineum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 28 figs 8-18
Remarks: length 12-19 μm; breadth 4-5,5 μm; 17-20 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Camise, Pauli Maiori, Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Navigiulum spinosissisum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 25 figs 1-7
Remarks: length 10-14 μm; breadth 5-6 μm; 15-18 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: ecologically unknown species.

Fam. Neidiaceae Mereschkowsky, 1903

Neidium Pfitzer, 1871

Neidium angustirostratum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 75 figs 12-17
Remarks: length 30-37 μm; breadth 8-8.5 μm; 18-18.5 striae in 10 μm.
Distribution: Pauli Murtas. Not frequent.
Ecology: no data available till now.

Neidium curtihamatum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 77 figs 1-11
Remarks: length 20-36 μm; breadth 6-7 μm; 25-27 in 10 μm.
Distribution: Pauli Murtas. Rare.
Ecology: ecologically unknown species.

Neidium paraffine Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 76 figs 5-9
Remarks: length 30-45 μm; breadth 8-9 μm; 24-26 in 10 μm.
Distribution: Pauli Murtas. Rare.
Ecology: ecologically unknown species.

Neidium sardiniense Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 75 figs 1-11
Remarks: length 25-28 μm; breadth 6.5-9.5 μm; 24-27 striae in 10 μm.
Distribution: Pauli Perdosu, Pauli Camise, Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Fam. Pinnulariaceae D. G. Mann in Round et al., 1990

Pinnularia Ehrenberg, 1843

Pinnularia borealis Ehrenberg, 1843
Hofmann et al. (2011) Pl. 75 figs 27-33
Remarks: length 28 μm; breadth 9 μm; 5 striae in 10 μm. Ony one specimen observed.
Distribution: Pauli Bartili.
Ecology: species characteristic of oligotrophic environments; salinity: oligohalobe (indifferent); pH: circumneutral; aerophilous.

Pinnularia gibba Ehrenberg 1843
Hofmann et al. (2011) Pl. 70 figs 1-5
Remarks: length 85-90 μm; breadth 11,5- 12 μm; c. 6 striae in 10 μm.
Distribution: Pauli Maiori. Rare.

Ecology: Salinity: oligohalobe (indifferent); pH: circumneutral.(Foged, 1981) In acque fortemente mesotrofiche fino eutrofiche (LB1996

Pinnularia infirma Krammer in Krammer et Lange-Bertalot 1985

Krammer (2000) Pl. 48 figs 1-14

Remarks: length 34-38 µm: breadth 6-6.5 µm; c. 10 striae in 10 µm.
Distribution: Pauli Perdosu, Pauli Oromeo, Pauli Bartili. Not frequent.
Ecology: species characteristic of oligotrophic environments.

Pinnularia jarensis Lange-Bertalot et Metzeltin in Lange-Bertalot et al., 2003

Lange-Bertalot et al. (2003) Figs 127: 15-24

Remarks: length 18-26 µm; breadth 5.5-6 µm; 9-9.5 striae in 10 µm.
Distribution: Pauli Perdosu, Pauli Murtas. Sporadica.
Ecology: ecologically unknown species.

Pinnularia spinea Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 88 figs 5-8

Remarks: length 50-90 µm; breadth 9.5-12 µm; 7-7.5 striae in 10 µm.
Distribution: Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Pinnularia subcapitata Gregory 1856

Hofmann et al. (2011) Pl 73 figs 6-10

Remarks: length 29-31 µm; breadth 4.5 µm; 11 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: species characteristic of oligotrophic environments; salinity: oligohalobe (indifferent); pH: circumneutral.

Pinnularia trivialiformis Lange-Bertalot et Metzeltin in Lange-Bertalot et al., 2003

Lange-Bertalot et al. (2003) Pl. 82 figs 19-28

Remarks: length 16-35 µm; breadth 5-6 µm; 11-12 striae in 10 µm.
Distribution: Pauli Perdosu, Pauli Camise. Not frequent.
Ecology: ecologically unknown species.

Pinnularia viridiformis Krammer 1992

Hofmann et al. (2011) Pl. 72 figs 3-4

Remarks: 80-83 µm; breadth 5 µm; 7.5 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: species characteristic of oligotrophic environments.

Fam. Pleurosigmataceae Mereschkowsky, 1903

Gyrosigma Hassall 1845

Gyrosigma acuminatum (Kütz.) Rabenhorst 1853

Hofmann et al. (2011) Pl. 62 figs 1-4

Remarks: length 105-128 µm; breadth 12-13 µm; 18-20 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori. Not frequent.
Ecology: species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic.

Fam. Sellaphoraceae Mereschkowsky, 1902

Fallacia Stickle et D. G. Mann i Round et al., 1990

Fallacia pygmaea ssp. ***subpygmaea*** Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 81 figs 1-9

Remarks: length 20-62 μm; breadth 22-28 μm near the middle, 23-32 towards the ends.
Distribution: Pauli S'Ala de Mengianu, frequent.
Ecology: spcies characteristic of α mesosaprobic till eutrophic environments; salinity: halophilous.

Sellaphora Mereschkowsky, 1902

Sellaphora laevissima (Kütz.) D. Mann 1989

Hofmann et al. (2011) Pl. 41 figs 24-28

Syn. *Navicula laevissima* Kützing, 1844
Rermarks: length 26-30 μm; breadth 8 μm; c. 18 striae in 10 μ.
Distribution: Pauli Maiori. Not common.
Ecology: species characteristic of oligo-mesotrophic environments; ph: circumneutral-indifferent; salinity: halophobous; saprobiety: xenosaprobic.

Sellaphora nana (Hustedt) Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 21 figs 1-14

Syn.: *Stauroneis nana* Hustedt, 2957
Remarks: length 10-21 μm; breadth 3-4.5 μm; striae vetry fine and hardly visible with the light microscope, about 40 in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Camise. Not frequent.
Ecology: ecologically unknown species.

Sellaphora nanoides Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 22 figs 1-20

Remarks: length 14-27 μm; breadth 4.5-7 μm; c. 30 striae in 10 μm.
Distribution: Pauli Perdosu. Not frequent.
Ecology: ecologically unknown species.

Sellaphora pupula (Kütz.) Mereschkowsky 1902

Hofmann et al. (2011) Pl. 41 figs 1-14

Syn.: *Navicula pupula* Kützing, 1844
Remarks: length 18-22 μm; breadth 6.5-7 μm; 20-21 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori. Not frequent.
Ecology: species characteristic of meso-eutrophic environments; pH: circumneutral; salinity: oligoahalobous-halophobous; saprobiety: β-α mesosaprobic.

Sellaphora rectilinearis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 19 figs 12-17

Remarks: length 16-28 μm; breadth 6-7 μm; 20-22 striae in 10 μm.
Distribution: Pauli Bartili, Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Sellaphora sardiniensis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 19 figs 1-9

Remarks: length 9-17 μm; breadth 4-5.5 μm; 22-24 striae in 10 μm.
Distribution: Pauli Perdosu, not common.
Ecology: ecologically unknown species.

Fam. Stauroneidaceae D. G. Mann, 1990

Craticula Grunow 1868

Craticula acidoclinata Lange-Bertalot et Metzeltin1996

Hofmann et al. (2011) Pl. 44 fig. 6

Remarks: length 62-64 µm; breadth 17 µm; 13 striae in 10 µm.
Distribution: Pauli Perdosu, not common.
Ecology: species characteristic of distrophic environments.

