INVENTORY OF THE DIATOM FLORA OF THE NW MEDITERRANEAN SEA

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INVENTORY OF THE DIATOM FLORA OF THE NW MEDITERRANEAN SEA

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DIATOMS
CHECKLIST
MEDITERRANEAN SEA
PHYTOPLANKTON

ABSTRACT – Extensive studies of phytoplankton species diversity from the northwestern Mediterranean Sea have been going on for more than one hundred years. Most of the taxonomic work around the northwestern Mediterranean Sea was carried out between 1925 and 1975 from samples obtained at coastal and inshore stations particularly in the Gulf of Lions, the Ligurian Sea and the Balearic Sea. Although there are an important number of publications covering all the groups of microscopic algae, there is no inventory of the diatom flora of the northwestern Mediterranean. Since 1975 in extenso inventories and checklists of phytoplankton species identified have not been included in the open literature, the authors referring only to the major species or to those offering a special ecological interest. The aim of the present study was to compile published and unpublished data on the composition of phytoplankton taxa from studies carried out since the early days in order to build an up-to-date and comprehensive taxonomic database to assist in the interpretation of the many phytoplankton records obtained in various cruises carried out in the area since 1979. Only the Class Bacillariophyceae has been included in the present paper. For the compilation of the inventory, the 753 taxonomic units (species, varieties and forms), with indication of synonyms, have been grouped within Orders and Suborders. The Inventory has been based on thirty four original bibliographic references and various review papers and atlases. The area studied covers the Gulf of Lions and neighbouring areas with extension to the Catalan Sea. The hydrographic conditions in the areas covered span from the estuarine areas off the Rhône and Ebro rivers to the open sea areas of the Algero-Provençal basin. Species that may have a benthic habitat and those from freshwater and estuarine environments, constituting only a minority, have also been included.

DIATOMÉES
INVENTAIRE
MÉDITERRANÉE
PHYTOPLANCTON

RÉSUMÉ – Les études conduites pendant les cent dernières années sur le phytoplancton de la Méditerranée nord-occidentale ont permis d'élaborer un inventaire de 753 taxons appartenant à la classe des Bacillariophyceae, regroupés en Ordres et Sous-ordres avec indication des espèces, variétés et formes supplémentaires ainsi que les synonymies. L'inventaire est basé sur 34 références bibliographiques regroupant à leur tour d'autres publications sur le même thème. Des observations menées à terme avec des échantillons récoltés lors de plusieurs campagnes océanographiques dans le Golfe du Lion, la Mer Catalane et leurs abords font aussi partie de l'inventaire.

INTRODUCTION

Early investigations on the taxonomy of phytoplankton carried out by Gourret (1883) in the Gulf of Marseilles were followed by those of Peragallo and Peragallo (1908) who provided for the first time a list of Diatom species found in the Gulf of Lions and, almost at the same time, Pavillard (1909; 1916a,b,c) identified 50 species of diatoms from the Gulf of Lions and the Ligurian Sea. Dangeard (1932) published the systematics of phytoplankton collected near Banyuls-sur-Mer between 1925 and 1932 including 53 species of diatoms. Devèze (1959) reported a study carried out in the Gulf of Marseilles during the period 1955-1956 with 57 species of diatoms identified by Margalef. Cachon and Cachon-Enjumet (1964) described two new species from plankton sampled off Villefranche-sur-Mer. Minas *et al.* (1968) on the COMEXO laboratory-buoy located in the bay of Villefranche-sur-Mer, cited 43 systematic units

of diatoms during their study of the microplankton and environmental conditions. Leger (1971) published a paper on the phytoplankton collected from that same buoy, this time anchored offshore, in the Gulf of Lions.

Until the beginning of the 1960s, all the work was carried out with samples obtained by towing a fine-meshed net. A. Travers (1962) and M. Travers (1962) simultaneously used the traditional net sampling and the new Utermöhl technique to study the phytoplankton of the Gulf of Marseilles between 1961 and 1962. As a result of their parallel work with both techniques, A. Travers (1962) published a systematic inventory including 203 diatom species while M. Travers (1962) focused on the quantitative aspects and both authors made an important contribution to the methodology and ecology of the phytoplankton of the Mediterranean Sea. This work was followed by the publication of an inventory of Protists of the Gulf of Marseilles (M. Travers, 1975) constituting perhaps the most exhaustive work ever done on the subject that has been used as the basis for our work.

The early work of Massuti (1930, 1944) in the bay of Palma de Mallorca and in Castellon was reviewed by Margalef (1951) together with that carried out by Dangeard in the French Catalonia as well as his own observations from Blanes and Castellon. Margalef (1969, 1971) and Margalef and Estrada (1987) have compiled the species found by various authors working along the Catalan coasts in locations such as the bays of Blanes (Margalef, 1945b), Cadaqués (Margalef, 1945a) and Palma de Mallorca (Balle, 1953, 1954, 1959; Navarro and Massuti, 1940), the ports of Barcelona (Morales and Arias, 1965; Margalef and Herrera, 1966) and Maho (Massuti, 1948) and coastal areas off Castelló (Herrera and Margalef, 1957, 1961; Margalef and Herrera, 1963, 1964; Margalef, 1969), Barcelona (Margalef and Ballester, 1967; Margalef and Castellvi, 1967; Margalef, 1969, 1971; Estrada, 1979, 1980, 1987) and the Ebro delta (Lopez and Arté, 1972). These authors listed 119 diatom species. Blasco (1970a,b), on the other hand, studied the systematics of *Chaetoceros didymus* and *Hemidiscus hardmanianus* Grev. and Castellvi (1963) focused on *Skeletonema costatum*.

Since 1975, in extenso inventories and checklists of phytoplankton species identified are not included in the scientific literature, the authors referring only to the most frequently observed species or to those offering a special ecological interest. Nevertheless, taxonomic information may be found in various publications (Estrada, 1979; Delgado, 1986; Descy and Willems, 1991) referring to the phytoplankton communities studied along both the Spanish coasts (Catalan and Balearic seas) and the French coasts (Gulf of Lions, Gulf of Marseilles).

A number of papers have collected and synthesized the knowledge available. Massuti and Margalef (1950), in the book « Introducción al estudio del fitoplancton marino » offered a valuable guide for the identification and systematic classification of some important marine phytoplankton species because of their abundance. Tregouboff and Rose (1957) handbook of planktonology of the western Mediterranean, based on 27 years of studies in the region, contains 227 plates and 2200 figures. Rampi and Bernhard (1978) produced an identification key for the Mediterranean pelagic diatoms with 28 genera and 126 species. More recently, Delgado and Fortuño (1990) published an atlas of Mediterranean phytoplankton containing 45 plates with electron micrographs of diatoms. However, no attempt has been made so far to compile a checklist of the phytoplanktonic flora of the northwestern Mediterranean following modern taxonomic criteria. Not all the authors having made contributions to the knowledge of phytoplankton of the NW Mediterranean are referred to here as their works had been included in one or another of these reviews. On the other hand, other authors contributors to the present work are referred to in the inventory.

The aim of the present study is part of an effort to compile the information available on the composition of the 12 most abundant Classes of phytoplankton in the NW Mediterranean (only the Class Bacillariophyceae is included in the present paper) from studies published since the early days and work done by the authors in the course of various oceanographic cruises carried out in the area during the last fifteen years.

MATERIAL AND METHODS

Two different sources of information were used for the preparation of the Inventory, (a) the taxa quoted in published references since 1883 (see list of references) and (b) those deriving from microscopic observations (following the Uttermohl technique) carried out in samples obtained from a number of cruises between 1979 and 1992 (Table I). Figure 1 shows the location of the stations visited during these cruises (Cruzado and Velásquez, 1990; Velásquez and Cruzado, 1990).

The bibliographic references consulted include review papers, especially the exhaustive work carried out by M. Travers (1975), which provided most of the taxa including synonyms, and by Margalef and Estrada (1981), and a number of unpublished reports and personal communications. Whenever possible, original sources have been consulted.

Volume 2 of Sournia's atlas of marine phytoplankton (Ricard, 1987) and the book by Round *et al.* (1990) have been used for the taxonomic classification.

