

## Diatoms from El Golfo on Lanzarote (Canary Islands)

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**RESUMEN.** Se identifican 140 taxa de diatomeas en una muestra de macroalgas procedente de esta pequeña laguna de playa en Lanzarote. Como era presumible, la mayor parte de los taxa son polihalobios (115 taxa) y 15 taxa oligohalobios. *Mastogloia* es dominante con 18 taxa, seguido de *Navicula* y *Nitzschia* con 14. Para cada especie se señala una referencia, sus dimensiones, su ecología y en algunos casos se acompaña con una fotografía. Palabras Clave: Diatomeas. El Golfo. Lanzarote. Islas Canarias.

**ABSTRACT.** In one sample of seaweeds from a small beach lagoon on Lanzarote, 140 taxa of diatoms were identified. As was to be expected the majority of these taxa are polyhalobe (115 taxa); 15 taxa are oligohalobe. Dominant is *Mastogloia*, represented by 18 taxa, followed by *Navicula* and *Nitzschia* with 14 taxa each. For each species mostly one reference, the measurements, the ecology and in some cases a photograph is presented. Key Words: Diatoms. El Golfo. Lanzarote. Canary Islands.

## INTRODUCTION

Lanzarote, the most Eastern island of the Canary Islands, is about 800 square kilometers large and has a coastline of 140 kilometers. It is, contrary to the other islands of the group, rather flat; the highest peaks of old volcanoes reaching about 600 meters. It has a very special character due to the fact that the greater part of the land is covered by volcanic ashes, the latest eruption having taken place in the 19th century.

As a result of its geographical position the island has a very constant climate throughout the year and although perhaps not blessed with such a magnificent nature as the other islands of the group, its rather raw beauty attracts many tourists. Many new hotels and apartments are now under construction and one must hope that the government is able to avoid secondary effects of tourism on the ecology of this island.

One of the remarkable places of Lanzarote is surely El Golfo, an open crater at sea level situated at the Westcoast and separated from the ocean only by a pebble beach, a few

hundred yards wide. The water in this crater has a high salinity and is of a beautiful deep-green colour, due to the massive growth of algae, hence its name 'the green lagoon'.

## METHODS

The sample of seaweeds, collected by hand from the green lagoon, Lanzarote, was thoroughly rinsed in order to remove salts and after that procedure boiled in sulphuric acid during 20 minutes. After careful injection of a few drops of hydrogen peroxide into the still boiling substance, it was allowed to cool off. Several rinsings in distilled water then took place in order to remove every trace of acid. The now cleaned frustules were mounted on several slides using Naphrax as a mounting medium.

## TAXONOMY

Species given below are in alphabetical order, literature information is normally restricted to one paper only. Further information on the references is given at the end of this article where more specific information on the books used can be found. An indication of the ecology of the species is given; here I follow the system so often used by the late Dr. NIELS FOGED in his numerous books.

### *Achnanthes* Bory 1832

*Achnanthes brevipes* Agardh var. *angustata* (Greville) Cleve

NAVARRO 1982: 26, t.25, f. 1

Polyhalobe, cosmopolite.

Frequent. Plate 1, fig. 1 : 80 x 10 µm. 11 striae in 10 µm.

— var. *intermedia* (Kützing) Cleve

HUSTEDT 1927-1966, II: 425, f. 877 d,e.

Polyhalobe, cosmopolite.

Very rare, seen only a few times.

*Achnanthes fimbriata* (Grunow) Ross

ROSS 1963: 72, f. 17-22

A polyhalobe species, reported from many places but often under different names i.e. *A. manifera* Brun, *A. danica* Grunow and *A. stroemi* Hustedt. Differences between

these last mentioned species have been reported (GIFFEN 1963, FOGED 1986) but as the differences are often minute, I followed ROSS' identification.

Very rare.

### *Actinocyclus* Ehrenberg 1837

*Actinocyclus octonarius* Ehrenberg var. *crassus* (W. Smith) Hendey

HENDEY 1964: 83

Polyhalobe and probably cosmopolite.

Rare. Plate 1, fig. 2 : diam. 35 µm.

*Actinocyclus subtilis* (Gregory) Ralfs

HUSTEDT 1927-1966, II: 534, f. 304

Polyhalobe, cosmopolite.

Very rare. Plate 1, fig. 3 : diam. 50 µm.

### *Amphora* Ehrenberg 1840

*Amphora acuta* Gregory var. *arcuata*  
(A.Schmidt) Cleve

PERAGALLO 1897-1908: 223, t.49, f. 28  
Polyhalobe.

Very rare. Plate 1, fig. 4 : 65 x 14 µm.

*Amphora bigibba* Grunow

HUSTEDT 1955: 40, t.14, f. 19-25

Polyhalobe, cosmopolite.

Not frequent.

*Amphora cingulata* Cleve

PERAGALLO 1897-1908: 219, t.49, f. 5-7

Polyhalobe.

Very rare. 86 x 15 µm.

*Amphora coffeaeformis* (Agardh) Kützing  
ARCHIBALD & SCHOEMAN 1984: 86,  
f. 1-24

Mesohalobe, cosmopolite.

Frequent. Plate 1, fig. 5 : 41 x 7 µm.

*Amphora granulata* Gregory var. *bigibbosa*  
Ricard

RICARD 1975: 202, t.2, f. 22

Polyhalobe.

Rare. 41 x 7 µm. 18 striae in 10 µm.

*Amphora mexicana* A. Schmidt fo. *minor*  
Peragallo

PERAGALLO 1897-1908: 203, t.44, f. 32  
Polyhalobe.

Very rare.

*Amphora obtusa* Gregory

PERAGALLO 1897-1908: 216, t.48, f. 9,10  
Polyhalobe, cosmopolite.

Very rare. Plate 1, fig. 6 : 140 x 28 µm.

*Amphora rhombica* Kitton var. *intermedia*  
Cleve

PERAGALLO 1897-1908: 224, t.50, f. 3  
Polyhalobe.

Very rare. Plate 1, fig. 7 : 75 x 13 µm. 15  
striae in 10 µm.