Craticula angustilancea Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 12 figs 3-10
Remarks: length 16-18 µm; breadth 4-4.5 µm; striae 28-30 in 10 µm, hardly visible with the light microscope.
Distribution: Pauli Bartili, Pauli Murtas, not common.
Ecology: ecologically unknown species.

Craticula citroides Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 3 figs 13-19
Remarks: length 14.5-18 µm; breadth 5.5-8 µm; 17-19 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Perdosu, Pauli Camise, Pauli Maiori, not frequent.
Ecology: ecologically unknown species.

Craticula fumantii Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 8 figs 1-18
Remarks: length 36-70 µm; breadth 10-15 µm; 17-129 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Perdosu, Pauli Camise, Pauli Bartili. Not frequent.
Ecology: ecologically unknown species.

Craticula lanceola Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 13 figs 1-9
Remarks: length 14-17 µm; breadth 4-5 µm; 22-26 striae in 10 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Not common.
Ecology: no data available till now.

Craticula neglecta Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 11 figs 1-8
Remarks: length 20-25 µm; breadth 6-7 µm; striae too fine to be resolved by the light microscope.
Distribution: Pauli Bartili, Pauli Murtas. Not frequent.
Ecology: ecologically unknown species.

Craticula paramolesta Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 11 figs 12-17
Remarks: length 10-13 µm; breadth 3.5-4 µm; striae very fine and hardly visible with the light microscope, c. 30 in 10 µm.
Distribution: common in all the examined Paulis.
Ecology: ecologically unknown species.

Stauroneis Ehrenberg, 1843

Stauroneis accedens Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 54 figs 1-18
Remarks: length 30-45 µm; breadth 9.5-11.5 µm; 17-21 striae in 10 µm.
Distribution: Pauli Murtas, Pauli Bartili. Rare.
Ecology: ecologically unknown species.

Stauroneis acuta W. Smith 1853
Lange-Bertalot et al. (2003) Pl. 51 figs 1-11
Remarks: length 43-100 µm; breadth 12-16 µm; 12-16 in 10 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Rare.
Ecology: Salinity: oligohalobe (indifferent); pH: circumneutral.

Stauroneis amica Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 68 figs 1-10
Remarks: length 33-37 µm; breadth 12-14 µm; 18-20 striae in 10 µm.

Distribution: Pauli Maiori. Rare.
Ecology: ecologically unknown species.

Stauroneis amicula Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 65 figs 1-17
Remarks: length 17-34 μm; breadth 6.5-8.5 μm; 19-21 striae in 10 μm.
Distribution: Pauli Perdosu, Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: ecologically unknown species.

Stauroneis amplipora Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 41 figs 1-14
Remarks: length 22-45 μm; breadth 8-9.5 μm; 20-22 striae in 10 μm.
Distribution: Pauli Maiori, Pauli Bartili, Pauli Murtas. Rare.
Ecology: ecologically unknown species.

Stauroneis anceps Ehrenberg 1843
Hofmann et al. (2011) Pl. 57 figs 1-5
Remarks: length 52-65 μm; breadth 11-11.5 μm; c. 23 striae in 10 μm.
Distribution: Pauli Perdosu, Pauli Camise, Pauli Oromeo. Not frequent.
Ecology: tolerant species, found in oligotrophic till eutrophic environments.

Stauroneis gracilior Reichardt 1995
Hofmann et al. (2011) Pl. 58 figs 23-26
Remarks: length 48 μm; breadth 9 μm; c. 25 striae in 10 μm. Only one specimen observed.
Distribution: Pauli Camise.
Ecology: species characteristic of oligotrophic environments; pH: circumneutral.

Stauroneis jarensis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 38 figs 1-13
Remarks: length 25-55 μm; breadth 8.5-11 μm; 20-24 striae in 10 μm.
Distribution: Pauli Perdosu, Pauli Camise, Pauli Bartili, Pauli Murtas. Not common.
Ecology: ecologically unknown species.

Stauroneis phoenicenteron (Nitzsch) Ehrenberg 1843
Hofmann et al. (2011) Pl. 55 figs 1-4
Remarks: length 95-98 μm; breadth 21-22 μm; 17-18 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, rare.
Ecology: species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: halophobous; saprobiety: xeno-oligosaprobic.

Stauroneis reichardtii Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 37 figs 1-14
Remarks: length 22-48 μm; breadth 6-11 μm; 21-23 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, rare.
Ecology: ecologically unknown species.

Stauroneis respectabilis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 32 figs 1-5
Remarks: length 85-125 μm; breadth 20-24 μm; 14-16 striae in 10 μm.
Distribution: Pauli Perdosu, rare.
Ecology: ecologically unknown species.

CYMBELLALES

Fam. Anomoeoneidaceae D. G. Mann in Round et al., 1990

Anomoeoneis Pfitzer, 1871

Anomoeoneis sphaerophora Pfitzer, 1871
Hofmann et al. (2011) Pl. 66 fig. 31
Remarks: length 110-125 µm; breadth 40-42 µm; c. 20 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, quite frequent.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments; salinity: halophilous.

Fam. Cymbellaceae Greville, 1833

Encyonema Kützing, 1833

Encyonema minutum (Hilse) D. Mann 1990
Hofmann et al. (2011) Pl. 87 figs 33-40
Syn.: *Cymbella minuta* Hilse in Rabenhorst, 1862
Remarks: length 15-16 µm; breadth 5 µm; c.16 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo. Not frequent.
Ecology: species characteristic of oligo-mesotrophic environments; pH: circumneutral; salinity: oligoahalobous; saprobiety: oligo-mesosaprobic.

Encyonopsis Krammer, 1997

Encyonopsis microcephala (Grunow) Krammer, 1997
Hofmann et al. (2011) Pl. 89 figs 35-39
Syn. *Cymbella microcephala* Grunow in Van Heurck, 1885
Remarks: length 12-15 µm; breadth 3.5-4 µm; 22-23 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, not frequent.
Ecology: species characteristic of oligo-mesotrophic environments; pH: circumneutral-alkaliphilous; salinity: oligoahalobous; saprobiety: xeno-β mesosaprobic.

Encyonopsis minuta Krammer et Reichardt in Krammer, 1997
Hofmann et al. (2011) Pl. 89 figs 25-34
Remarks: length 9-11 µm; breadth c. 3 µm; 24-25 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, not frequent.
Ecology: species characteristic of oligotrophic environments; pH: circumneutral; salinity: oligoalobous-tolerant; saprobiety: oligo- β mesosaprobic.

Fam. Gomphonemataceae Kützing, 1844

Gomphonema Ehrenberg, 1832

Gomphonema acuminatum Ehrenberg 1836
Hofmann et al. (2011) Pl. 93 figs 9-12
Remarks: length 47-50 µm; breadth 13-15 µm; 10-11 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori. Rare.
Ecology: species characteristic of mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic.

Gomphonema parvulum (Kütz.) Kützing 1849

Hofmann et al. (2011) Pl. 99 figs 1-5
Remarks: length 15-25 µm; breadth 5.5-7 µm; 12-14 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Camise, Pauli Maiori, Pauli Oromeo, Pauli Bartili, Pauli Murtas. Not frequent.
Ecology: species characteristic of meso-eutrophic environments; pH: circumneutral-indifferent; salinity: oligoahalobous; saprobiety: β-α mesosaprobic.

Gomphonema subangustatum Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 91 figs 1-15
Remarks: length 10-36 µm; breadth 4-5.5 µm; 13-18 striae in 10 µm.
Distribution: quite frequent in all the examined Paulis.
Ecology: no data available till now.