The information presented here is part of a computer database developed in order to facilitate the interpreta-

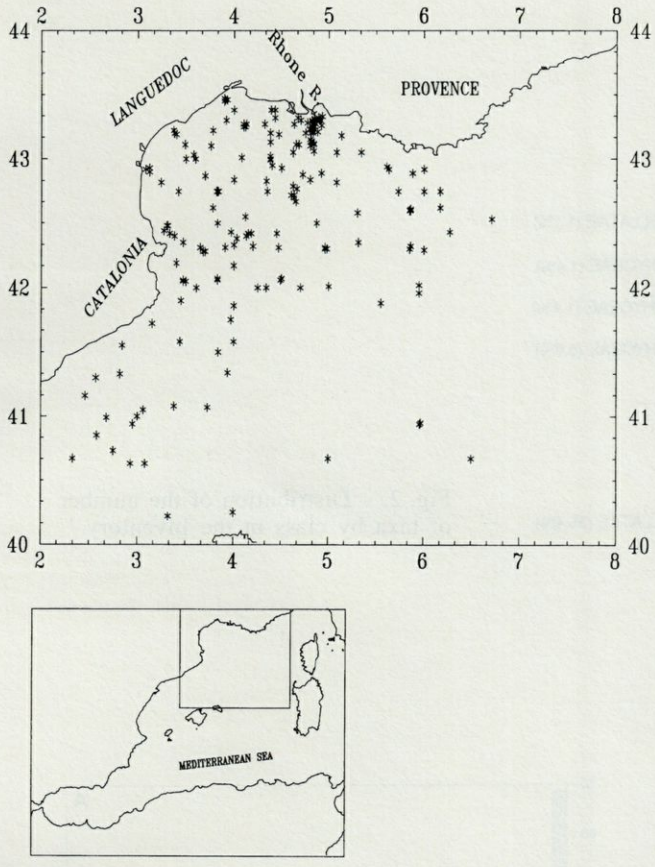

Fig. 1. – Map showing the area covered by the study and position of the stations sampled during the cruises.

Table I. – Oceanographic cruises covered by the present work.

Cruise	Date	Project	Funding
TANIT 79	5-11 Aug 1979	TANIT	CAICYT
CARON 85	25-28 Feb 1985	CARON	CAICYT
PELAGOLION III	10-15 Mar 1988	PICS	CSIC/CNRS
PANACHE I	10-15 Mar 1988	FRONTAL	CNRS
PANACHE II	6-19 Nov 1988	FRONTAL	CNRS
DISCOVERY 88	12-26 Dec 1988	EROS 2000	CEC
TYRO 91	20 Nov-5 Dec 1991	EROS 2000	CEC

tion of many phytoplankton records, including bibliographic references, complemented with optical and electron microscope images as well as descriptive and ecological information. The data constitute the knowledge base for an expert system at present at the pilot stage (Velásquez *et al.* 1991).

PRESENTATION OF THE INVENTORY

The taxonomic units, at the level of species, variety and form, all belonging to the Class Bacillariophyceae, have been grouped within Orders and Suborders following Ricard (1987). A number in chronological order (in brackets after each taxon) was assigned to each of the bibliographic references on which this work is based (Table II). The studies from the Gulf of Marseilles published prior to 1975 are referenced as Travers (1975) (reference = 0) instead of the original ones.

Many species have been cited by the original authors with names different from those accepted at present. An effort has been made to adapt the original citations to the most recently accepted systematics and, whenever possible, synonyms have been indicated (by an = sign). Some of the taxa may not reflect the state of the art with regard to the ever-changing taxonomical and systematic knowledge.

Most of the work included in this Inventory refers to organisms collected in the marine planktonic domain. However, species that may have a benthic habitat and also those that appear in the estuarine areas near the Rhône and Ebro rivers have also been included. The difficulty to define the term planktonic (vs. benthic and/or epiphytic), particularly in the estuarine and littoral areas (ecotones) has been acknowledged by Ricard (1987). In such habitats, the local populations are often formed by allochtonous organisms originating in either continental or oceanic systems and may be due to organisms showing tychoplanktonic characters. Accordingly, the habitat(s) given by Ricard (1987) to each genus has been represented in the Inventory by a letter (*P* = Planktonic; *B* = Benthic; *E* = Epiphytic; *T* = Tychoplanktonic). Those genera not showing any of the above letters are considered only Planktonic. It must be noted, however, that individual species, within any given genus, may show one or other behaviour.

Table II. – Key to the references in the Inventory.

0.	Travers,M (1975)	16.	Margalef,R (1965)
1.	Massuti, M (1930)	17.	Jacques,G (1967, 1969)
2.	Dangeard,P (1932)	18.	Margalef,R (1969)
3.	Margalef,R (1945a)	19.	Blanc,F *et al.* (1969)
4.	Navarro, FP; Bellon Uriarte, F (1945)	20.	Margalef, R (1971)
		21.	Blanc, F *et al.* (1975)
5.	Margalef,R (1945b)	22.	Bourgade,B (1977)
6.	Margalef,R (1951)	23.	Estrada,M (1979)
7.	Morales,E (1952)	24.	Estrada,M (1980)
8.	Balle,P (1953)	25.	Kim,KT (1980)
9.	Morales, E (1956)	26.	Arfi,R *et al.* (1982)
10.	Margalef, R (1957)	27.	Margalef,R; Estrada,M (1987)
11.	Margalef,R; Morales,E (1960)	28.	Delgado,M (1987)
12.	Herrera, J; Margalef, R (1961)	29.	Palau, M *et al.* (1991)
13.	Margalef, R; Herrera, J (1963a)	30.	Estrada, M (1991)
		31.	Delgado, M (Personal Comm.)
14.	Margalef, R; Herrera, J (1963b)	32.	Estrada, M. (Personal Comm.)
		33.	Margalef, R (Personal Comm.)
15.	Margalef,R (1964)	34.	Velásquez, ZR (this work)

RESULTS

The checklist contains 753 taxa (species, varieties and forms) belonging to 104 genus of diatoms. Of these taxa, 199 are varieties or supplementary forms. A total of 249 taxa belong to the Order Centrales and 504 to the Order Pennales of which 20 taxa could not be accomodated

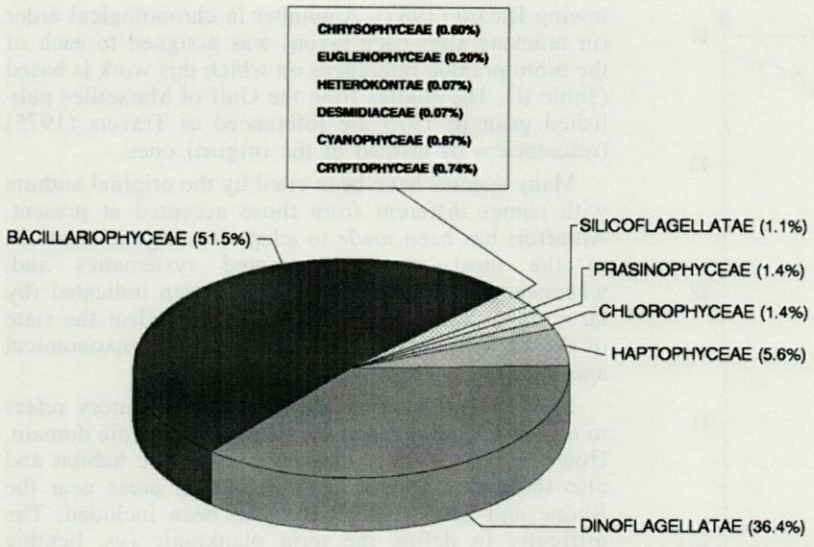

Fig. 2. – Distribution of the number of taxa by class in the Inventory.

to the classification given by Ricard (1987) and had to be listed according to Round *et al.* (1990) except for the genus *Amphiprora* that was absent from both keys but was cited by Cupp (1943). Fifty two synonyms, commonly used by many authors, were included in the inventory. Of the 248 genera given by Ricard(1987), 71 (34 belonging to Centric and 37 to Pennate diatoms) were never cited in the area studied. They have however been included in the Inventory for completion.

Figure 2 shows the importance of the Bacillariophyceae > 51 %) when compared to the overall species composition of the phytoplankton of the NW Mediterranean, followed by the Dinoflagellatae (> 36 %). All other groups only account for less than 13 % with the Haptophyceae representing nearly 6 % and the Chlorophyceae, Prasinophyceae and Silicoflagellatae each representing just above 1 % of the total number of taxa.

There is a relatively low degree of coincidence amongst the various authors citing the various species (Fig. 3A). A large part of the taxa (68 %) were cited only by one author while only 10 – 15 % of the taxa have been cited by more than five authors. The compilation made by Travers (1975) of the phytoplankton of the Gulf of Marseilles contributes with most of the species in the checklist citing 422 species that have not been cited again by the phytoplankton workers in the region. Ninety nine species were first cited outside the Gulf of Marseilles, most of them after 1967 (Fig. 3B). Table III shows the most frequently cited taxa, listed in order of citation (by more than 17 authors).