*Amphora turgida* Gregory

PERAGALLO 1897-1908: 231, t.50, f. 33  
Polyhalobe.

Rather common.

### *Anomoeoneis* Pfitzer 1871

*Anomoeoneis sphaerophora* (Kützing)  
Pfitzer

HUSTEDT 1927-1966, II: 740, f. 1108 a.

Halophil, cosmopolite.

Very rare.

### *Asterionella* Hassall 1825

*Asterionella notata* (Grunow) Cleve

HUSTEDT 1927-1966, II: 254, f. 733

Polyhalobe.

Very rare.

### *Biddulphia* Gray 1821

*Biddulphia pulchella* Gray

HUSTEDT 1927-1966, I: 832, f. 490

Polyhalobe, cosmopolite.

Very rare.

### *Caloneis* Cleve 1891

*Caloneis amphisbaena* (Bory) Cleve

HUSTEDT 1930: 230, f. 346

Halophil, cosmopolite.

Very rare.

**Campylodiscus Ehrenberg 1840**

*Campylodiscus fastuosus* Ehrenberg  
 HUSTEDT 1964: 290, t.40, f. 13  
 Polyhalobe.  
 Very rare.

**Cocconeis Ehrenberg 1835**

*Cocconeis britannica* Naegeli  
 HUSTEDT 1927-1966, II: 333, f. 786  
 Polyhalobe.  
 Frequent.

*Cocconeis dirupta* Gregory var. *flexella*  
 (Janisch & Rabenhorst) Grunow  
 HUSTEDT 1927-1966, II: 355, f. 809 d-i.  
 Polyhalobe  
 Very rare, the nominate species has not  
 been found in the sample. 16 x 9 µm.

*Cocconeis ornata* Gregory  
 HUSTEDT 1927-1966, II: 339, f. 793  
 Polyhalobe.  
 Very rare.

*Cocconeis placentula* Ehrenberg var.  
*lineata* (Ehrenberg) Cleve  
 HUSTEDT 1927-1966, II: 348, f. 802 d.  
 Oligohalobe, cosmopolite.  
 Very rare.

*Cocconeis scutellum* Ehrenberg  
 HUSTEDT 1927-1966, II: 337, f. 790  
 Polyhalobe.  
 Very frequent.

**Cyclophora Castracane 1878**

*Cyclophora tenuis* Castracane  
 HUSTEDT 1927-1966, II: 114, f. 639  
 Polyhalobe.  
 Very rare.

**Cyclotella Kützing 1833**

*Cyclotella meneghiniana* Kützing  
 HUSTEDT 1927-1966, I: 341, f. 174  
 Halophil. Very rare. Plate 1, fig. 8 : diam.  
 22 µm.

**Cymbella Agardh 1830**

*Cymbella affinis* Kützing  
 HUSTEDT 1930: 362, f. 671  
 Oligohalobe.  
 Rare.

*Cymbella gracilis* (Ehrenberg) Kützing  
 KRAMMER & LANGE-BERTALOT  
 1986: 308, t.120, f. 1-16  
 Oligohalobe, cosmopolite.  
 Rare.

*Cymbella prostrata* (Berkeley) Cleve  
 KRAMMER & LANGE-BERTALOT  
 1986: 312, t.123, f. 7-10  
 Oligohalobe, cosmopolite.  
 Very rare.

**Diatoma de Candolle 1805**

*Diatoma vulgare* Bory  
 HUSTEDT 1927-1966, II: 96, f. 628  
 Oligohalobe.  
 Very rare.

**Dimerogramma Ralfs 1861**

*Dimerogramma fulvum* (Gregory) Ralfs  
 HUSTEDT 1927-1966, II: 120, f. 643  
 Polyhalobe.  
 Very rare.

**Diploneis Ehrenberg 1844**

*Diploneis bomboides* (A. Schmidt) Cleve  
 HUSTEDT 1927-1966, II: 695, f. 1080



HUSTEDT's remarks with regard to the median constriction in the variety *madagascarensis* Cleve seem to me not quite right (HUSTEDT l.c. 697). At the constriction the nominate species measures about 1/3 of the length; the variety however is less constricted. A width of about 1/2 the length of the scale is more or less conform to HUSTEDT's drawing at page 698. See also the diagnosis in CLEVE 1894-1896, page 88.

Polyhalobe.

Very rare. Plate 1, fig. 9 : 61 x 25  $\mu\text{m}$ ., 10 costae in 10  $\mu\text{m}$ .

*Diploneis crabro* Ehrenberg

HUSTEDT 1927-1966, II: 616, fig 1028

Polyhalobe.

Very rare. Plate 1, fig. 10 : 65 x 25  $\mu\text{m}$ ., 8 costae in 10  $\mu\text{m}$ .

*Diploneis fusca* (Gregory) Cleve

HUSTEDT 1927-1966, II: 654, f. 1053 a.

Polyhalobe.

Very rare.

*Diploneis oculata* (Brebisson) Cleve

HUSTEDT 1927-1966, II: 675, f. 1068 a.

Oligohalobe,

cosmopolite.

Very rare. 16 x 6  $\mu\text{m}$ . 25 costae in 10  $\mu\text{m}$ .

*Diploneis smithi* (Brebisson) Cleve

HUSTEDT 1927-1966, II: 647, f. 1051

Polyhalobe.

Very rare.

— var. *pumila* (Grunow) Hustedt

HUSTEDT 1927-1966, II: 650, f. 1052 d,e.

Polyhalobe.

Rare. 16 x 8  $\mu\text{m}$ . 18 costae in 10  $\mu\text{m}$ .

*Diploneis vacillans* (A. Schmidt) Cleve  
var. *renitens* A. Schmidt

HUSTEDT 1927-1966, II: 663, f. 1060 c-g.  
Polyhalobe.

Very rare. Plate 1, fig. 11 : 30 x 9  $\mu\text{m}$ . 17 costae in 10  $\mu\text{m}$ .

Donkinia Ralfs 1888

*Donkinia angusta* (Donkin) Ralfs

COX 1983: 578, f. 5,6

Polyhalobe.