Gomphonema vibrio Ehrenberg 1843
Hofmann et al. (2011) Pl. 96 figs 1-5
Remarks: length 45-52 µm; breadth 8-8.5 µm; c. 8 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.
Ecology: species characteristic of oligotrophic environments; pH: alkaliphilous.

THALASSIOPHYSALES

Fam. Catenulaceae Mereschkowsky, 1902

Amphora Ehrenberg ex Kützing 1844

Amphora ovalis (Kütz.) Kützing 1844
Hofmann et al. (2011) Pl. 90 figs 1-5
Remarks: length 48-55 µm; breadth 13 µm; 20-22 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo, Pauli Bartili, Pauli Murtas.Quite frequent.
Ecology: species characteristic of oligo-mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic.

Amphora paraveneta Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003
Lange-Bertalot et al. (2003) Pl. 93 figs 1-8
Remarks: length 20-75 µm; breadth 4-9 µm; 18-21 striae in 10 µm.
Distribution: quite common in all the Paulis except Pauli S'Ala de Mengianu.
Ecology: ecologically unknown species.

Halamphora (Cleve) Levkov, 2009

Halamphora montana (Krasske) Levkov 2009
Hofmann et al. (2011) Pl. 92 figs 12-14
Syn.: *Amphora montana* Krasske, 1932
Remarks: length 16-19 µm; breadth 3.5-4 µm; striae very fine and difficult to resolve, about 40 in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Not common.
Ecology: species characteristic of mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic; aerophilous.

Halamphora veneta (Kütz.) Levkov, 2009
Hofmann et al. (2011) Pl. 92 figs 20-25
Syn.: *Amphora veneta* Kützing, 1844
Remarks: length 17-21 µm; breadth 5 µm; c. 20 striae in 10 µm.
Distribution: common in all the Paulis, except Pauli S'Ala de Mengianu and Pauli Murtas.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments; salinity: oligohalobe (indifferent); pH: circumneutral.

BACILLARIALES

Fam. Bacillariaceae Ehrenberg, 1840

Hantzschia Grunow 1877

Hantzschia amphioxys (Ehr.) Grunow 1880

Hofmann et al. (2011) Pl. 102 fugs 1-5

Remarks: length 44-51 µm; breadth 6-7 µm; c. 8 fibulae in 10 µm and 21-23 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Bartili, Pauli Murtas. Not frequent.
Ecology: species characteristic of meso-eutrophic environments; pH: circumneutral-indifferent; salinity: oligoahalobous; saprobiety: oligo-β mesosaprobic; arophilous.

Hantzschia fusiformis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) figs 117: 1-8

Remarks: length 80-110 µm; breadth 6-7 µm; 6.5-7.5 fibulae in 10 µm and 17-18 striae in 10 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Rare.
Ecology: ecologically unknown species.

Hantzschia longa Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 100 figs 1-4.

Remarks: length 200-250 µm; breadth 10-12 µm; 6-7 fibulae in 10 µm and 17-18 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Perdosu, Pauli Camise, Pauli Maiori. Not frequent.
Ecology: ecologically unknown species.

Hantzschia mossae Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 114 figs 4-8

Remarks: length 100-140 µm; breadth 7-8 µm; 8-10 fibulae in 10 µm and 20-21 striae in 10 µm.
Distribution: Pauli Murtas, rare.
Ecology: ecologically unknown species.

Hantzschia nitzschioides Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 115 figs 1-8

Remarks: length 60-110 µm; breadth 6.5-8 µm; 7-9 fibulae in 10 µm and about 21 striae in 10 µm.
Distribution: common in all the examined Paulis.
Ecology: ecologically unknown species.

Hantzschia sardiniensis Lange-Bertalot, Cavacini, Tagliaventi et Alfinito, 2003

Lange-Bertalot et al. (2003) Pl. 112 figs 1-7

Remarks: length 100-150 µm; bradth 9-11 µm; 5-6 fibulae in 10 µm and 14-16 striae in 10 µm.
Distribution: quite common in all the Paulis excepting Pauli Maiori.
Ecology: ecologically unknown species.

Nitzschia Hassall 1845

Nitzschia angustata (W. Smith) Grunow in Cleve et Grunow 1880

Hofmann et al. (2011) Pl. 104 figs 13-17

Remarks: length 78-84 µm; breadth 8 µm; c. 15 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: species characteristic of oligo-mesotrophic environments; pH: circumneutral-alkaliphilous; salinity: oligoahalobous; saprobiety: oligo-mesosaprobic.

Nitzschia calida Grunow in Cleve et Grunow 1880

Hofmann et al. (2011) Pl. 103 figs 5-8

Remarks: length 35-38 µm; breadth 7-7.5 µm; 8 fibulae in 10 µm and 32-33 striae in 10 µm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Bartili, Pauli Murtas. Not common.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments.

Nitzschia constricta (K ütz.) Ralfs in Pritchard 1861

Hofmann et al. (2011) Pl.104 figs 18-22

Ramarks: length 35-40 μm; breadth 5.5-6 μm; c. 16 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Camise, Pauli Bartili. Not frequent.
Ecology: species characteristic of strongly mesotyrophic till eutrophic environments.

Nitzschia debilis (Arnott) Grunow in Cleve et Grunow 1880

Hofmann et al. (2011) Pl. 102 figs 12-17

Remarks: length 20 μm; breadth 8.5 μm; c. 9 fibulae in 10 μm; striae too fine to be resolved by the light microscope. Only one specimen observed.
Distribution: Pauli Bartili.
Ecology: pH: alkaliphilous; salinity: oligohalobe (indifferent); aerophilous.

Nitzschia frustulum Grunow in Cleve et Grunow 1880

Hofmann et al. (2011) Pl. 112 figs 28-34

Remarks: length 25-28 μm; breadth 3-3.5 μm; 11-12 fibulae in 10 μm and 21-22 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, not frequent.
Ecology: species characteristic of strongly mesotyrophic till eutrophic environments; pH: alkaliphilous; salinity: oligohalobe (indifferent); halophilous.

Nitzschia littoralis Grunow in Cleve et Grunow 1880

Krammer & Lange Bertalot (1988) Pl. 30 figs 6-10

Remarks: length 45-50 μm; breadth 14 μm; 6-7 fibulae in 10 μm; striae very fine and difficult ton resolve, about 30-35 in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori. Not common.
Ecology: salinity: halophilous.

Nitzschia lorenziana Grunow in Cleve et Grunow 1880

Krammer & Lange Bertalot (1988) Pl. 86 figs 6-10

Remarks: length 95-103 μm; breadth 5-5.5 μm; 7-8 fibulae in 10 μm and 15-16 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Bartili. Not common.
Ecology: salinity: halophilous.

Nitzschia nana Grunow in van Heurck 1881

Hofmann et al. (2011) Pl. 116 figs 13-14

Remarks: length 42 μm: breadth 3.5 μm; 8 fibulae and c. 30 striae in 10 μm. Only one specimen observed.
Distibution: Pauli Perdosu.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments; salinity: halophilous.

Nitzschia perminuta (Grunow) M. Peragallo 1903

Hofmann et al. (2011) Pl. 112 figs 55-60

Remarks: length 18-20; breadth 3 μm; 12-13 fibulae in 10 μm and 28-30 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: species characteristic of oligotrophic environments; pH: alkaliphilous; salinity: oligohalobe (indifferent).

Nitzschia salinarum Grunow in van Heurck 1880

Hofmann et al. (2011) Pl. 103figs 9-13

Remarks: length 32 μm; breadth 9 μm; 8 fibulae in 10 μm and about 32 striae in 10 μm. Only one specimen observed.
Distribution: Pauli S'Ala de Mengianu.
Ecology: species characteristic of strongly mesotyrophic till eutrophic environments; salinity: halophilous.