Of the total number of taxa in the checklist (753), about 20 % are varieties and 5 % synonyms (Fig. 4A) much fewer than the results shown at the level of genus from Ricard (1987) with 46.4 %

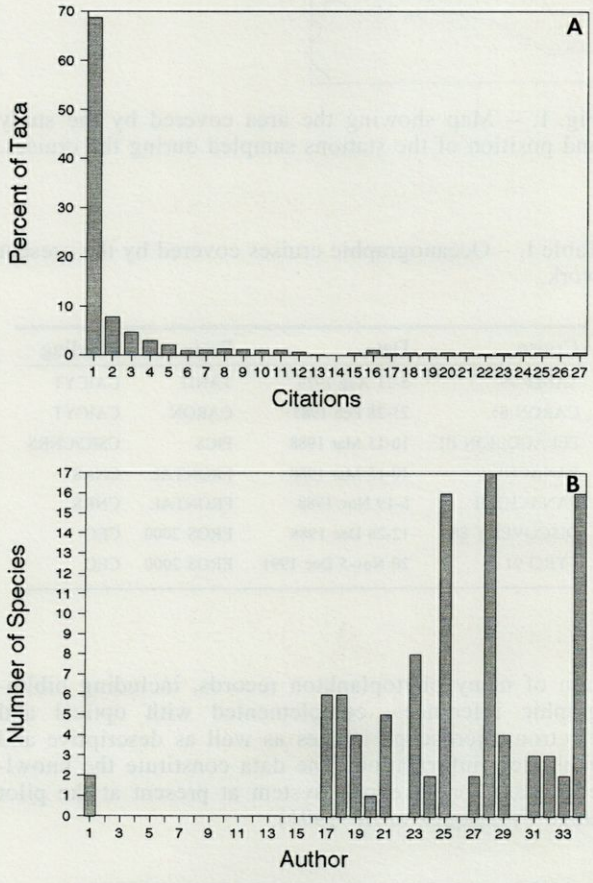

Fig. 3. – A, Distribution of taxa according to the number of citations made in the sources of reference. B, Number of taxa newly recorded in the region (since 1967) according to the author (see Table I for a reference to the authors code).

Table III. – Most of the taxa.

Taxon	Citations
Asterionella japonica Cleve in Cleve and Möller (=*A. glacialis* Castracane)	27
Thalassionema nitzschioides Grunow ex Hustedt (=*Thalassiothrix nitz.*)	27
Chaetoceros curvisetus Cleve	27
Leptocylindrus danicus Cleve	27
Rhizosolenia stolterfothi H. Peragallo	26
Dactyliosolen mediterraneus H. Peragallo (=*D. bergoni* H. Peragallo)	25
Hemiaulus haucki Grunow in Van Heurck	25
Nitzschia pungens Grunow in Cleve and Möller (=*N. seriata*)	25
Thalassiothrix frauenfeldi (Grunow) Cleve and Möller	25
Cerataulina pelagica (Cleve) Hendey (=*C. bergoni* H. Peragallo)	24
Chaetoceros decipiens Cleve (+ f. *singularis* Grant)	24
Rhizosolenia alata Brightwell (f. *alata*)	24
Rhizosolenia calcar-avis Schultze	24
Chaetoceros affinis Lauder (v. *affinis* Cleve)	23
Chaetoceros peruvianus Brightwell (v. *peruvianus*)	23
Guinardia flaccida (Castracane) H. Peragallo	23
Biddulphia mobiliensis (Bailey) Grunow in Van Heurck (=*Odontella mobiliensis*)	22
Schroederella delicatula (H. Peragallo) Pavillard (+ *S. schorederi* (Bergon) Pavillard)	22
Bacteriastrum delicatulum Cleve	21
Cylindrotheca closterium (Ehrenberg) W. Smith (=*Nitzs. closterium*)	21
Rhizosolenia delicatula Cleve	21
Rhizosolenia fragilissima Bergon	21
Chaetoceros lorenzianus Grunow	20
Lauderia annulata Cleve (=*L. borealis* Gran)	20
Nitzschia lineola Cleve (=*N. delicatissima* Cleve)	20
Skeletonema costatum (Greville) Cleve (=*Stephanopyxis costata* (Greville) Hustedt)	20
Chaetoceros didymus Ehrenberg (v. *didymus*)	19
Chaetoceros pseudocurvisetus Mangin	19
Chaetoceros rostratus Lauder	19
Hemiaulus sinensis Greville	19
Nitzschia longissima (Brébisson in Kuützing) Ralfs in Pritchard (v. *longissima*)	18

of synonyms (Fig. 4B). The varieties (Fig. 4C) are most frequent in the genera ***Nitzschia*** (18.1 %), ***Navicula*** (17.1 %), ***Amphora*** (9.5 %), ***Chaetoceros*** (6.5 %) and ***Diploneis*** (6.5 %) (Fig. 4). Many species (22.8 %) have only one synonym (Fig. 4D) while a large number of them have up to 5 synonyms (47.4 %). The genera ***Chaetoceros*** (19.3 %) and ***Navicula*** (10.5 %) show the largest number of synonyms.

The genera with larger number of species also show the larger number of varieties (Fig. 5A) and of synonyms (Fig. 5B) in roughly constant proportions.

DISCUSSION

The checklist given in the present paper is the result of more than one hundred years of work of a considerable number of phytoplankton taxonomists and ecologists working in the NW Mediterranean Sea. Some of these scientists have made a very substantial contribution to the Taxonomy and Ecology of phytoplankton. A number of species were first identified in samples from this region and their original description is still being used by marine biologists around the world.

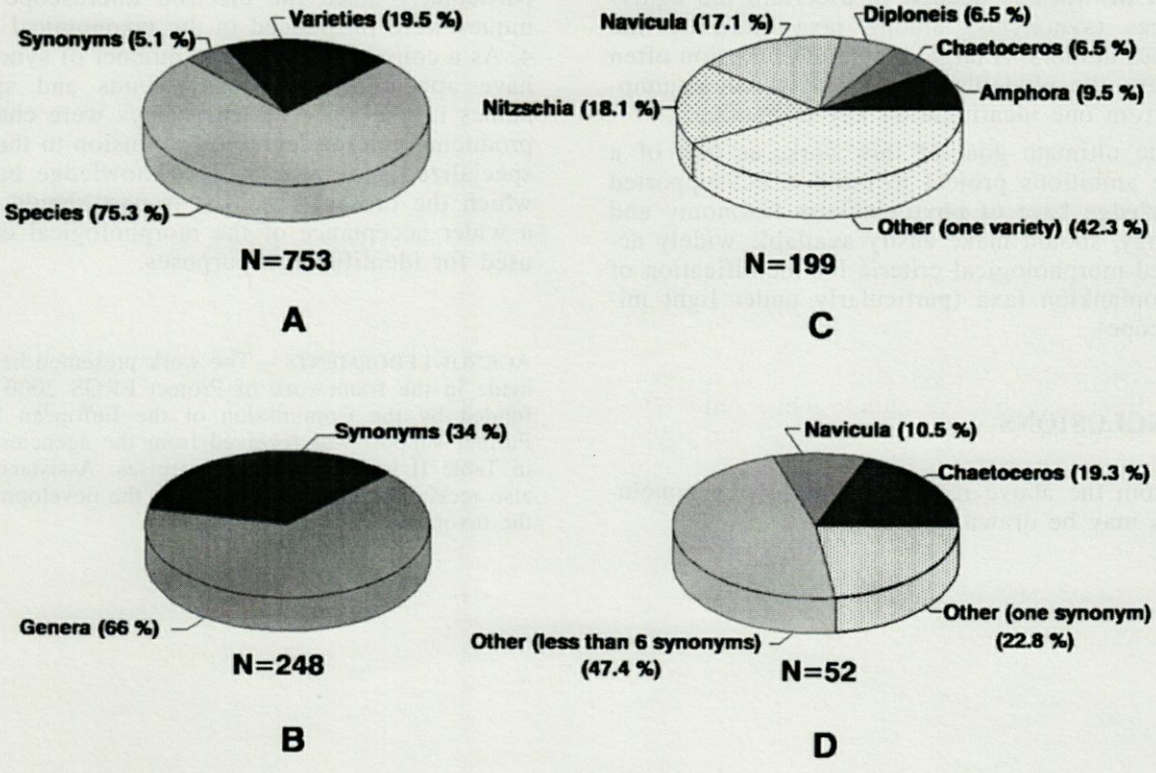

Fig. 4. – (A) Distribution of taxa in species, synonyms and varieties. (B) Proportion of synonyms in relation to genera (as given by Ricard, 1987). (C) Distribution of varieties according to genera. (D) Distribution of synonyms according to genera.