Very rare, found only once. Plate 2, fig. 1 : 97 x 10  $\mu\text{m}$ .

Fragilaria Lyngbye 1819

*Fragilaria construens* (Ehrenberg) Grunow

var. *venter* (Ehrenberg) Grunow

HUSTEDT 1927-1966, II: 158, f. 670 h-m.

Oligohalobe, cosmopolite.

Rare.

*Fragilaria pinnata* Ehrenberg

HUSTEDT 1927-1966, II: 160, f. 671 a-f.

Oligohalobe.

Very rare.

Gephyria Arnott 1860

*Gephyria media* Arnott

HUSTEDT 1927-1966, II: 10, f. 544

Polyhalobe.

Very rare. Smaller than the dimensions given by HUSTEDT. 75 x 18  $\mu\text{m}$

Grammatophora Ehrenberg 1839

*Grammatophora angulosa* Ehrenberg

HUSTEDT 1927-1966, II: 39, f. 584

Polyhalobe.

Very rare.

*Grammatophora caribaea* Cleve

BOYER 1927: 158; VAN HEURCK 1885: plate 53 bis, f. 19 Though a good description seems to be lacking, the remarks made by MERESCHKOWSKY (1902) in his work on the Polenesian diatoms warrant this determination. I observed this rare species also in the waters around the Cape Verde Islands. (unpublished)  
Polyhalobe, earlier reported from the Virgin Islands by HAGELSTEIN (1938).  
Plate 2, fig. 3: 91 x 15 µm.

*Grammatophora marina* (Lyngbye) Kützing

HUSTEDT 1927-1966, II: 43, f. 569  
Polyhalobe, cosmopolite.  
Very rare. Plate 2, fig. 4: 56 x 12 µm.

*Grammatophora oceanica* Ehrenberg fo. *intermedia* Grunow

HUSTEDT 1927-1966, II: 46  
Very rare. 29 x 4 µm. 30 striae in 10 µm.

*Grammatophora serpentina* (Ralfs) Ehrenberg

HUSTEDT 1927-1966, II: 49, f. 577  
Polyhalobe.  
Very rare. Plate 2, fig. 2: 58 x 12 µm.  
(Girdle view)

*Grammatophora undulata* Ehrenberg

HUSTEDT 1927-1966, II: 48, f. 576  
Polyhalobe, cosmopolite.  
Very rare. 45 x 9 µm.

*Gyrosigma* Hassall 1845

*Gyrosigma fasciola* (Ehrenberg) Griffith & Henfrey var. *closteroides* Grunow  
CARDINAL et al 1986: 175, f. 23,27  
Polyhalobe?

Very rare. 128 x 7 µm. Somewhat less wide than stated in above mentioned literature; the number of striae is about 24 in 10 µm.

*Gyrosigma spenceri* (W. Smith) Cleve var. *nodifera* Grunow

HUSTEDT 1930: 226, f. 337  
Mesohalobe.

Very rare. 82 x 10 µm. 20 striae in 10 µm.

*Gyrosigma uncinatum* Ricard

RICARD 1975: 209, t.1, f. 3  
Polyhalobe.

Very rare. 146 x 8 µm., somewhat larger than stated by RICARD l.c.

*Isthmia* Agardh 1832

*Isthmia lindigiana* Grunow et Eulenstein  
GRUNOW 1877: 182, t.196, f. 1 a-d.

Polyhalobe and reported from several locations in the Caribbean and on the East coast of Africa. The 'club shaped' corpses (GRUNOW l.c.) in the interior of the valve can be very clearly seen.

Very rare. Plate 1, fig. 12: 87 x 35 µm.

*Licmophora* Agardh 1827

*Licmophora ehrenbergii* (Kützing) Grunow  
HUSTEDT 1927-1966, II: 70, f. 573

Polyhalobe, cosmopolite.  
Very rare. 78 x 19 µm., 13 striae in 10 µm.

— var. *ovata* (W. Smith) Peragallo

HUSTEDT 1927-1966, II: 71, f. 597  
Polyhalobe

Very rare. Plate 2, fig. 5: 80 x 35 µm. 13 striae in 10 µm.

*Licmophora flabellata* (Carmichael)  
Agardh

HUSTEDT 1927-1966, II: 58, f. 581

Polyhalobe.

Very rare.

*Licmophora gracilis* (Ehrenberg) Grunow  
var. *anglica* (Kützing) Peragallo

HUSTEDT 1927-1966, II: 60, f. 583

Polyhalobe, cosmopolite.

Frequent and mixed with the nominate species. The latter, however, is very rare in the sample.

*Licmophora paradoxa* (Lyngbye) Agardh  
HUSTEDT 1927-1966, II: 76, f. 605

Polyhalobe, cosmopolite.

Rare. 66 x 9 µm.

— var. *crystallina* (Kützing) Grunow  
HUSTEDT 1927-1966, II: 77, f. 606

Polyhalobe, cosmopolite.

Very rare.

*Licmophora remulus* Grunow

HUSTEDT 1927-1966, II: 57, f. 580

Polyhalobe.

Very rare. Plate 2, fig. 6: 118 x 10 µm.

## Mastogloia Thwaites 1856

*Mastogloia acutiuscula* Grunow var.  
*elliptica* Hustedt

HUSTEDT 1927-1966, II: 515, f. 947 c,d

Polyhalobe.

Rare. 25 x 10 µm.

*Mastogloia binotata* (Grunow) Cleve

HUSTEDT 1927-1966, II: 470, f. 889

Polyhalobe, cosmopolite.

Frequent.

—fo. *ovata* Voigt

VOIGT 1942: 6, f. 3

Polyhalobe. First recorded by VOIGT from Nagasaki and Djibouti, this species has also been observed by me in small numbers in samples from the waters around the Azores and the Cape Verde Islands. Not rare. Plate 2, fig. 7: 20 x 13 µm.

*Mastogloia corsicana* Grunow

HUSTEDT 1927-1966, II: 533, f. 966

Polyhalobe.

Rare. Plate 2, fig. 8: 31 x 13 µm.