Nitzschia tenuis W. Smith 1853

Hofmann et al. (2011) Pl. 106 figs 4-6

Remarks: length 145-150 μm; breadth 5 μm; 12-13 fibulae in 10 μm and 28 striae in 10 μm.
Distribution: Pauli Bartili, rare.
Ecology: species characteristic of mesotyrophic till eutrophic environments; pH: circumneutral; salinity: oligohalobe-tolerant; saprobiety: β- α mesosaprobic.

RHOPALODIALES

Fam. Rhopalodiaceae (Karsten) Topachevskyi et Oksiyuk, 1960

Rhopalodia O. Müller 1895

Rhopalodia gibba (Ehr.) O. Müller 1895

Hofmann et al. (2011) Pl. 122 figs 4-8

Remarks: 67-80 μm; breadth 10-11 μm; 6-7 costae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo, Pauli Bartili. Frequent.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments; pH: alkaliphilous; salinity: oligohalobe (indifferent).

Rhopalodia gibberula (Ehr.) O. Müller 1899

Krammer & Lange Bertalot (1988) Pl. 112 figs 1-6

Remarks: length 28-30 μm; breadth 8-8.5 μm; 3-4 costae in 10 μm.
Distribution: Pauli S'Ala de Mengianu. Not frequent.
Ecology: tolerant species; pH: alkaliphilous (indifferent).

Epithemia Brébisson ex Kützing, 1844

Epithemia adnata (Kütz.) Brébisson, 1838

Hofmann et al. (2011) Pl. 119 figs 5-9

Remarks: length 32-48 μm; breadth 8-9 μm; 4-5 fibulae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo, Pauli Bartili, common.
Ecology species characteristic of strongly mesotrophic till eutrophic environments; pH: alkaliphilous; salinity: halophobous-oligoahalobous.

Epithemia sorex Kützing, 1844

Hofmann et al. (2011) Pl. 121 figs 1-7

Remarks: length 25-30 μm; breadth 9-11 μm; 5-6 fibulae in 10 μm.
Distribution: Pauli Bartili, rare.
Ecology: species characteristic of strongly mesotrophic till eutrophic environments; pH: alkaliphilous; salinity: oligohalobe (indifferent).

SURIRELLALES

Fam. Surirellaceae Kützing, 1844

Surirella Turpin, 1828

Surirella brebissoni Krammer et Lange-Bertalot 1987

Hofmann et al. (2011) Pl. 130 figs 11-21

Remarks: length 25-36 μm breadth 11-13 μm; 16-18 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, Pauli Maiori, Pauli Oromeo, Pauli Bartili. Quite frequent.
Ecology: species characteristic of mesotrophic environments; pH: alkaliphilous; salinity: oligohalobe-tolerant; saprobiety: β mesosaprobic.

Surirella minuta Brébisson ex Kützing 1849

Hofmann et al. (2011) Pl. 131 figs 6-12

Remarks: length 18-26 μm; breadth 9,5-10 μm; 22-24 striae in 10 μm.
Distribution: Pauli S'Ala de Mengianu, not common.
Ecology: species characteristic of mesotrophic environments; pH: alkaliphilous; salinity: oligoahalobous-halophilous; saprobiety: β mesosaprobic.

CHLOROPHYCEAE

VOLVOCALES

Fam. Volvocaceae Ehrenberg 1834

Pandorina Bory 1824

Pandorina morum (Müller) Bory 1824
Huber-Pestalozzi (1961) fig. 881
Remarks: length 12-13 µm; breadth 15-17 µm.
Distribution: Pauli Bartili, Pauli Camise, Pauli Murtas, Pauli S'Ala de Mengianu. Sporadic.

Eudorina Ehrenberg 1832

Eudorina elegans Ehrenberg 1832
Huber-Pestalozzi (1961) fig. 889
Remarks: cells 11- 15 µm in diameter.
Distribution: Pauli Camise. Rare.

CLOROCOCCALES

Fam. Botryococcaceae Wille 1909

Botryococcus Kützing 1849

Botryococcus braunii Kützing 1849
Komárek & Fott (1983) Pl. 113 fig. 4
Remarks: length 8-9 µm; breadth 3-4 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Sporadic.

Dictyospharium Nägeli 1849

Dictyosphaerium ehrenbergianum Naegeli 1849
Komárek & Fott (1983) Pl. 107 fig. 3
Remarks: length 3.5-4 µm; breadth 2 µm.
Distribution: Pauli Bartili, Pauli Murtas. Sporadic.

Fam. Chlorellaceae Brunnthaler 1915

Ankistrodesmus Corda 1838

Ankistrodesmus spiralis (Turner) Lemmermann 1908
Komárek & Fott (1983) Pl. 192 fig. 4
Remarks: length 25-30 µm; breadth 1.5-2 µm.
Distribution: Pauli Maiori. Sporadic.

Ankistrodesmus stipitatus (Chodat) Komárková Legnerová 1969
Komárek & Fott (1983) Pl. 191 fig. 2
Remarks: length 50-65 µm; breadth 1.5 µm.
Distribution: Pauli Camise, Pauli Murtas, Pauli Oromeo. Sporadic.

Ankistrodesmus subtilis Hindák 1984
Hindák (1984) Pl. 95

Remarks: length 26-30 µm; breadth 1 µm.
Distribution: Pauli Bartili, Pauli Camise, Pauli Murtas, Pauli Perdosu. Sporadic.

Geminella Turpin 1828

Geminella interrupta (Turp.) Lagerheim 1883
Prescott (1951) Pl. 6 fig. 15
Remarks: length 5 µm; breadth 3.5-4 µm.
Distribution: Pauli Maiori, Pauli Oromeo, Pauli S'Ala de Mengianu. Sporadic.

Kirchneriella Schmidle 1893

Kirchneriella lunaris (Kirchn.) Moebius 1894
Komárek & Fott (1983) Pl. 187 fig. 3
Remarks: length 10 µm; breadth 2 µm.
Distribution: Pauli Bartili, Pauli Murtas. Sporadic.

Monoraphidium Komárková Legnerová 1969

Monoraphidium arcuatum (Koršikov) Hindák 1970
Komárek & Fott (1983) Pl. 178 fig. 2
Remarks: length 25-30 µm; breadth 1 µm.
Distribution: Pauli Camise, Pauli Murtas. Frequent.

Monoraphidium circinale (Nygaard) Nygaard 1979
Komárek & Fott (1983) Pl. 180 fig. 1
Remarks: length 15 µm; breadth 2µ.
Distribution: Pauli Bartili. Frequent.

Monoraphidium griffithii (Berk.) Komárková Legnerová 1969
Komárek & Fott (1983) Pl. 177 fig. 1
Remarks: length 50-55 µm; breadth 2-2,5 µm.
Distribution: Pauli Murtas, Pauli Oromeo. Frequent.

Tetraedron Kützing 1845

Tetraedron caudatum (Corda) Hansgirg 1888
Komárek & Fott (1983) Pl. 196 fig. 2
Remarks: cells 6-12 µm in diameter; spines 2-3 µm long.
Distribution: Pauli Maiori, Pauli Murtas. Sporadic.

Tetraedron minimum (A. Braun) Hansgirg 1888
Komárek & Fott (1983) Pl. 195 fig. 7
Remarks: cells 6-10 µm in diameter.
Distribution: Pauli Maiori, Pauli Oromeo. Frequent.