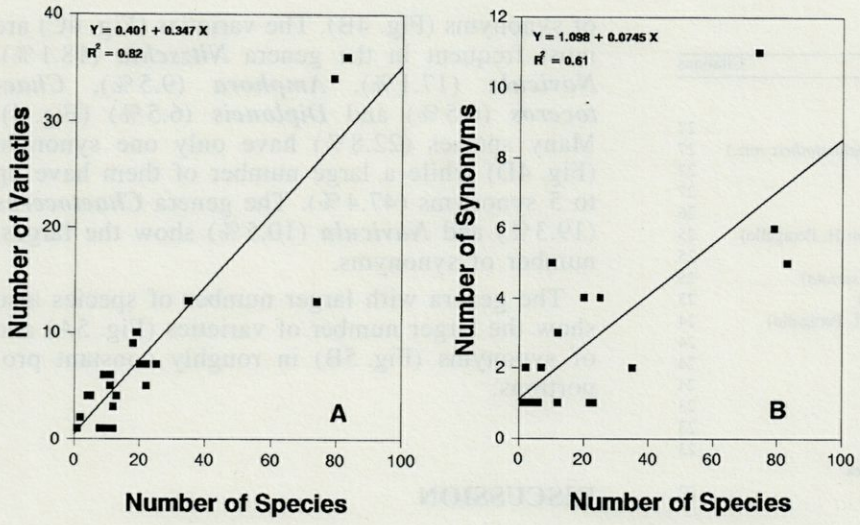

Fig. 5. – Number of varieties (A) and number of synonyms (B) in relation to the number of species for the various genera.

The greater precision introduced in the taxonomy of diatoms by the electron microscopy observations challenges the original identification thus making some taxa to appear and other disappear. The analysis of the references gives support to such a statement although a purely statistical, superficial assessment, could give birth to the idea of species extinction and appearance. A lot of work is needed to ascertain the equivalences (synonyms) among taxa cited by the various authors. A large degree of confusion often assaults the phytoplankton biologist when jumping from one identification key to another.

The ultimate goal of this work, as part of a more ambitious project to build a PC-supported knowledge base of phytoplankton taxonomy and ecology, should make easily available widely accepted morphological criteria for identification of microplankton taxa (particularly under light microscope).

CONCLUSIONS

From the above results, the following conclusions may be drawn :

1, The taxonomic identification of phytoplankton in the Northwestern Mediterranean has been mostly done before 1967. 2, Very few species have been added since the consolidated checklist published by Travers for the Gulf of Marseilles. The most recent additions are mainly unpublished work. 3, The classification keys used by the various authors are far from being homogeneous particularly since the electron microscope techniques were introduced in the taxonomical work. 4, As a consequence, a large number of synonyms have appeared when many genus and species names in use since the early days were changed, producing certain degree of confusion to the non-specialized biologist. 5, The knowledge base of which the present checklist is part should allow a wider acceptance of the morphological criteria used for identification purposes.

ACKNOWLEDGEMENTS – The work presented here was made in the framework of Project EROS 2000 partly funded by the Commission of the European Union. Further support was received from the agencies listed in Table II which funded the cruises. Assistance was also received from UNEP/FAO for the development of the taxonomic data base.

INVENTORY

CLASS BACILLARIOPHYCEAE

Order Centric Schütt, 1896

Suborder Coscinodiscineae

COSCINODISCUS Ehrenberg, 1838

Coscinodiscus alborani (6,7,18), *C. asteromphalus* (0,11,18,34), *C. centralis* (*v. pacifica*) (0), *C. centralis* (*v. centralis*) (0,2,6,7,9,11,17,18), *C. concinnus* (0,8,17, 34), *C. curvatulus* (0), *C. excentricus* (2,6,7,9,11,12,13, 14,15,17,18), *C. gigans* (6,9,11,12,18,22,28), *C. grani* (0,17,22,28,34), *C. janischi* (10,14,15,18), *C. lineatus* (0,6,7,8,10,11,14,15,18,34), *C. marginatus* (0,34), *C. nitidus* (=C. scintillans) (0,34), *C. nodulifer* (0,25), *C. oculus-iridis* (0,6,7,9,11,18,25,34), *C. perforatus* (*v. perforatus*) (0,17,18,22), *C. perforatus* (*v. cellulosa*) (0), *C. perforatus* (*v. pavillardi*) (0,2,6,7,9,10,11,12,14,15, 17,18,25), *C. radiatus* (0,6,7,10,11,12,13,14,15,16, 17,18,21,22,25,30,34), *C. sp* (1,5,7,9,11,13,14,15,20,23, 24,25,26,28,30,34), *C. subtilis* (0), *C. stellaris* (34), *C. thorii* (6,7,9,18).

GOSSLERIELLA Schütt, 1893

Gossleriella tropica (0,1,6,7,10,11,18).

HEMIDISCUS Wallich, 1860

Hemidiscus cuneiformis (*v. ventricosa*) (0), *H. cuneiformis* (*v. recta*) (0), *H. cuneiformis* (*v. gibba*) (0), *H. cuneiformis* (*v. cuneiformis*) (6,10,11,12,14,18,22,24,29, 30,34).
Euodia cuneiformis (1).

ROPERIA Grunow, 1881

ACTINOCYCLUS Ehrenberg, 1837

Actinocyclus ehrenbergi (*v. tenella*) (0), *A. ehrenbergi* (*v. ehrenbergi*) (0), *A. normani* (0).

ASTEROLAMPRA Ehrenberg, 1844

Asterolampra grevillei (0,2,6,7,10,11,12,14,15,17,18, 34), *A. marylandica* (2,6,7,9,10,11,2,14,17,18,34), *A. vanheurcky* (6,10,18).

ASTEROMPHALUS Ehrenberg, 1844

Asteromphalus flabellatus (0,28), *A. heptactis* (18,23), *A. hookeri* (0), *A. robustus* (0, 14,18).

BRIGHTWELLIA Ralfs, 1861 (O,N,P)

ACTINOPTYCHUS Ehrenberg, 1843

Actinoptychus senarius (=*A. undulatus*) (0), *A. splendens* (0)

AULACODISCUS Ehrenberg, 1884

THALASSIOSIRA Cleve, 1873

Thalassiosira condensata (25), *T. decipiens* (+*T. kryophila*) (0), *T. decipiens* (+*Cosc. eccent. fasc.*) (0,6,7,17,18,22,25), *T. eccentrica* (*v. eccentrica*) (0,27,29), *T. eccentrica* (=*Cosc. eccent. ecce.*) (0), *T. mediterranea* (=*Coscinosira medit.*) (0), *T. nordenskioeldi* (0), *T. parva* (17), *T. polychorda* (=*Coscinosira polychorda*) (0), *T. rotula* (0,17,18,24, 26,34), *T. sp* (10,11,20,23,24,26,28,29,30,34), *T. subtilis* (6,10,11, 18).*Coscinosira polychorda* (17).

MINIDISCUS Hasle, 1973

BACTERIOSIRA Gran, 1900

POROSIRA (Grunow) Jorgensen, 1905

PLANKTONIELLA Schütt, 1893

Planktoniella sol (0,7,9,10,17,18,34).

CYCLOTELLA Kutzing, 1833

Cyclotella caspia (0,16,17,18), *C. catenata* (21), *C. comta* (0,25), *C. glomerata* (25), *C. kuetzingiana* (0), *C. melosiroides* (25), *C. meneghiniana* (0,28), *C. ocellata* (0), *C. operculata* (25), *C. sp* (20,21,22,25,29).

CYCLOSTEPHANOS Round, 1982

STEPHANODISCUS Ehrenberg, 1845

Stephanodiscus hantzschi (0,22).

SKELETONEMA Greville, 1865

Skeletonema costatum (=*Stephanopyxis costatum*), (0,6,7,8,10,11,15,16,17,18,20,21, 22,23,24,25,26,28,29,34).

CYMATODISCUS Hendey, 1958

CYMATOTHECA Hendey, 1958

TRYBLIOPTYCHUS Hendey, 1958

DETONULA (Castracane) Schütt, 1983

Detonula confervacea (18), *D. moselyana* (34), *D. pumila* (31).

LAUDERIA Cleve, 1873

Lauderia annulata (=*L. borealis*) (0,2,6,7,8,9,10,11,12, 15,17,18,20,22,23,24,25,26, 28,34).