*Mastogloia erythraea* Grunow

HUSTEDT 1927-1966, II: 524, f. 959

Polyhalobe.

Very rare.

*Mastogloia fallax* Cleve

HUSTEDT 1927-1966, II: 504, f. 930

Polyhalobe. The identification is not without doubt. My specimens have a central area which is deflated slightly only at one side, the raphe is quite straight and does not seem to have an undulate character. (HUSTEDT l.c.: "Raphe wenig gewellt").

Very rare.

FOGED in his work on the diatoms from Cuba (FOGED 1984, page 53, plate 37, f. 1 and 2) described the new forma *bioculis*. In the photographs of his plate 37 it can be seen that this species has a large depressed area around the raphe, which should not be normal for the species. It seems therefore necessary to study the holotype to see whether this 'depression' is an artefact or really exists. Should the latter be the case, then it might be an hitherto undescribed *Mastogloia* species.

*Mastogloia fimbriata* (Brightwell) Cleve  
HUSTEDT 1927-1966, II: 464, f. 884.  
Polyhalobe.  
Frequent. Plate 2, fig. 9 : 30 x 22  $\mu$ m.

*Mastogloia horvathiana* Grunow  
HUSTEDT 1927-1966, II: 472, f. 890.  
Polyhalobe.  
Very rare. 72 x 42  $\mu$ m.

*Mastogloia obliqua* Hagelstein  
HAGELSTEIN 1938: 375, t.5, f. 12,13.  
Polyhalobe. Reported from the  
Seychelles Islands (GIFFEN 1980), Virgin  
Islands (HAGELSTEIN 1938) and by me  
from the Azores and Cape Verde Islands  
(unpublished).  
Very rare. Plate 2, fig. 10 : 11 x 4  $\mu$ m.

*Mastogloia ovalis* A. Schmidt  
HUSTEDT 1927-1966, II: 474, f. 893.  
Polyhalobe.  
Rare.

*Mastogloia ovulum* Hustedt  
HUSTEDT 1927-1966, II: 474, f. 892.  
Polyhalobe.  
Common. Plate 2, fig. 11 : 26 x 15  $\mu$ m. 20  
striae in 10  $\mu$ m.

*Mastogloia paradoxa* Grunow  
HUSTEDT 1927-1966, II: 519, f. 953.  
Polyhalobe. Distinguished from *M. similis*  
Hustedt mainly by its more or less undulate  
raphe.  
Very rare. Plate 3, fig. 1 : 42 x 11  $\mu$ m. 25  
striae in 10  $\mu$ m.

*Mastogloia peragalli* Cleve  
HUSTEDT 1927-1966, II: 561, f. 991.  
Polyhalobe.  
Common. Plate 3, fig. 2 : 35 x 17  $\mu$ m.

*Mastogloia pumila* (Grunow) Cleve  
HUSTEDT 1927-1966, II: pag.553, f. 983.  
Polyhalobe.  
Very rare. 30 x 9  $\mu$ m. 24 striae in 10  $\mu$ m.

*Mastogloia pusilla* Grunow var. *subcapitata*  
Hustedt  
HUSTEDT 1927-1966, II: 569, f. 1002 e.  
Polyhalobe.  
Very rare. 13 x 6  $\mu$ m.

*Mastogloia schmidtii* Heiden  
HUSTEDT 1927-1966, II: 567, f. 1000  
Polyhalobe.  
Very rare. 37 x 5  $\mu$ m.

*Mastogloia splendida* (Gregory) Cleve  
HUSTEDT 1927-1966, II: 463, f. 883.  
Polyhalobe, cosmopolite.  
Common. Plate 3, fig. 3 : 36 x 24  $\mu$ m.

*Mastogloia vasta* Hustedt  
HUSTEDT 1927-1966, II: 553, f. 984.  
Polyhalobe. Reported by HUSTEDT  
from Borneo and by FOGED (1987) from  
the Fiji Islands. In my specimens the raphe-  
accompanying H- formed depressions are  
very weak and therefore easy to overlook.  
Very rare. Plate 3, fig. 4 : 26 x 13  $\mu$ m. 25  
striae in 10  $\mu$ m.

## Navicula Bory 1824

*Navicula cancellata* Donkin  
HENDEY 1964: 203, plate 30, f. 18-20  
Polyhalobe, cosmopolite.  
Common.

*Navicula cryptotenella* Lange-Bertalot  
KRAMMER & LANGE-BERTALOT  
1986: 106, plate 33, f. 9-11  
Oligohalobe, cosmopolite.  
Common.



*Navicula digito-radiata* (Gregory) Ralfs  
var. *rostrata* Hustedt

HUSTEDT 1939: 627, f. 92,93.

KRAMMER & LANGE-BERTALOT 1986, page 109, discuss the taxonomy of this variety and doubt whether HUSTEDT was right in his assumption that this rostrate form belongs to *N. digito-radiata*. Perhaps *N. salinarum* would be a more appropriate choice.

In the material from Lanzarote, both types are present and there *N. salinarum* generally has a more slender shape and more striae in 10  $\mu$ m. However, until more investigation has been done on this subject, I like to maintain the variety *rostrata*. Mesohalobe.

Common. Plate 3, fig. 5: 51 x 12  $\mu$ m. 12 striae in 10  $\mu$ m.

*Navicula directa* (W. Smith) Cleve  
PERAGALLO 1897-1908: 90, t.12, f. 6.  
Polyhalobe, cosmopolite.  
Very rare.

*Navicula flantica* Grunow  
KRAMMER & LANGE-BERTALOT 1986: 109, t.34, f. 10,11.  
Mesohalobe?  
Rather common.

*Navicula hennedyi* W. Smith  
HUSTEDT 1927-1966, III: 453, f. 1516.  
Polyhalobe, cosmopolite.  
Very rare. Plate 3, fig. 6: 45 x 28  $\mu$ m. 13 striae in 10  $\mu$ m.

*Navicula mollis* (W. Smith) Cleve  
PERAGALLO 1897-1908: 92, t.12, f. 11,12.  
Polyhalobe.  
Very rare. 22 x 6  $\mu$ m. 17 striae in 10  $\mu$ m.