Tetraedron triangulare Koršikov 1953
Komárek & Fott (1983) Pl. 195 fig. 5
Remarks: cells 8-9 µm in diameter.
Distribution: Pauli Maiori, Pauli Oromeo. Frequent.

Fam. Coelastraceae Wille 1909

Actinastrum Lagerheim 1882

Actinastrum hantzschii Lagerheim 1882

Komárek & Fott (1983) Pl. 207 fig. 2
Remarks: length 18-20 µm; breadth 1-1.5 µm.
Distribution: Pauli Murtas. Sporadic.

Coelastrum Nägeli 1849

Coelastrum astroideum De Notaris 1867
Komárek & Fott (1983) Pl. 202 fig. 4
Remarks: cells 7-8 µm in diameter.
Distribution: Pauli Bartili, Pauli Camise, Pauli Murtas. Frequent.

Coelastrum microporum Nägeli in Braun 1855
Komárek & Fott (1983) Pl. 202 fig. 1
Remarks: cells 9-11 µm in diameter.
Distribution: Pauli Bartili, Pauli Camise. Quite frequent.

Fam. Hydrodictyaceae Cohn 1880

Pediastrum Meyen 1829

Pediastrum boryanum (Turp.) Meneghini 1840
Komárek & Fott (1983) Pl. 87 fig. 1
Remarks: cells 10-23 µm in diameter.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli S'Ala de Mengianu. Frequent.

Pediastrum duplex Meyen 1829
Komárek & Fott (1983) Pl. 88 fig. 2
Remarks: cells 13- 18 µm in diameter.
Distribution: Pauli Bartili, Pauli Camise, Pauli Murtas, Pauli Oromeo. Sporadic.

Pediastrum tetras (Ehr.) Ralfs 1844
Komárek & Fott (1983) Pl. 91 fig. 5
Remarks: cells 9- 14 µm in diameter.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli S'Ala de Mengianu. Sporadic.

Fam. Palmellaceae Lemmermann 1915

Sphaerocystis Chodat 1897

Sphaerocystis schroeteri Chodat 1897
Komárek & Fott (1983) Pl. 20 fig. 3
Remarks: cells 8-12 µm in diameter.
Distribution: Pauli Murtas, Pauli Oromeo. Sporadic.

Fam. Oocystaceae Bohlin 1901

Fusola Snow 1902

Fusola viridis Snow 1902
Komárek & Fott (1983) Pl. 153 fig. 10
Remarks: length 42-50 µm; breadth 7-8 µm.
Distribution: Pauli Perdosu. Rare.

Lagerheimia Chodat 1895

Lagerheimia quadriseta (Lemm.) G. M. Smith 1926
Hindák (1984) Pl. 60
Remarks: length 7-8 µm; breadth 3,5-4 µm.
Distribution: Pauli Murtas. Rare.

Nephrocytium Nägeli 1849

Nephrocytium lunatum W. West 1892
Komárek & Fott (1983) Pl. 156 fig. 5
Remarks: length 15 µm; breadth 3 µm.
Distribution: Pauli Oromeo. Rare.

Oocystis A. Braun 1855

Oocystis lacustris Chodat 1896
Komárek & Fott (1983) Pl. 148 fig. 2
Remarks: length 12-15 µm; breadth 6-7 µm.
Distribution: Pauli Bartili, Pauli Murtas, Pauli Oromeo. Sporadic.

Oocystis submarina Lagerheim 1886
Komárek & Fott (1983) Pl. 147 fig. 4
Remarks: length 13-14 µm; breadth 6 µm.
Distribution: Pauli Maiori. Rare.

Oonephris Fott 1964

Oonephris obesa (W. West) Fott 1964
Komárek & Fott (1983) Pl. 155 fig. 4
Remarks: length 22- 32 µm; breadth 13-25 µm.
Distribution: Pauli Bartili, Pauli Oromeo, Pauli Perdosu. Sporadic.

Fam. Scenedesmaceae Oltmanns 1904

Crucigenia Morren 1830

Crucigenia quadrata Morren 1830
Komárek & Fott (1983) Pl. 219 fig. 4
Remarks: cells 2,5-3 µm in diameter.
Distribution: Pauli Murtas. Frequent.

Crucigeniella Lemmermann 1900

Crucigeniella rectangularis (Nägeli) Komárek 1974
Komárek & Fott (1983) Pl. 217 fig. 1
Remarks: length 7-8 µm; breadth 4 µm.
Distribution: Pauli Bartili, Pauli Murtas, Pauli Oromeo. Frequent.

Scenedesmus Mayen 1829

Scenedesmus acutiformis Schröder 1897
Komárek & Fott (1983) Pl. 230 fig. 4
Remarks: length 13-15 µm; breadth 5 µm.
Distribution: Pauli Maiori, Pauli Oromeo. Frequent.

Scenedesmus acutus Meyen 1829
Komárek & Fott (1983) Pl. 228 fig. 1
Remarks: length 16-18 µm; breadth 5 µm.
Distribution: Pauli Bartili, Pauli Oromeo. Frequent.

Scenedesmus armatus Chodat 1913
Komárek & Fott (1983) Pl. 241 fig. 9
Remarks: length 9-15 µm; breadth 3 µm.
Distribution: Pauli Bartili, Pauli Maiori. Frequent.

Scenedesmus dimorphus (Turp.) Kützing 1833
Komárek & Fott (1983) Pl. 228 fig. 3
Remarks: length 17-22 µm; breadth 2 µm.
Distribution: Pauli Bartili, Pauli Murtas. Frequent.

Scenedesmus disciformis **(**Chodat) Fott et Komárek 1960
Komárek & Fott (1983) Pl. 226 fig. 2
Remarks: length 9-10 µm; breadth 3 µm.
Distribution: Pauli Maiori. Rare.

Scenedesmus ecornis (Ehr.) Chodat 1926
Komárek & Fott (1983) Pl. 225 fig. 1
Remarks: length 12 µm; breadth 4 µm.
Distribution: Pauli Bartili. Rare.

Scenedesmus obliquus (Turp.) Kützing 1833
Komárek & Fott (1983) Pl. 227 fig. 3
Remarks: length 12-20 µm; breadth 4 µm.
Distribution: Pauli S'Ala de Mengianu. Frequent.

Scenedesmus obtusus Meyen 1829
Komárek & Fott (1983) Pl. 225 fig. 8
Remarks: length 7-9 µm; breadth 2.5-3 µm.
Distribution: Pauli Oromeo. Rare.

Scenedesmus quadrispina Chodat 1913
Komárek & Fott (1983) Pl. 249 fig. 6
Remarks: length 12 µm; bradth 5 µm.
Distribution: Pauli Bartili. Rare.

OEDOGONIALES

Fam. Oedogoniaceae De Bary ex Hirn 1900

Bulbochaete Agardh 1817

Bulbochaete sp.
Remarks: filaments 15-16 µm in diameter. Oogonia always immature, 40-48 x 33 µm. Distribution: Pauli Maiori, Pauli Oromeo. Frequent.

Oedogonium Link 1820

Oedogonium sp.
Remarks: only sterile filaments, 16-18 µm in diameter.
Distribution: Pauli Oromeo. Quite frequent.

TETRASPORALES

Fam. Tetrasporaceae (Nägeli) Wittrock 1872

Apiocystis Nägeli 1849

Apiocystis brauniana Naegeli in Kützing 1849
Prescott (1951) figs 7-8
Remarks: cells 6 µm in dimeter; colonies attached to *Bulbochaete* sp.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Oromeo. Sporadic.

KLEBSORMIDIOPHYCEAE

COLEOCHAETALES

Fam. Chaetosphaeridiaceae Blackman etTansley 1902.