Schroederella delicatula (+*S. schroederi*) (0,1,2,6,7,9, 10,11,12,13,14,15,16,17,18,22, 24,25,28,29,30,34).

BT MELOSIRA Agardh, 1824

Melosira arenaria (0), *M. distans* (0), *M. granulata* (0,21,28,29,34), *M. granulata* (*v. angustissima*) (21), *M. italica* (22), *M. juergensi* (13,19), *M. juergensi* (*v. subangularis*) (0,18), *M. moniliformis* (*v. moniliformis*) (0,28), *M. moniliformis* (*v. subglobosa*) (0), *M. nummuloides* (21), *M. roeseana* (21), *M. sp* (34), *M. sulcata* (18,29), *M. varians* (19,21,22, 29).

B PARALIA Kutzing, 1844

BT DRURIDGEA Donkin, 1861

BT PODOSIRA Ehrenberg, 1840

Podosira stelliger (18).

ENDICTYA Ehrenberg, 1845

STEPHANOPYXIS (Ehrenberg) Grunow, 1884

Stephanopyxis palmeriana (8,18,34), *S. sp* (0,34), *S. turris* (1).

BT HYALODISCUS Ehrenberg, 1845

Hyalodiscus radiatus (0), *H. scoticus* (0).

BT PYXIDICULA Ehrenberg, 1833

Suborder Rhizosoleniineae

RHIZOSOLENIA Brightwell, 1858

Rhizosolenia acuminata (2,7,8,9,17), *R. bergoni* (0,2,6, 7,8,11,15,17,18), *R. castracanei* (0,2,6,7,8,9,10,11,12, 14,17,18), *R. cylindrus* (0,18,25), *R. delicatula* (0,6,7, 8,9,10,11,12,13,14,16,17,18,20,21,22,23,24,25,28,34), *R. firma* (12,18), *R. fragilissima* (0,6,7,8,9,10,11,14,16, 17,18,19,20,21,23,24,25,26,28,29,34), *R. hebetata* (*f. semispina*) (0,1,2,6,7,8,10,11,12,13,14,18,25,26,29), *R. hebetata* (*f. hebetata*) (0,9,22,23,24,34), *R. imbricata* (*v. imbricata*) (2,6,7,8,9,23,24,28,30,34), *R. imbricata* (*v. shrubsolei*) (0,1,2,6,7,9,10,11,12,13,14,15,16,17,18,20, 25,29), *R. robusta* (=*R. sigma*) (0,1,2,5,6,10,11,12, 13,14,15,16,17,18,22,28,29,34), *R. setigera* (=*R. hensenii*) (0,17,18,21,22,23,25,28,29), *R. sp* (5,23,24,25, 30), *R. stolterfothi* (0,1,2,5,6,7,8,9,10,11,13,14,15,16, 17,18,19,20,22,23,24,25,26,28,29,34), *R. styliformis* (*v. polydactyla*) (0), *R. styliformis* (=*R. formosa*) (0), *R. styliformis* (*v. longispina*) (0), *R.* styliformis (v. styliformis) (0,6,7,9,18,19,21,25,26,34), R. *styliformis* (=*R. styl. latissima*) (0), *R. temperei* (*v. temperei*) (0,2,6,7, 10,11,12,13,14,17,18), *R. temperei* (*v. acuminata*) (0,6, 10,11,14,18).
Pseudosolenia calcar-avis (= *Rhizosolenia calcar-avis*) (0,1,2,3,5,6,7,8,9,10,11,12,13,14,15,16,17,18,22,24,25, 28,29, 33,34),.

DACTYLIOSOLEN Castracane, 1886

Dactyliosolen mediterraneus (=*Leptocylindrus med.*) (=*D. bergoni*) (0,2,5,6,7,9,10,11,12,13,14,15,16,17,18, 19,20,22,23,24,25,26,28,29,34).

GUINARDIA H. Peragallo, 1892

Guinardia blavyana (0,2,6,7,9,18), *G. flaccida* (0,1,2,3,5, 6,10,11,12,13,14,15,16,17,18,19,20,22,24,25,26,29,34), *G. fragilissima* (33).

LEPTOCYLINDRUS Cleve, 1889

Leptocylindrus danicus (0,1,2,6,7,8,9,10,11,12,13,14, 15,16,17,18,20,21,22,23,24,25,26,28,29,30,34), *L. minimus* (0,17,18,19,21,28,34), *L. sp* (21).

CORETHRON Castracane, 1886

Corethron criophilum (=*C. hystrix*) (0,10,11,17,18,22, 26,29,34), *C. pelagicum* (17).

Suborder Biddulphiineae

BT BIDDULPHIA Gray, 1821

Biddulphia alternans (18,34), *B. aurita* (0,8,25), *B. longicruris* (*v. longicruris*) (0,22), *B. mobiliensis* (=*Odontella mobiliensis*) (0,2,6,7,9,10,11,12,13,14,15,17,18, 20,22,23,24,25,26,28,29,34), *B. pelagica* (=*Triceratium pelagicum*) (0), *B. pulchella* (=*B. biddulphiana*) (0,8, 18,22), *B. regina* (0), *B. rhombus* (0), *B. schroederiana* (0,5,18), *B. sinensis* (0), *B. sp* (1, 11,28), *B. tridens* (0).

BBIDDULPHIOPSIS von Stosch & Simonsen, 1984

ANAULUS Ehrenberg, 1844

Anaulus minutus (0), *A. sp* (29).

EUNOTOGRAMMA Weisse, 1854

HYDROSERA Wallich, 1858

BT ISTHMIA Agardh, 1832

TERPSINOE Ehrenberg, 1843

BT TRIGONIUM Cleve, 1868

HEMIAULUS Ehrenberg, 1844

Hemiaulus haucki (0,1,2,5,6,7,8,9,10,11,12,13,14,15, 16,17,18,19,21,22,23,25,26,29,34), *H. membranaceus* (28), *H. sinensis* (0,2,6,7,8,9,10,11,12,13,14,15,16,17, 18,24,25,28,34), *H. sp* (=*H. haucki/membranaceus*?) (27).

ATTHEYA West, 1860

CERATAULINA H. Peragallo ex. Schütt, 1896

Cerataulina pelagica (=*C. bergoni*) (0,1,2,6,7,9,10,11, 12,13,14,15,16,17,18,20,22,23,24,26,28,29,31,34).

CLIMACODIUM Grunow, 1868

Climacodium fraunfeldianum (0).

EUCAMPIA Ehrenberg, 1939

Eucampia cornuta (0,17,18,24,28), *E. zodiacus* (0,1,8,12,13,14,15,17,18,20,22,24,25, 26,28,34).

BT STICTODISCUS (Ehrenberg) Greville, 1861

ARACHNOIDISCUS Ehrenberg, 1849

CHRYSANTHEMODISCUS Mann, 1925

ETHMODISCUS Castracane, 1886

B STICTOCYCLUS (Grunow) Ross, 1973

EUPODISCUS Bailey, 1851

AULISCUS Ehrenberg, 1843

Auliscus coelatus (0), *A. sculptus* (0).

CERATAULUS Ehrenberg, 1844

Cerataulus sp (0).

ODONTELLA (Lyngbye) Agardh, 1832

Odontella mobiliensis (33).

PLEUROSIRA (Ehrenberg) Compere, 1982

TRICERATIUM Ehrenberg, (1839) 1841

Triceratium alternans (=*Trigonium alternans*) (0,6,29), *T. antediluvianum* (0), *T. favus* (0), *T. formosum* (0), *T. grande* (0), *T. shadboltianum* (+*T. elongatum*) (0), *T. sp* (29), *T. spinosum* (0).

BT CYMATOSIRA Grunow, 1862

BT CAMPYLOSIRA (A. Schmidt) Grunow, 1885

BT PLAGIOGRAMMOPSIS (Grunow) Hasle *et al.*, *Plagiogrammopsis*

PLAGIOGRAMMA Heiberg, 1863

Plagiogramma adriaticum (0), *P. van-heurcki* (0,23).