*Navicula oblonga* Kützing  
HUSTEDT 1930: 307, f. 550.  
Oligohalobe.  
Very rare. 142 x 19  $\mu$ m. 7 striae in 10  $\mu$ m.

*Navicula palpebralis* Brebisson ex W. Smith  
HENDEY 1964: 216, t.34, f. 13-19.  
Polyhalobe, cosmopolite.  
Very rare.

*Navicula ramossissima* (Agardh) Cleve  
PERAGALLO 1897-1908: 92, t.12, f. 10.  
Polyhalobe.  
Very rare.

*Navicula rhynchocephala* Kützing  
KRAMMER & LANGE-BERTALOT 1986: 101, t.30, f. 1-8.  
Oligohalobe, cosmopolite.  
Very rare.

*Navicula salinarum* Grunow  
HUSTEDT 1930: 295, f. 1498.  
Polyhalobe.  
Common. 34 x 7  $\mu$ m. 16 striae in 10  $\mu$ m.

*Navicula tripunctata* (O. Müller) Bory  
PATRICK & REIMER 1966: 513, t.49, f. 3.  
Oligohalobe.  
Very rare. Plate 3, fig. 7: 35 x 7.5  $\mu$ m.

*Navicula zostereti* Grunow  
FOGED 1975: 45, t.20, f. 2.  
Polyhalobe.  
Very rare.

*Nitzschia* Hassall 1845

*Nitzschia amphibia* Grunow  
HUSTEDT 1930: 414, f. 793.  
Oligohalobe, cosmopolite.  
Very rare.

*Nitzschia coarctata* Grunow

HUSTEDT 1930:401 (as *N. punctata* (W. Smith) Grunow var. *coarctata* Grunow)  
Polyhalobe, cosmopolite.  
Rare.

*Nitzschia distantoides* Hustedt

HUSTEDT 1958: 171, f. 161.  
Polyhalobe.  
Very rare.

*Nitzschia hybridaeformis* Hustedt

HUSTEDT 1955: 44, t.15, f. 9-11.  
Polyhalobe.  
Very rare. Plate 3, fig. 8 : 65 x 6 µm. 10  
fibulae in 10 µm.

*Nitzschia incrustans* Grunow

GIFFEN 1971: 9, f. 44,45.  
Polyhalobe.  
Very rare.

*Nitzschia longissima* (Brebisson) Ralfs

PERAGALLO 1897-1908: 293, t.74, f. 20  
Polyhalobe.  
Common.

*Nitzschia marginulata* Grunow var. *didyma* Grunow

FOGED 1975: 47, t.28, f. 5  
Polyhalobe.  
Very rare.

*Nitzschia panduriformis* Gregory

PERAGALLO 1897-1908:268, t.70, f. 3-5  
Polyhalobe.  
Very rare.

*Nitzschia pseudohybrida* Hustedt

HUSTEDT 1955: 45, t.15, f. 3,4  
Polyhalobe.  
Rare.

*Nitzschia sigma* (Kützing) W. Smith

HUSTEDT 1930: 420, f. 813  
Mesahalobe, cosmopolite.  
Very rare. 92 x 4 µm.

*Nitzschia sigmaformis* Hustedt

HUSTEDT 1955: 47, t.16, f. 2,3.  
Polyhalobe. Reported from the Atlantic  
Coast U.S.A.  
Not rare. Plate 3, fig. 9 : 118 x 4 µm. 10  
fibulae in 10 µm.

*Nitzschia spathulata* Brebisson

PERAGALLO 1897-1908: 284, t.73, f. 4.  
Polyhalobe.  
Very rare.

*Nitzschia ventricosa* Kitton

GIFFEN 1970: 293, f. 84.  
Polyhalobe.  
Very rare.

*Pinnularia* Ehrenberg 1840

*Pinnularia maior* (Kützing) Rabenhorst  
HUSTEDT 1930: 331, f. 614  
Oligohalobe, cosmopolite.  
Very rare. 166 x 25 µm.

*Pinnularia viridis* (Nitzsch) Ehrenberg

HUSTEDT 1930: 334, f. 617a.  
Oligohalobe, cosmopolite.  
Very rare. 100 x 18 µm.

*Plagiodiscus* Grunow & Eulenstein  
1867*Plagiodiscus nervatus* Grunow

PERAGALLO 1897-1908: 256, t.65, f. 6.  
(As *Surirella reniformis* Grunow)  
Polyhalobe.  
Very rare.

**Pleurosigma W. Smith 1852***Pleurosigma normanii* RalfsPERAGALLO 1897-1908: 162, t.32, f. 4-6 (as *Pleurosigma affine* Grunow var. *normanii* Ralfs)

Polyhalobe.

Rare. 120 x 20 µm. 18/20 striae in 10 µm.

*Pleurosigma decorum* W. Smith

PERAGALLO 1897-1908: 157, t.30, f. 9,10.

Polyhalobe.

Very rare.

*Pleurosigma elongatum* W. Smith var.*fallax* (Grunow) Cleve

CARDINAL et al.1986: 184, f. 65-69.

Polyhalobe.

Rare. 200 x 22 µm. 20/20 striae in 10 µm.

*Pleurosigma strigosum* W. Smith

HENDEY 1964: 246, t.36, f. 7.

Polyhalobe.

Very rare. 180 x 22 µm.

**Podocystis Kützing 1844***Podocystis adriatica* Kützing

HUSTEDT 1927-1966, II: 131, f. 652.

Polyhalobe. Rare. Plate 2, fig. 12: 58 x 29 µm.

**Pyxidicula Ehrenberg 1838***Pyxidicula mediterranea* Grunow

HUSTEDT 1927-1966, I: 300, f. 137.

Polyhalobe.

Very rare. Diam. 42 µm.

**Rhabdonema Kützing 1838***Rhabdonema adriaticum* Kützing

HUSTEDT 1927-1966, II: 23, f. 552.

Polyhalobe.

Very rare.

**Rhaphoneis Ehrenberg 1844***Rhaphoneis amphiceros* Ehrenberg

HUSTEDT 1927-1966, II: 174, f. 680.