Chaetosphaeridium Klebahn 1892

Chaetosphaeridium globosum (Nordst.) Klebahn 1893
Prescott (1951) Pl. 14 fig. 6
Remarks: cells 10-12 µm in diameter, attached to *Spirogyra* sp. and aquatic macrophytes.
Distribution: Pauli Maiori. Not frequent.

Fam. Coleochaetaceae Nägeli 1847

Coleochaete Brébisson 1844

Coleochaete scutata de Brébisson 1844
Prescott (1951) Pl. 18 fig. 9
Remarks: cells 20-35 µm in diameter, attached to aquatic macrophytes.
Distribution: Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli Perdosu. Sporadic.

ZYGNEMATOPHYCEAE

ZYGNEMATALES

Fam. Zygnemataceae Kützing 1843

Mougeotia Agardh 1824

Mougeotia gracillima (Hassall) Wittrock 1872
Randhawa (1959) fig. 89 a-b
Remarks: cells 5-6 µm in diameter. Square zygospores, 22-24 µm in diameter. Distribution: Pauli Oromeo. Frequent.

Spirogyra Link in Nees 1820

Spirogyra sp.
Remarks: cells 98-100 µm in diameter with 5-6 chloroplasts, always sterile.
Distribution: Pauli Camise, Pauli Oromeo, Pauli S'Ala de Mengianu. Frequent.

DESMIDIALES

Fam. Gonatozygaceae (Lütkem.) G.S. West et Fritsch 1927

Gonatozygon De Bary 1856

Gonatozygon brebissonii de Bary in Rabenhorst 1856
Förster (1982) Pl. 3 fig. 1
Remarks: length 125-138 µm; breadth 5-5.5 µm.
Distribution: Pauli Bartili, Pauli Murtas, Pauli Oromeo, Pauli Perdosu. Sporadic.

Gonatozygon monotaenium de Bary in Rabenhorst 1856
Förster (1982) Pl. 2 figs 5-6
Remarks: length 188-220 µm; breadth 9 µm.
Distribution: Pauli Murtas, Pauli Oromeo. Rare.

Fam. Closteriaceae Pritchard 1872

Closterium Nitzsch ex Ralfs 1848

Closterium acerosum (Schr.) Ehrenberg ex Ralfs 1848 var**.** ***acerosum***
Růžička (1977) Pl. 18 figs 1-4
Remarks: length 420-670 µm; breadth 45-50 µm.
Distribution: Pauli Bartili, Pauli Camise, Pauli S'Ala de Mengianu. Sporadic.

Closterium acerosum (Schr.) Ehrenberg ex Ralfs var. ***angolense*** West et West 1897
Růžička (1977) Pl. 18 figs 11-12
Remarks: length 535-580 µm; breadth 21 µm.
Distribution: Pauli Camise. Rare.

Closterium aciculare T. West 1860
Förster (1982) Pl. 4 fig. 12
Remarks: length 330-460 µm; breadth 5-6 µm.
Distribution: Pauli Perdosu. Rare.

Closterium ehrenbergii Meneghini ex Ralfs 1848
Prescott et al. (1977) Pl. 21 figs 8-9
Remarks: length 460-510 µm; breadth 105-110 µm.
Distribution: Pauli S'Ala de Mengianu. Rare.

Closterium pritchardianum Archer 1862
Růžička (1977) Pl. 19 figs 1-4
Remarks: length 497- 515 µm; breadth 38 µm.
Distribution: Pauli Bartili. Sporadic.

Closterium venus Kützing ex Ralfs 1848
Prescott et al. (1975) Pl. 40 figs 1-5
Remarks: length 60-75µm; breadth 10 µm.
Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo. Sporadic.

Fam. Desmidiaceae Ralfs 1848

Actinotaenium Teiling 1854

Actinotaenium diplosporum (Lund.) Teiling 1954

Růžička (1981) 55 figs 1-10
Remarks: length 58-64 µm; breadth 29-30 µm. Zygospore double, quadrangular, 24 x 46 µm.
Distribution: Pauli Bartili, Pauli Murtas, Pauli Perdosu. Sporadic.

Cosmarium Corda ex Ralfs 1845

Cosmarium abbreviatum Raciborski 1885
Förster (1982) Pl. 20 fig. 8
Remarks: length 17 µm; breadth 20 µm; isthmus 4 µm.
Distribution: Pauli Bartili, Pauli Oromeo. Rare.

Cosmarium bireme Nordstedt var. ***barbadense*** G. S. West 1904
Prescott et al. (1981) Pl. 175 figs 3-4
Remarks: cells very small, 8 µm long and 8 µm broad; isthmus 2 µm. Zygospore 16 -17 µm in diameter.
Distribution: Pauli Bartili, Pauli Perdosu. Rare.

Cosmarium biretum (Bréb.) Ralfs var. ***minus*** Hansgirg 1888
Prescott et al. (1981) Pl. 277 fig. 12
Remarks: length 42-45 µm; breadth 36-42 µm; isthmus 12-14 µm.
Distribution: Pauli Bartili. Rare.

Cosmarium humile (Gay) Nordstedt in De Toni 1889
Prescott et al. (1981) Pl. 281 figs 10-11
Remarks: length 11-12 µm; breadth 12 µm; isthmus 4 µm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Oromeo. Rare.

Cosmarium botrytis Meneghini ex Ralfs 1848 var. ***botrytis***
Förster (1982) Pl. 33 figs 1-2
Remarks: length 65-68 µm; breadth 50 µm; isthmus 12-14 µm. Zygospore globose, 55 µm in diameter without spines.
Distribution: Pauli Maiori, Pauli Murtas, Pauli Oromeo. Quite frequent.

Cosmarium botrytis Meneghini ex Ralfs var. ***subtumidum*** Wittrock 1872
Förster (1982) Pl. 33 fig. 3
Remarks: length 58-63 µm; breadth 56-60 µm; isthmus 12-13 µm.
Distribution: Pauli Oromeo. Rare.

Cosmarium laeve Rabenhorst 1868 var. ***laeve***
Förster (1982) Pl. 23 fig. 1 (morpha j, k)
Remarks: length 20-22 µm; breadth 15 µm; isthmus 4 µm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Perdosu. Quite frequent.

Cosmarium laeve Rabenhorst var. ***westii*** Krieger et Gerloff 1969
Förster (1982) Pl. 25 fig. 14
Remarks: length 24-25 µm; breadth 16-16.5 µm; isthmus 5 µm.
Distribution: Pauli Oromeo. Rare.

Cosmarium punctulatum Brébisson var. ***subpunctulatum*** (Nordst.) Börgesen 1894
Prescott et al. (1981) Pl. 236 figs 1-3
Remarks: length 28-35 µm; breadth 25-30 µm; isthmus 8-10 µm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Oromeo, Pauli Perdosu. Quite frequent.

Cosmarium regnelli Wille var. ***pseudoregnelli*** (Messik.) Krieger et Gerloff 1969
Prescott et al. (1981) Pl. 219 fig. 14
Remarks: length 17 µm; breadth 15 µm; isthmus 4 µm.
Distribution: Pauli Bartili, Pauli S'Ala de Mengianu. Rare.

Cosmarium regnelli Wille 1884 var. ***regnelli***
Prescott et al. (1981) Pl. 219 fig. 12

Remarks: length 14-15 µm; breadth 12 µm; isthmus 3.5 µm.
Distribution: Pauli Maiori, Pauli Murtas, Pauli Oromeo. Quite frequent.