BP BROCKMANNIELLA (Hustedt) Hasle *et al.*, 1983

BP MINUTOCELLUS Hasle *et al.*, 1983

BT LEYANELLA Hasle *et al.*, 1983

BP ARCOCELLULUS Hasle *et al.*, 1983

PAPILIOCELLULUS Hasle *et al.*, 1983

BP EXTUBOCELLULUS Hasle *et al.*, 1983

CHAETOCEROS Ehrenberg, 1844

Chaetoceros affinis (*v. circinalis*), (0), *C. affinis* (+*C. ralfsi*) (0), *C. affinis* (*v. affinis*) (0,1,2,6,7,8,9,10,11,12, 13,14,15,16,17,18,20,21,23,24,25,26,34), *C. affinis* (+*C. schetti*) (0), *C. affinis* (*v. willei*) (0,6,10,11,12,13,14, 25), *C. affinis* (+*C. javanicus*) (0), *C. affinis* (=*C. willei*) (0), *C. anastomosans* (0,13,14,18), *C. atlanticus* (=*C. neapolitanus*) (0), *C. atlanticus* (*v. atlanticus*) (0,7,8,10,17,18,23,25,34), *C. atlanticus* (*v. neapolitanus*) (0,1,17,26), *C. borealis* (8,17), *C. brevis* (0,6,7, 8,9,10,11, 12,13,14,15,17,18,24,25), *C. calcitrans* (=*C. simplex*) (0,13,18,25), *C. coarctatus* (0,24), *C. compressus* (+*C. contortus*) (0,2,6,7,8,9,10,11,12,13,14,15,16, 17,18,21,25,34), *C. concavicornis* (?) (17,32,34), *C. constrictus* (*v. constrictus*) (0,7,9,17,24,26,34), *C. convolutus* (0,1,7,8,9,12,22,24,25), *C. costatus* (0,6,10,11, 12,13,14,15,17,18), *C. crinitus* (0), *C. curvisetus* (0,1,2,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22, 23,24,25,26,28,31,34), *C. dadayi* (0,1,6,9,10,12,13, 14,15,17,18), *C. danicus* (0,2,6,7,8,10,12,13,14, 17,18, 22,26,29,34), *C. debilis* (0,25), *C. decipiens* (+*singularis*) (0,1,2,6,7,8,9,10,11,12,13,14,15,16,17,18,21,22, 23,24,25,26,28,34), *C. delicatulus* (17), *C. densus* (0,1,2,3,5,6,7,8,10,11,12,13,14,15,17,18,25), *C. diadema* (=*C. subsecundus*) (0,25,34), *C. dichaeta* (0,34), *C. didymus* (*v. didymus*), (0,1,2,6,7,8,11,14,15,17,18,20, 22,23,24,25,26,28,34), *C. didymus* (*v. anglica*) (0), *C. didymus* (*v. protuberans*) (0,9,10,12,13), *C. difficilis* (0,25), *C. dipyrenops* (11,14,18), *C. diversus* (*v. tenuis*) (0), *C. diversus* (*v. diversus*) (0,2,6,10,11,12,13,14,15, 16,17,18), *C. eibeni* (0,8,17,23), *C. filiformis* (17), *C. fragilis* (10,18), *C. gracilis* (0,21,25, 34), *C. heterovaluatus* (18), *C. holsaticus* (0), *C. insignis* (17,18), *C. laciniosus* (0,6,7,8,9,11,13,17,18,25,34), *C. lauderi* (0,1,6,7,8,10,11,12,13,14,15,17,18,24,25,34), *C. lorenzianus* (0,2,6,7,8,10,11,12,13,14,15,17,18,20,23,24,25,26, 28,34), *C. messanensis* (0,1,2,6,7,8,9,10,11,12,13,14, 17,18,25,34), *C. muelleri* (25), *C. neogracilis* (=*C. gracilis*) (0), *C. pelagicus* (0,17,26), *C. pendulus* (0,17,25,34), *C. perpusillus* (0,16,17,18,25), *C. peruvianus* (*v. peruvianus*), (0,1,2,6,7,8,9,10,11,12,13,14, 15,16,17,18,21,22,24,26,28,29,34), *C. peruvianus* (*v. gracilis*) (0), *C. pseudocrinitus* (0), *C. pseudocurvisetus* (0,1,2,6,7,8,10,11,12,14,15,17,18,20,23,24,25,28,34), *C. radicans* (=*C. scolopendra*) (0,6,34), *C. rostratus* (0,1,2, 3,6,7,8,9,10,11,12,13,14,15,16,17,18,24,28), *C. saltans* (8), *C. schimperanus* (0), *C. seiracanthus* (0,18, 25), *C. septentrionalis* (0), *C. socialis* (0,6,7,8,9, 12,17,18,24,25,34), *C. sp* (9,10,13, 14,18,19,20,21,23, 24,25,26,28,29,30), *C. subsecundus* (17), *C. teres* (0,17,18,21,25), *C. tetrastichon* (0,10,11,13,14,18), *C. tortissimus* (0,12,13,14,18), *C. vanheurcki* (0), *C. vistulae* (25), *C. visvisibilis* (16,17,18), *C. whighami* (0,7,8,9,10,11,12,13,18,21,22,28), *C. willei* (18,20).

BACTERIASTRUM Shadbolt, 1854

Bacteriastrum biconicum (0,6,9,10,11,12,13,18), *B. comosum* (0,11,18), *B. delicatulum* (0,1,2,5,6,7,8,9, 10,11,12,13,14,15,16,17,18,25,26,29,34), *B. elegans* (0,6,7,9,10,11,17,18, 25), *B. elongatum* (0,6,7,9,17,25), *B. hyalinum* (0,2,6,7,8,9,10, 11,12,13,14,17,18,28,29, 34), *B. mediterraneum* (0,2,6,7,12,13,14,17,18), *B. sp* (21,24,28,31), *B. varians* (0,1,34).

LITHODESMIUM Ehrenberg, 1840

Lithodesmium undulatum (0,11,14,15,17,18,24,34).

BELLEROCHEA Van Heurck, 1885

Bellerochea yucatanensis (32).

DITYLUM W. Bailey, 1861

Ditylum brightwellii (0,22,24,25,26,27,28,29,30,34), *D. trigonum* (33).

HELICOTHECA (Shrubsole) Ricard, 1987

Streptotheca tamesis (0,23,24).

NEOSTREPTOTHECA Von Stosch, 1977

Order Pennatae Schütt, 1896

Suborder Fragilariineae

FRAGILARIA Lyngbye, 1819

Fragilaria capucina (0,25), *F. crotonensis* (0,14,18,21, 22,25,26), *F. hyalina* (0), *F. pinnata* (0), *F. pirescens* (0), *F. sp* (25,29,34).

BT SYNEDRA Ehrenberg, 1830 partim.

Synedra acus (0), *S. affinis* (0), *S. baculus* (0), *S. crystallina* (0), *S. fulgens* (0), *S. gailloni* (0), *S. hennedyana* (0), *S. investiens* (0), *S. sp* (19,21,29), *S. tabulata* (0,28), *S. ulna* (0,22), *S. undulata* (0,3,5,6,8,18,22, 28,29,34).

ARDISSONIA de Notaris, 1871

CYCLOPHORA Castracane, 1878

ASTERIONELLA Hassall, 1855

Asterionella bleakeleyi (0,19,21,29,34), *A. formosa* (4,17,18,21,22,23,25,28,31,34), *A. gracillina* (25), *A. japonica* (=*A. glacialis*) (0,2,6,7,8,9,10,11,12,13,14, 15,16,17,18,19, 20, 21,22,23,24,25,26,28,29,31,34), *A. kariana* (17,22), *A. notata* (0,2,5,6,18).

Diatoma vulgare (0,25,29), *D. sp* (22), *D. elongatum* (0,25,34).

THALASSIONEMA Grunow in Van Heurck, 1881

Thalassionema bacillaris (?) (32), *T. nitzschioides* (=*Thalassiothrix nitz.*) (0,1,2,3,6,7,8,9,10,11,13,14,15, 16,17,18,19,20,22,23,24,25,26,28,29,30,34), *T. sp* (25).

THALASSIOTHRIX Cleve & Grunow, 1880

Thalassiothrix frauenfeldi (0,1,2,6,7,8,9,10,11,12,13,14, 15,16,17,18,19,22,23,25,26,28,29, 30,34), *T. longissima* (0,2,10,11,12,13,15,17,18), *T. mediterranea* (=*Asterionella medit.*) (0,6,7,9,10,11,12,13,14,15,16,17,18,23, 24,25,26,28,29,30,34), T. sp (25).

SYNEDROSPHENIA Hustedt, 1932

BT PODOCYSTIS Kutzing, 1844

Podocystis adriatica (0).

BT OPEPHORA Petit, 1888

Opephora marina (0), *O. pacifica* (0).

BT SCEPTRONEIS Ehrenberg, 1844

GLYPHODESMIS Greville, 1862

Glyphodesmis distans (0), *G. williamsoni* (0).