Polyhalobe, cosmopolite.

Very rare.

**Rhoicosphenia Grunow 1860***Rhoicosphenia abbreviata* (Agardh) Lange-Bertalot

KRAMMER &amp; LANGE-BERTALOT

1986: 381, t.91, f. 20-28

Oligohalobe, cosmopolite.

Very rare. 19 x 5 µm. 15 striae in 10 µm.

**Rhopalodia O. Mueller 1895***Rhopalodia constricta* (W. Smith) Krammer

KRAMMER 1988: 169, t.14, f. 149-154

Mesohalobe/polyhalobe(?)

Not rare. Plate 3, fig. 10: 47 x 12 µm.

*Rhopalodia gibberula* (Ehrenberg) O. Müller

KRAMMER 1988: 160, t.1, f. 1-14.

Mesohalobe/polyhalobe.

Not rare.

*Rhopalodia gütingeri* Krammer

KRAMMER 1988: 168, t.13, f. 139-144.

Polyhalobe. Reported from Costa Rica and the Mediterranean.

Very rare. Plate 3, fig. 11: 15 x 8 µm.

*Rhopalodia musculus* (Kützing) O.Müller  
 KRAMMER 1988: 163, t.7, f. 68-75  
 Mesohalobe/polyhalobe. Cosmopolite.  
 Common.

### Striatella Agardh 1832

*Striatella delicatula* (Kützing) Grunow  
 HUSTEDT 1927-1966, II: 33, f. 561.  
 Polyhalobe.  
 Very rare.

*Striatella unipunctata* (Lyngbye) Agardh  
 HUSTEDT 1927-1966, II: 32, f. 560.  
 Polyhalobe.  
 Not rare.

### Surirella Turpin 1828

*Surirella armoricana* Peragallo  
 PERAGALLO 1897-1908: 249, t.60, f. 10  
 Polyhalobe.  
 Very rare. Plate 3, fig. 12 : 64 x 37 µm.

*Surirella fastuosa* (Ehrenberg) Kützing  
 PERAGALLO 1897-1908: 248, t.58, f. 6,7.  
 Polyhalobe.  
 Very rare.

*Surirella fluminensis* Grunow  
 PERAGALLO 1897-1908: 249, t.60, f. 1,2  
 Polyhalobe.  
 Very rare. 39 x 18 µm.

### Synedra Ehrenberg 1830

*Synedra formosa* Hantzsch  
 HUSTEDT 1927-1966, II: 233, f. 720.  
 Polyhalobe.  
 Very rare. Plate 3, fig. 13 : 220 x 18 µm. 9  
 striae in 10 µm.

*Synedra gaillonii* (Bory) Ehrenberg  
 HUSTEDT 1927-1966, II: 195, f. 690.  
 Polyhalobe.  
 Very rare. 160 x 7 µm. 11 striae in 10 µm.

*Synedra laevigata* Grunow  
 HUSTEDT 1927-1966, II: 213, f. 706 a-c.  
 Polyhalobe.  
 Common.

—var. *hyalina* Grunow  
 HUSTEDT 1927-1966, II: 214, f. 706 e-i.  
 Polyhalobe.  
 Common.

*Synedra tabulata* (Agardh) Kützing  
 HUSTEDT 1927-1966, II: 218, f. 710 a-d.  
 Mesohalobe, cosmopolite.  
 Very rare.

*Synedra toxoneides* Castracane  
 HUSTEDT 1927-1966, II: 220, f. 711.  
 Polyhalobe.  
 Rare. 174 x 3.5 µm. 25 striae in 10 µm.

*Synedra ulna* (Nitzsch) Ehrenberg  
 HUSTEDT 1927-1966, II: 195, f. 691 a-c  
 Oligohalobe, cosmopolite.  
 Very rare. 142 x 7 µm. 9 striae in 10 µm.

*Synedra undulata* Bailey  
 HUSTEDT 1927-1966, II: 224, f. 714.  
 Polyhalobe.  
 Very rare.

### Trachyneis Cleve 1894

*Trachyneis aspera* (Ehrenberg) Cleve  
 PERAGALLO 1897-1908: 150, t.29, f. 1,2  
 Polyhalobe.  
 Very rare.



**Triceratium Ehrenberg 1841**

*Triceratium antediluvianum* (Ehrenberg)  
Grunow

HUSTEDT 1927-1966, I: 810, f. 472.

Polyhalobe.

Very rare.

*Triceratium pentacrinus* (Ehrenberg)  
Wallich fo.

*quadrata* Hustedt

HUSTEDT 1927-1966, I: 814, f. 475.

Polyhalobe.

Very rare. Plate 3, fig. 14: Length of edges  
45  $\mu$ m.

*Triceratium shadboltianum* Greville var.  
*elongata* Grunow

HUSTEDT 1927-1966, I: 809, f. 471.

Polyhalobe.

Very rare.

**Tropidoneis Cleve 1891**

*Tropidoneis lepidopterau* (Gregory) Cleve  
PERAGALLO 1897-1908: 188, t.39, f. 3,4.

Polyhalobe, cosmopolite.

Very rare.

*Tropidoneis pusillau* (Gregory) Cleve

HENDEY 1964: 256, t.27, f. 1,2

Polyhalobe, cosmopolite.

Very rare.

**DISCUSSION**

The wealth on diatoms from this location at Lanzarote is relatively modest, still it could be interesting to investigate more samples from the lagoon and from other locations in the future, because little is known about the diatom population of this island.

The lagoon is shielded from the land-side by a steep mountain wall and it must be the occasional heavy rains pouring down from this wall into the lagoon that are responsible for some rather unexpected freshwater diatoms which were discovered.