Cosmarium reniforme (Ralfs) Archer 1874
Prescott et al. (1981) Pl. 258 figs 13-14
Remarks: length 36-38 µm; breadth 28-30 µm; isthmus 10 µm.
Distribution: Pauli Murtas, Pauli Oromeo. Rare.

Cosmarium subprotumidum Nordstedt 1876
Förster (1982) Pl. 37 fig. 11
Remarks: length 25-28 µm; breadth 20-22 µm; isthmus 5-6 µm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo. Quite frequent.

Pleurotaenium Nägeli 1849

Pleurotaenium ehrenbergii (Bréb.) de Bary 1858
Prescott et al. (1975) Pl. 45 figs 1-5
Remarks: length 232-258 µm; breadth 27-28 µm.
Distribution: Pauli Bartili, Pauli Camise. Quite frequent.

Pleurotaenium trabecula (Ehr.) Naegeli 1849
Prescott et al. (1975) Pl. 40 figs 1-5
Remarks: length 500-510 µm; breadth 30 µm.
Distribution: Pauli Bartili, Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli Perdosu. Quite frequent.

Staurastrum Meyen emend. Ralfs 1848

Staurastrum dilatatum (Ehr.) Ralfs 1848
Prescott et al. (1982) Pl. 338 figs 2-4
Remarks: length 24-25 µm; breadth 25-26 µm; isthmus 7-8 µm.
Distribution: Pauli Bartili, Pauli Oromeo. Sporadic.

Staurastrum punctulatum Brébisson in Ralfs 1848
Prescott et al. (1982) Pl. 339 fig. 16
Remarks: length 25-27 µm; breadth 20-21 µm; isthmus 8 µm.
Distribution: Pauli Maiori, Pauli Murtas, Pauli Oromeo, Pauli S'Ala de Mengianu. Quite frequent.

Discussion

From these investigations the algal flora of the examined Paulis exhibits a high diversity, particularly surprising considering the type of environment, characterized by a few centimeters of water and presumably a few nutrients.
A total of 213 algal *taxa* were identified, distributed as follows in the different classes: Cyanophyceae: 16; Xanthophyceae: 1; Bacillariophyceae: 110; Dinophyceae: 4; Euglenophyceae: 10; Chlorophyceae: 42; Klebsormidiophyceae: 2; Zygnematophyceae: 28. From a qualitative point of view the Bacillariophyceae clearly predominate. On the basis of the known autoecology, the diatom flora of the Giara could be considered as characterized by oligo-mesotrophic species. Among them, the most frequent are indeed *Melosira varians*, *Achnanthidium minutissimum*, *Planothidium lanceolatum*, *Planothidium minutissimum*, *Diploneis elliptica* and *Cocconeis placentula*. There are also some freshwater species that tolerate moderate grades of saprobiety: *Ulnaria ulna*, *Fallacia pygmaea*, *Halamphora veneta*, *Rhopalodia gibba* and *Epithemia adnata*.
From a taxonomic point of view, Bacillariophyceae, that have already been studied in detail, revealed two genera and 40 species new for science (Lange-Bertalot et al., 2003). This highlights the extreme importance of these ephemeral pools in the Mediterranean environment on volcanic substrate.
In conclusion this study of the algal flora of the Giara of Gesturi proved to be extremely promising and, at least for what concerns the diatom communities, further researches including physical and chemical analysis of water and quantitative data, are to be hoped.

Reference

Anagnostidis K., Komárek J., 1989. Modern approach to the classification system of Cyanophytes. 4- Nostocales. Algological Studies 56, 247-345.

Anagnostidis K., Komárek J., 1990. Modern approach to the classification system of Cyanophytes. 5- Stigonematales. Algological Studies 59, 1-73.

Anonymous, 1975. Proposals for a standardization of diatom terminology and diagnoses. Beihefte zur Nova Hedwigia 53, 323-354.

Coesel P. F. M., Meester K. J., 2007. Desmids of the Lowlands. KNNV Publishing, pp. 35. KNNV Publishing. Zeist, The Netherlands.

Croasdale H., Bicudo C. E., Prescott G. W., 1983. A synopsis of North American Desmids. Part II. Desmidiaceae: Placodermae, sect. 5. The filamentous genera, pp.117. University Nebraska Press, Lincoln and London.

Della Bella V., Bazzanti M., Dowgiallo M.G., Iberite M., 2008. Macrophyte diversity and physico-chemical characteristics of Tyrrhenian coast ponds in central Italy: implications for conservation. Hydrobiologia 597, 85-95

Desikachari T.V., 1959. Cyanophyta. Indian Council of Agricoltural Research, New Dahli.

Ettl H., 1978. Xanthophyceae 1 Teil. In: Ettl H., Gerloff J., Heynig H., Mollenhauer D., Süsswasserflora von Mitteleuropa Bd 3, pp. 530. G. Fischer Verl., Jena, Stuttgart.

Förster K., 1982. Conjugatophyceae, Zygnematales und Desmidiales (excl. Zygnemataceae). In: Elster H., Ohle W., Die Binnengewässer Bd XVI, 8 Teil, pp. 543. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Fumanti B., Cavacini P., 1997. Indagini preliminari sulla microflora algale dei "Paulis" della Giara di Gesturi (Sardegna). 92° Congresso della Società Botanica Italiana. Abstract Book: 72.

Grillas P., Gauthier P., Yavercovski N., Perennou C., 2004a. Mediterranean Temporary Pools, Vol. 1. Issues Relating to Conservation, Functioning and Menagement, pp. 122. Station Biologique de la Tour du Valat. Imprimerie De Rudder, Avignon.

Grillas, P., Gauthier P., Yavercovski N., Perennou C., 2004b. Mediterranean Temporary Pools, Vol. 2. Species Information Sheets, pp. 130. Station biologique de la Tour du Valat. Imprimerie De Rudder, Avignon.

Hindak F., 1984. Studies on the chlorococcal algae (Chlorophyceae). III. Biologické Práce 30 (1), 1-310.

Hoek C. van den, Mann D. G., Jahns H. M., 1995. Algae. An introduction to phycology, pp. 623. Cambridge University Press, Cambridge.

Hofmann G., Werum M., Lange-Bertalot H., 2011. Diatomeen im Süsswasser-Benthos von Mitteleuropa, pp. 908. A. R. G. Gantner Verlag K. G., Ruggell.

Huber-Pestalozzi G., 1938. Das Phytoplankton des Süsswasser. 1 Teil. Blaualgen. Bakterien. Pilze. In: Thienemann A., Die Binnengewässer Bd XVI, 1 Teil, pp. 342. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Huber-Pestalozzi G., 1950. Das Phytoplankton des Süsswasser. 3 Teil. Cryptophyceae, Chloromonadinen, Peridineen. In: Thienemann A., Die Binnengewässer Bd XVI, 3 Teil, pp. 310. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Huber-Pestalozzi G., 1955. Das Phytoplankton des Süsswasser. 4 Teil. Euglenophyceae. In: Thienemann A.,

Die Binnengewässer Bd XVI, 4 Teil, pp. 606 + pl. 114. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Huber-Pestalozzi G., 1961. Das Phytoplankton des Süsswasser. 5 Teil. Chlorophyceae: Volvocales. Thienemann A., Die Binnengewässer Bd XVI, 5 Teil, pp. 744 + pl.158. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Komárek J., Anagnostidis K., 1999. Cyanoprokaryota 1 Teil: Chroococcales. In: Ettl H., Gerloff J., Heynig H., Mollenhauer D., Süsswasserflora von Mitteleuropa Bd 19/1, pp. 548. G. Fischer Verl., Jena, Stuttgart.