BT DIMEREGRAMMA Ralfs in Pritchard, 1861

Dimeregramma dubium (0), *D. fulvum* (0), *D. marinum* (0), *D. minus* (0), *D. sp* (22).

BT DIMEREGRAMMOPSIS Ricard, 1987

BT RHAPHONEIS Ehrenberg, 1844

Rhaphoneis amphiceros (0), *R. nitida* (0).

DELPHINEIS Andrews, 1977

BT SUBSILICEA V Stosch & Reim., 1970

TABELLARIA Ehrenberg, 1840

Tabellaria fenestrata (22,34), *T. sp* (26,29,34).

E RHABDONEMA Kutzing, 1844

Rhabdonema adriaticum (0,1,8), R. arcuatum (0), R. sp (12,14,18).

BP PLAGIOGRAMMA Greville, 1859

HUSTEDTIELLA Simonsen, 1960

B STRIATELLA Agardh, 1832

Striatella delicatula (0), *S. interrupta* (0), *S. unipunctata* (0,8,22,26,28,29,34).

BT GRAMMATOPHORA Ehrenberg, 1839 (1841)

Grammatophora angulosa (0,25,34), *G. gibberula* (0), *G. longissima* (0), *G. marina* (*v. marina*) (0,25,28,34), *G. marina* (*v. adriatica*) (0), *G. oceanica* (*v. adriatica*) (0), *G. oceanica* (=*G. communis*) (0), *G. oceanica* (*v. macilenta subtilissima*) (0), *G. oceanica* (*v. macilenta*) (0), *G. oceanica* (*v. oceanica*) (0,25), *G. serpentina* (0), *G. sp* (22,26,29).

BT LICMOPHORA Agardh, 1827

Licmophora abbreviata (=*L. lyngbyei*) (0,8,25,34), *L. aedipus* (1), *L. communis* (0), *L. dalmatica* (0), *L. ehrenbergi* (*v. ehrenbergi*) (0), *L. ehrenbergi* (*v. subconstricta*) (0), *L. ehrenbergi* (=*L. robusta*) (0), *L. flabellata* (0), *L. gracilis* (*v. gracilis*) (0), *L. gracilis* (*v. anglica*) (0), *L. grandis* (0), *L. hyalina* (0), *L. juergensi* (0), *L. nubecula* (0), *L. paradoxa* (*v. crystallina*) (0), *L. paradoxa* (=*L. crystallina*) (=*L. tincta*) (0), *L. paradoxa* (*v. tincta*) (0), *L. paradoxa* (*v. paradoxa*) (0), *L. remulus* (28), *L. sp* (18,19, 21,22,23,26,28,29).

BT LICMOSPHENIA Mereschkowsky, 1902

CLIMACOSPHENIA Ehrenberg, 1841

Climacosphenia moniligera (0).

BP ENTOPYLA Ehrenberg, 1848

BT GEPHYRIA Arnott, 1860

E FALCULA Voigt, 1960

PROTORAPHIS Simonsen, 1970

PSEUDOHIMANTIDIUM Hustedt & Kraske, 1941

Suborder Eunotiineae

Mostly Freshwater

Suborder Naviculiineae

BT NAVICULA Bory, 1822

Navicula abrupta (*v. rattrayi*) (0), *N. abrupta* (*v. abrupta*) (0), *N. ammophila* (0), *N. arenaria* (0), *N. arenicola* (0), *N. bacillum* (25), *N. biskanteri* (0), *N. cancellata* (*v. apiculata*) (0), *N. cancellata* (*v. gregori*) (0), *N. cancellata* (*v. cancellata*) (0), *N. clavata* (0), *N. crucicula* (19,21), *N. crucifera* (0), *N. cryptocephala* (0,34), *N. cuspidata* (34), *N. digito-radiata* (*v. cyprinus*) (0), *N. digito-radiata* (*v. digito– radiata*) (0), *N. digitoradiata* (*v. striolata*) (0), *N. directa* (*v. directa*) (0), *N. directa* (*v. subtilis*) (0), *N. distans* (0,24,25, 29,34), *N. elegans* (34), *N. flanatica* (0), *N. forcipala* (*v. punctata*) (0), *N. forcipala* (*v. forcipala*) (0), *N. forcipala* (*v. densestriata*) (0), *N. fortis* (0), *N. fraudulenta* (=*Nitzschia fraudulenta*?) (0,27), *N. gracilis* (*v. schizonemoides*) (0), *N. granulata* (0), *N. grevillei* (*v. grevillei*) (0), *N. grevillei* (*v. commoides*) (0), *N. guttata* (0), *N. hamulifera* (0), *N. hennedyi* (0), *N. humerosa* (0,28), *N. lanceolata* (0), *N. libellus* (0), *N. litoricola* (=*Diploneis litoricola*?) (0), *N. longa* (0), *N. lyra* (=*typica*) (0), *N. lyra* (*v. ellip* =*N. libroides*) (0), *N. lyra* (*v. recta*) (0), *N. lyra* (*v. elliptica*) (0), *N. lyra* (*v. lyra*), (0,28), *N. lyra* (=*producta*) (0), *N. lyroides* (=*N. elliptica*) (0), *N. lyroides* (=*N. lyra intermedia*) (0), *N. mediterranea* (0), *N. minuscula* (0), *N. monilifera* (0), *N. nebulosa* (0), *N. nummularia* (0), *N. opima* (0), *N. palpebralis* (*v. protracta*) (0), *N. palpebralis* (*v. palpebralis*) (0), *N. palpebralis* (*v. semiplena*) (0), *N. pennata* (*v. atlas*) (19), *N. pennata* (*v. maxima*) (0,6,7,8, 11,16,18), *N. pennata* (*v. pennata*) (0,6,7,8,9,10, 11,12,13,16,18,34), *N. peregrina* (0,34), *N. polysticta* (*v. elliptica*) (0), *N. protracta* (0,34), *N. pygmea* (0), *N. ramosissima* (*v. ramosissima*) (0), *N. ramosissima* (*v. mollis*) (0), *N. reichardti* (0), *N. retusa* (0), *N. robertsiana* (0), *N. socialis* (*v. massiliensis*) (0), *N. sp* (10,11,20,22,24,25,28,29,34), *N. spectabilis* (0), *N. subminuscula* (0), *N. versicolor* (0), *N. viridula* (*v. viridula*) (0,25), *N. viridula* (*v. rostellata*) (0), *N. viridula* (*v. slesvicensis*) (0), *N. wawrikae* (0), *N. zostereti* (0).

LYRELLA (Cleve) Karayeva, 1978

AMPHIPLEURA Kutzing, 1844

Amphipleura pellucida (34), A. sp (0,34).

FRUSTULIA Agardh, 1824

ANOMOEONEIS Pfitzer, 1871

STAURONEIS Ehrenberg, 1843

Stauroneis decipiens (28), *S. membranacea* (27), *S. paradoxum* (34), *S. sp* (24).

DICTYONEIS Cleve, 1890

BT DIPLONEIS (Ehrenberg) Cleve, 1894

Diploneis advena (0), *D. bomboides* (*v. bombiformis*) (0), *D. bombus* (0,14,16,18,34), *D. chersonensis* (0,28), *D. coffaeiformis* (0), *D. crabro* (0,34), *D. dalmatica* (0), *D. eximia* (0), *D. fusca* (*v. aestiva*) (0), *D. fusca* (*v. fusca*) (0,6,18), *D. fusca* (*v. delicata*) (0), *D. gemmata* (0), *D. gemmatula* (0), *D. incruvata* (0), *D. interrupta* (29), *D. littoralis* (=*D. litoricola*) (=*Navicula litoricola*) (0), *D. mediterranea* (0), *D. nitescens* (0), *D. papula* (0), *D. placida* (0), *D. praestes* (0), *D. schmidti* (0), *D. sejuncta* (18), *D. smithi* (*v. constricta*) (0), *D. smithi* (*v. cuneata*) (0), *D. smithi* (*v. rhombica*) (0), *D. smithi* (*v. pumila*) (0), *D. smithi* (*v. smithi*) (0), *D. sp* (19,21,22,24, 28,29,30,34), *D. splendida* (28), *D. suborbicularis* (*v. suborbicularis*) (0), *D. suborbicularis* (*v. constricta*) (0), *D. vacillans* (*v. vacillans*) (0), *D. vacillans* (*v. renitens*) (0), *D. weissflogi* (0).

B OESTRUPIA Heiden, 1906

Oestrupia musca (0).

NANONEIS Norris, 1973

BT GOMPHONEMA Ehrenberg, 1831

Gomphonema sp (0,22).