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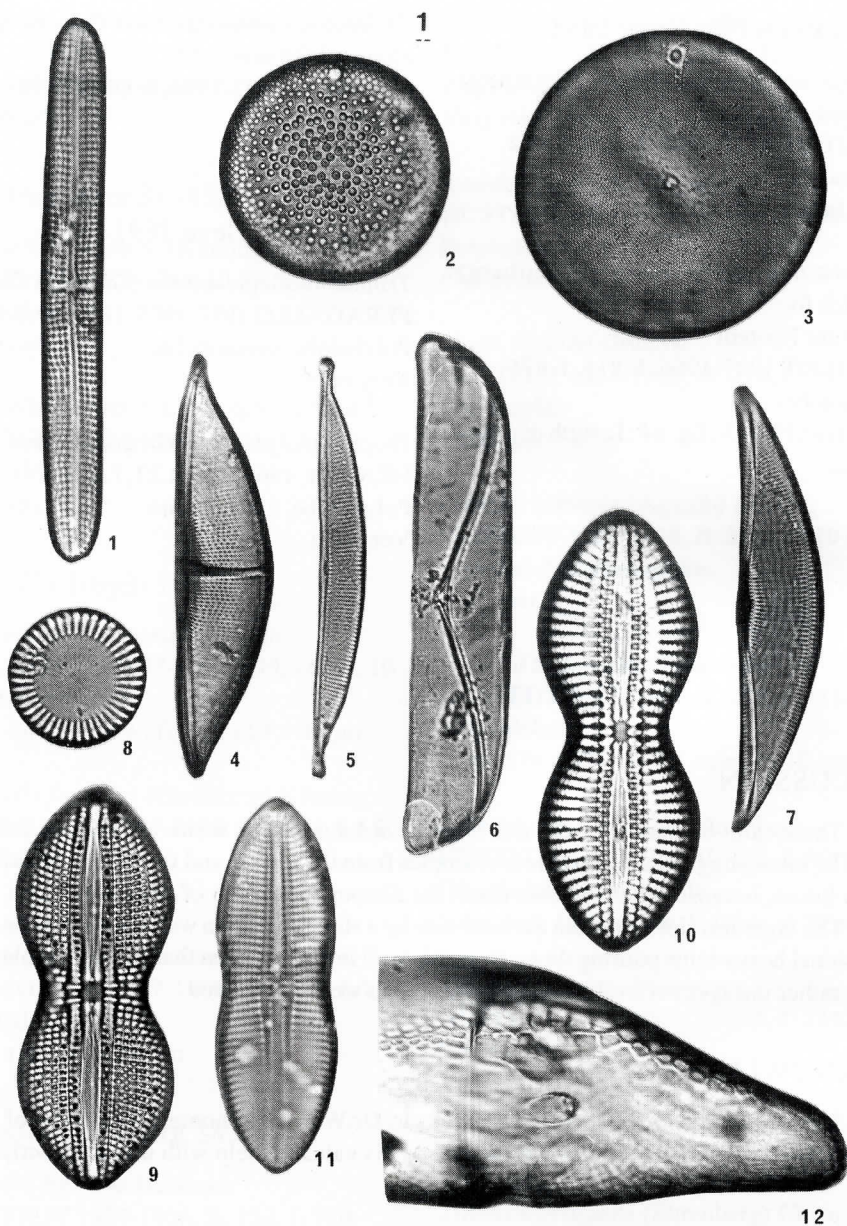


PLATE 1. 1. *Achnantes brevipes* Agardh var. *angustata* (Greville) Cleve. 2. *Actinocyclus octonarius* Ehrenberg var. *crassus* (W. Smith) Hendey. 3. *Actinocyclus subtilis* (Gregory) Ralfs. 4. *Amphora acuta* Gregory var. *arcuata* (A. Schmidt) Cleve. 5. *Amphora coffeaeformis* (Agardh) Kützing. 6. *Amphora obtusa* Gregory. 7. *Amphora rhombica* Kitton var. *intermedia* Cleve. 8. *Cyclotella meneghiniana* Kützing. 9. *Diploneis bomboides* (A. Schmidt) Cleve. 10. *Diploneis crabro* Ehrenberg. 11. *Diploneis vacillans* (A. Schmidt) Cleve var. *renitens* A. Schmidt. 12. *Isthmia lindigiana* Grunow et Eulenstein.