Komárek J., Anagnostidis K., 2005. Cyanoprokaryota 2 Teil: Oscillatoriales. In: Ettl H., Gerloff J., Heynig H., Mollenhauer D., Süsswasserflora von Mitteleuropa Bd 19/2, pp. 759. G. Fischer Verl., Jena, Stuttgart.

Komárek J., Fott B., 1983. Das Phytoplankton des Süsswasser. 7 Teil. Chlorophyceae, Chlorococcales, pp. 1044. In: Thienemann A., Die Binnengewässer Bd XVI. E. Schweizerbart'sche Verl. Stuttgart.

Krammer K., 2000. The genus *Pinnularia*. Diatoms of Europe, pp 703. A. R. G. Gantner Verlag K. G., Ruggell.

Krammer K., Lange-Bertalot H., 1986. Bacillariophyceae. 1. Teil: Naviculaceae. In: Ettl H., Gerloff J., Heynig H., Mollenhaurer D., Süsswasserflora von Mitteleuropa, Band 2/1, pp. 876. VEB G. Fischer. Jena.

Krammer K., Lange-Bertalot H., 1988. Bacillariophyceae. 2. Teil: Bacillariaceae, Epithemiaceae, Surirellaceae. In: Ettl H., Gerloff J., Heynig H., Mollenhaurer D., Süsswasserflora von Mitteleuropa, Band 2/2, pp. 596. VEB G. Fischer. Jena.

Krammer K., Lange-Bertalot H., 1991a. Bacillariophyceae. 3. Teil: Centrales, Fragilariaceae, Eunotiaceae. In: Ettl H., Gerloff J., Heynig H., Mollenhaurer D., Süsswasserflora von Mitteleuropa, Band 2/3, pp. 576. VEB G. Fischer. Jena.

Krammer K., Lange-Bertalot H., 1991b. Bacillariophyceae. 4. Teil: Achnanthaceae, Kritische Ergänzungen zu *Navicula* (Lineolatae) und *Gomphonema* Gesamtliteraturverzeichnis Teil 1-4. In: Ettl H., Gerloff J., Heynig H., Mollenhaurer D., Süsswasserflora von Mitteleuropa, Band 2/4, pp. 437. VEB G. Fischer. Jena.

Krammer K., Lange-Bertalot H., 2000. Bacillariophyceae. Part 5: English and French translation of the keys. In: Büdel B., Gärtner G., Krienitz L., Lokhorst G. M., Süsswasserflora von Mitteleuropa, Band 2/5. Spektrum Akademischer Verlag Heidelberg. Berlin.

Lange-Bertalot H., 2001. *Navicula* sensu stricto. 10 genera separated from *Navicula* sensu lato. *Frustulia*. Diatoms of Europe 2, pp. 526. A. R. G. Gantner Verlag K. G., Ruggell

Lange-Bertalot H., Metzeltin D., 1996. Indicators of Oligotrophy. 800 *taxa* representative of three ecologically distinct lake types. Iconographia Diatomologica 2, 1-390.

Lange-Bertalot H., Moser G., 1994. *Brachysira*. Monographie der Gattung. Bibliotheca Diatomologica 29, 1-212.

Lange-Bertalot H., Cavacini P., Tagliaventi N., Alfinito S., 2003. Diatoms of Sardinia. Rare an 76 new species in rock pools and other ephemeral waters. Iconographia Diatomologica 12, 1-438.

Marchi M., Murgia M.V., Maccioni L., 1989. Geologia, Idrologia - Pedologia. In: A.A.V.V. – Sa Jara. Un'area di interesse naturalistico da salvaguardare. Prov. di Cagliari. Pubblisar Ed., Cagliari.

Mossa L., Scrugli A., Mulas B., Fogu M.C., Cogoni A., 1989. La componente geobotanica del parco della Giara di Gesturi, pp. 27-84. In: A.A.V.V. – Sa Jara. Un'area di interesse naturalistico da salvaguardare. Prov. di Cagliari. Pubblisar Ed., Cagliari.

Mrozińska T., 1985. Chlorophyta VI. Oedogoniophyceae: Oedogoniales. In: Ettl H., Gerloff J., Heynig H., Mollenhauer D., Süsswasserflora von Mitteleuropa Bd 14, pp. 624. G. Fischer Verl., Jena, Stuttgart.

Nicolet, P., J. Biggs, G. Fox, M. J. Hodson, C. Reynolds, M. Withfield, P. Williams, 2004. The wetland plant and macroinvertebrate assemblages of temporary ponds in England and Wales. Biological Conservation 120, 265-282.

Popovský J., Pfiester L. A., 1990. Dinophyceae. In: Ettl H., Gerloff J., Heynig H., Mollenhauer D., Süsswasserflora von Mitteleuropa Bd 6, pp. 272. G. Fischer Verl., Jena, Stuttgart.

Prescott G. W., 1951. Algae of the Western Great Lakes Area. Bulletin of the Cranbrook Institute of Science 31: 1-935.

Prescott G. W., Bicudo C. E., Vinyard W. C., 1982. A synopsis of North American Desmids. Part II. Desmidiaceae: Placodermae, sect. 4, pp. 700. University Nebraska Press, Lincoln and London. 700 pp.

Prescott G. W., Croasdale H., Vinyard W. C., 1972. North American Flora. Ser. II. Part 6, pp. 84. New York Botanical Garden Ed., New York.

Prescott G. W., Croasdale H., Vinyard W. C., 1975. A synopsis of North American Desmids. Part II. Desmidiaceae: Placodermae, sect. 1, pp. 275. University Nebraska Press, Lincoln.

Prescott G. W., Croasdale H., Vinyard W. C., 1977. A synopsis of North American Desmids. Part II. Desmidiaceae: Placodermae, sect. 2, pp. 413. University Nebraska Press, Lincoln.

Prescott G. W., Croasdale H., Vinyard W. C., Bicudo C. E,

1981. A synopsis of North American Desmids. Part II. Desmidiaceae: Placodermae, sect. 3, pp. 720. University Nebraska Press, Lincoln.

Randhawa M.S. 1959. Zygnemaceae, pp. 478. Indian Council of Agricoltural Research. New Dahli.

Round F., Crawford R., Mann D., 1990. The Diatoms. Biology and morphology of the genera, pp. 747. Cambridge University Press, Cambridge.

Růžička J., 1977. Die Desmidiaceen Mitteleuropas. Bd 1, Lief. 1, pp. 292 + pl. 44. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Růžička J., 1981. Die Desmidiaceen Mitteleuropas. Bd 1, Lief. 2, pp. 444 + pl. 72. E. Schweizerbart'sche Verl. (Ed.), Stuttgart.

Silvano R., Fadda A., Buffa F., Orrù N., 1998. Nuovo Studio dell'Idrologia Superficiale della Sardegna. Ente Autonomo del Flumendosa, http://pcserver.unica.it/web/sechi/main/Corsi/Didattica/IDROLOGIA/DatiSISS/index.htm

Simonsen R., 1979. The diatom system: ideas on phylogeny. Bacillaria 2, 9-71.

Torrisi M., Dell'Uomo A., 2009. Diatomee bentoniche del corso superiore di alcuni fiumi centro-appenninici. Studi Trentini di Scienze Naturali 84, 139-151.

Williams P., Whitfield M., Biggs J., Bray S., Fox G., Nicolet P., Sear D., 2004. Comparative biodiversity of rivers, streams, ditches and ponds in an agricultural landscape in Southern England. Biological Conservation 115, 329-341.