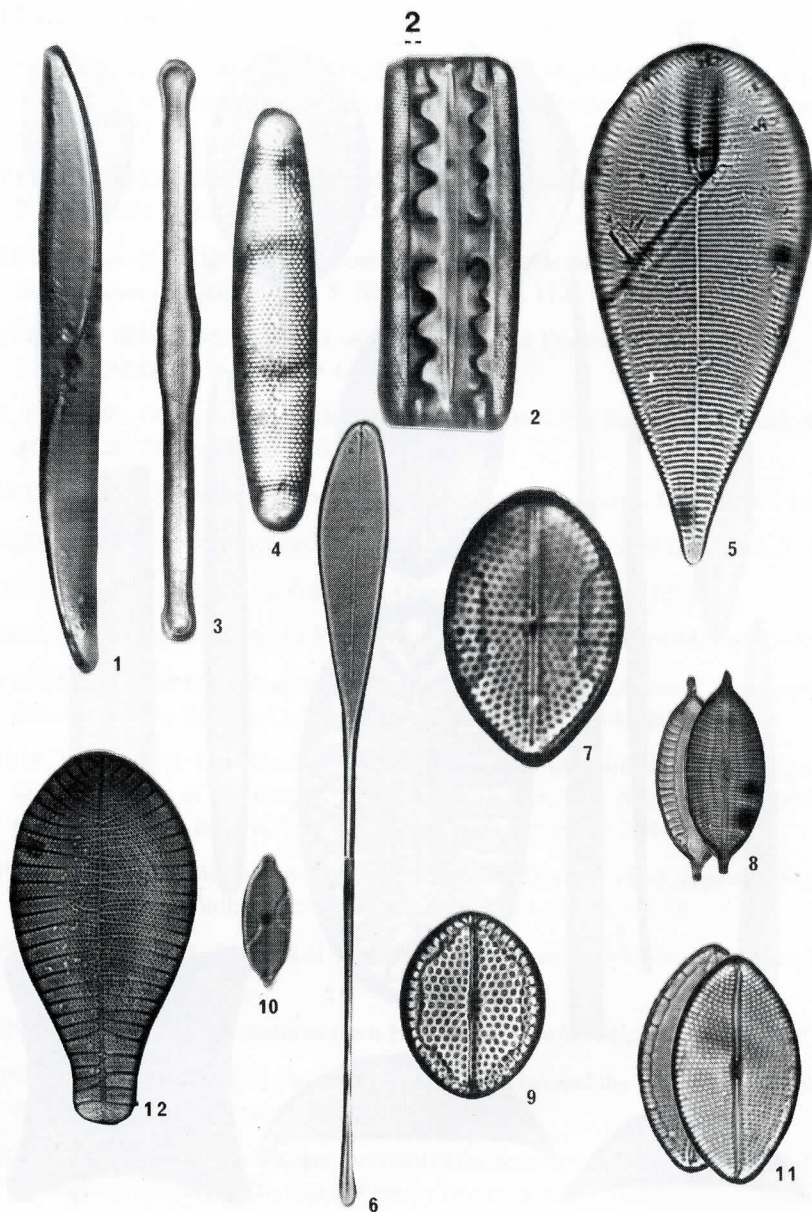


PLATE 2. 1. *Donkinia angusta* (Donkin) Ralfs. 2. *Grammatophora serpentina* (Ralfs) Ehrenberg. 3. *Grammatophora caribaea* Cleve. 4. *Grammatophora marina* (Lyngbye) Kützing. 5. *Licmophora ehrenbergii* (Kützing) Grunow var. *ovata* (W. Smith) Peragallo. 6. *Licmophora regulus* Grunow. 7. *Mastogloia binotata* (Grunow) Cleve fo. *ovata* Voigt. 8. *Mastogloia corsicana* Grunow. 9. *Mastogloia fimbriata* (Brightwell) Cleve. 10. *Mastogloia obliqua* Hagelstein. 11. *Mastogloia ovulum* Hustedt. 12. *Podocystis adriatica* Kützing.



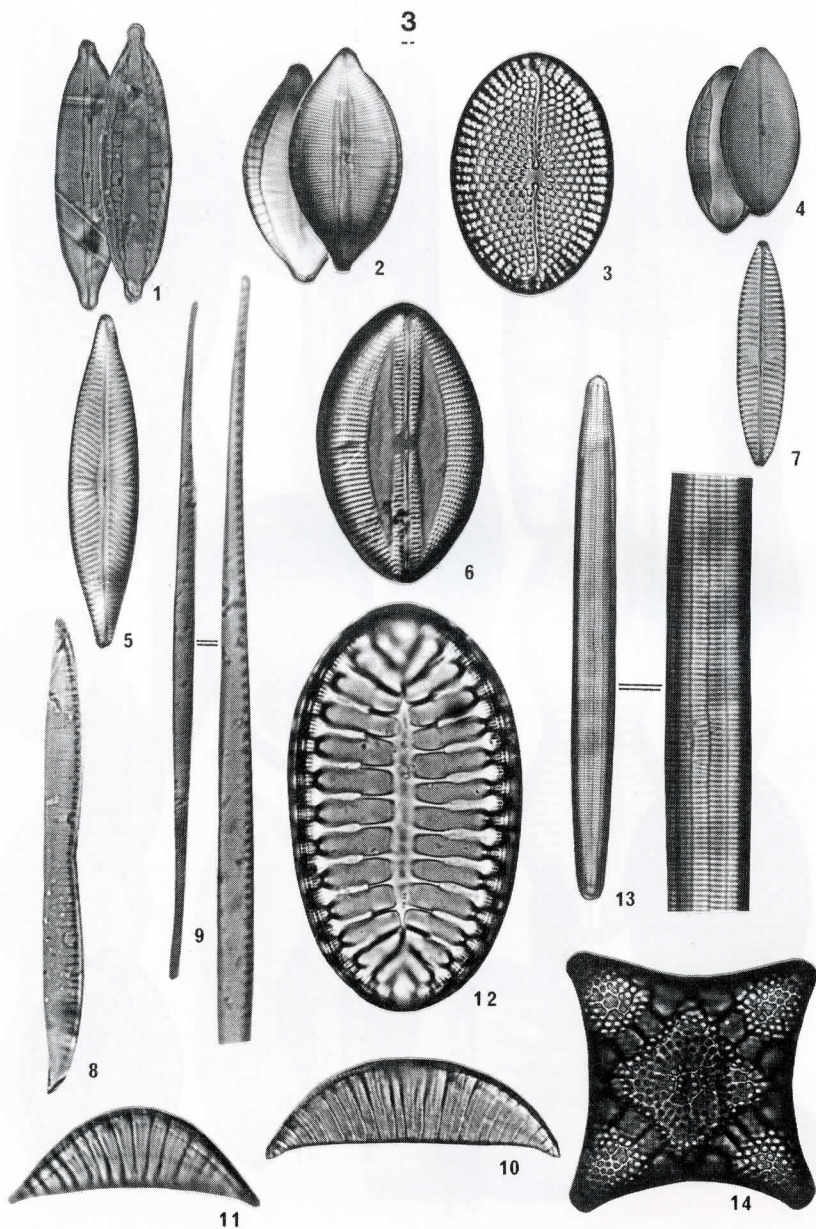


PLATE 3. 1. *Mastogloia paradoxa* Grunow. 2. *Mastogloia peragalli* Cleve. 3. *Mastogloia splendida* Cleve. 4. *Mastogloia vasta* Hustedt. 5. *Navicula digito-radiata* (Gregory) Ralfs var. *rostrata* Hustedt. 6. *Navicula hennedyi* W. S. Smith. 7. *Navicula tripunctata* (O. Müller) Bory. 8. *Nitzschia hybridaeformis* Hustedt. 9. *Nitzschia sigmaformis* Hustedt. 10. *Rhopalodia constricta* (W. Smith) Krammer. 11. *Rhopalodia güttingeri* Krammer. 12. *Surirella armoricana* Peragallo. 13. *Synedra formosa* Hanrzs. 14. *Triceratium pentacritus* (Ehrenberg) Wallich fo. *quadrata* Hustedt.



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