PINNULARIA Ehrenberg, 1841

Pinnularia claviculus (0), *P. rectangulata* (0), *P. sp* (22,34), *P. trevelyana* (0).

CALONEIS Cleve, 1894

Caloneis liber (*v. liber*) (0), *C. liber* (*v. elongata*) (0), *C. liber* (*v. linearis*) (0), *C. maxima* (*v. bicuneata*) (0), *C. westi* (0).

BRACHYSIRA Kutzing, 1836

GOMPHOCALONEIS Meister, 1932

SCOLIOPLEURA Grunow, 1860 partim.

Scoliopleura tumida (0).

SCOLIOTROPIS Cleve, 1894

B CISTULA Cleve, 1894

Cistula lorenziana (0).

BT TRACHYNEIS Cleve, 1894

Trachyneis aspera (*v. pulchella*) (0), *T. aspera* (*v. vulgaris*) (0), *T. aspera* (*v. aspera*) (0), *T. aspera* (*v. intermedia*) (0), *T. oblonga* (0).

BT MASTOGLOIA Wm. Smith, 1856

Mastogloia sp (28).

B CYMATONEIS Cleve, 1894

B CLIMACONEIS Grunow, 1862

E RHOICONEIS Grunow, 1863

BT PLAGIOTROPIS Pfitzer, 1871

Tropidoneis elegans (*v. adriatica*) (0), *T. elegans* (18), *T. lepidoptera* (*v. lepidoptera*) (0), *T. lepidoptera* (*v. mediterranea*) (0), *T. lepidoptera* (*v. minor*) (0), *T. lepidoptera* (*v. delicatula*) (0), *T. lepidoptera* (*v. robusta*) (0), *T. maxima* (0), *T. sp* (21,23,29,34), *T. vitrea* (0).

DONKINIA Ralfs, 1861

B CATENULA Mereschkowsky, 1902

HASLEA (Gaillon) Simonsen, 1974

PACHYNEIS Simonsen, 1974

BT PLEUROSIGMA Wm. Smith, 1852

Pleurosigma angulatum (0,6,7,8,9,18,22,34), *P. australe* (0), *P. cuspidatum* (28), *P. decorum* (0), *P. elongatum* (0,22,34), *P. formosum* (*v. formosum*) (0), *P. formosum* (*v. balearicum*) (0), *P. ibericum* (0), *P. intermedium* (*v. nubecula*) (0), *P. intermedium* (*v. intermedium*) (0), *P. itium* (34), *P. longum* (*v. subrigida*) (0), *P. longum* (*v. lanceolatum*) (25), *P. majus* (0), *P. naviculaceum* (0), *P. nicobaricum* (0,25), *P. normani* (=*P. affine v. normani*) (0,18,25,34), *P. obscurum* (*v. macilenta*) (0), *P. rigidum* (0), *P. sp* (5,10,11,12,13,14,15,16,23,24,25, 26,28,29,30,34), *P. speciosum* (0), *P. strigosum* (0), *P. tortuosum* (0).

BP GYROSIGMA (Ehrenberg) Hassall, 1845

Gyrosigma balticum (0), *G. diminutum* (0), *G. hippocampus* (0), *G. lineare* (0), *G. rectum* (*v. thumi*) (0), *G. scalproides* (34), *G. sp* (28,34), *G. spenceri* (0,25), *G. wansbecki* (0,28).

BT BERKELEYA Greville, 1827

RHOICOSPHENIA Grunow, 1860

Rhoicosphenia curvata (*v. curvata*) (0), *R. curvata* (*v. marina*) (0).

ET CAMPYLOPYXIS Medlin, 1985

BT ENTOMONEIS Ehrenberg, 1845

B AMPHORA Ehrenberg, 1840

Amphora acutiuscula (0), *A. angusta* (*v. ventricosa*) (0), *A. angusta* (*v. angusta*) (0), *A. arcus* (*v. arcus*) (0), *A. arcus* (*v. sulcata*) (0), *A. arenaria* (0), *A. bigibbosa* (0), *A. binodis* (0), *A. cingulata* (0), *A. coffeaeformis* (0,28), *A. contracta* (0), *A. costata* (0), *A. crassa* (0), *A. cymbelloides* (0), *A. cymbifera* (0), *A. decussata* (0), *A. egregia* (*v. egregia*) (0), *A. egregia* (*v. exornata*) (0), *A. eunotia* (0), *A. exigua* (0), *A. exsecta* (0), *A. fluminensis* (0), *A. gigantea* (0), *A. grevilleana* (*v. contracta*) (0), *A. hyalina* (0,34), *A. inflexa* (0), *A. janischi* (0), *A. kolbei* (0), *A. laevis* (0), *A. laevissima* (*v. laevissima*) (0), *A. laevissima* (*v. perminuta*) (0), *A. lineolata* (0), *A. macilenta* (0), *A. marina* (0), *A. obtusa* (*v. radula*) (0), *A. ocellata* (*v. ocellata*) (0), *A. ocellata* (v. bistriata) (0), *A. ostrearia* (*v. quadrata*) (0), *A. ostrearia* (*v. vitrea*) (0), *A. ostrearia* (*v. lineata*) (0), *A. ostrearia* (*v. ostrearia*) (0), *A. ovalis* (0), *A. peragalloi* (0), *A. proteus* (*v. oculata*) (0), *A. proteus* (*v. maxima*) (0), *A. proteus* (*v. proteus*) (0), *A. pusio* (0), *A. robusta* (0), *A. salina* (0), *A. sp* (22,26,28,29), *A. spectabilis* (0), *A. sulcata* (0), *A. truncata* (0), *A. turgida* (0).

PHAEODACTYLUM Bohlin, 1897

Phaeodactylum sp (28), *P. tricornutum* (0,22,24,26, 33,34).

EPITHEMIA (Ehrenberg) Kutzing, 1844

Epithemia sp (22), *E. turgida* (0).

BT RHOPALODIA (Ehrenberg) Muller, 1895

BT AURICULA Paddock & Sims, 1980

Auricula amphitritis (0), *A. decipiens* (0), *A. insecta* (0), *A. intermedia* (0).

THALASSIOPHYSA Paddock & Sims, 1980

Proboscidea alata (=*Rhizosolenia alata*) (*f. gracillina*) (*Proboscidea* according to Ricard 1987, *Proboscia* according to Round *et al.* 1990) (0,3,6,7,8,10,11,12,15, 16,17,18,22,25, 29,33), *P. alata* (*f. alata*) (0,1,2,6,7,8, 9,10,11,12,13,14,15,17,18,20,23,24,25,26,28,29,30, 34), *P. alata* (*f. indica*) (0,6,7,8,11,12,15,16,17,18,22).

BP UNDATELLA Paddock & Sims, 1980

BT SURIRELLA Turpin, 1828

Surirella apiculata (0), *S. comis* (0), *S. fastuosa* (*v. fastuosa*) (0), *S. fastuosa* (*v. suborbicularis*) (0), *S. intercedens* (*v. abludens*) (0), *S. intercedens* (*v. collare*) (0), *S. intercedens* (*v. intercedens*) (0), *S. lata* (0), *S. lorenziana* (0), *S. ovata* (0), *S. sp* (28), *S. sp* (22), *S. subquadrata* (0).

BT CAMPYLODISCUS Ehrenberg, 1840

Campylodiscus adriaticus (*v. massiliensis*) (0), *C. adriaticus* (*v. adriaticus*) (0), *C. biangulatus* (0), *C. brightwelli* (*v. balearicus*) (0), *C. clevei* (0), *C. decorus* (0), *C. fastuosus* (=*C. thureti*) (0), *C. hodgsoni* (+*C. eximius*) (0), *C. horologium* (0), *C. incertus* (0), *C. limbatus* (0), *C. lorenzianus* (0), *C. sp* (22,29).

BT PLAGIODISCUS Grunow, 1867

BT HYDROSILICON Brun, 1891

NITZSCHIA Wm. Smith, 1853

Nitzschia acicularis (25), *N. acuminata* (0), *N. acuta* (0), *N. angularis* (*v. affinis*) (0), *N. angularis* (*v. kariana*) (0), *N. angularis* (*v. angularis*) (0), *N. apiculata* (0), *N. bilobata* (0,22), *N. brebissoni* (0), *N. clarissima* (0), *N. clausi* (25), *N. constricta* (*v. subconstricta*) (0), *N. debilis* (0), *N. distans* (*v. distans*) (0,28,34), *N. distans* (*v. tumescens*) (0), *N. fluminensis* (0), *N. fraudulenta* (28), *N. frustulum* (0), *N. habirshawi* (=*N. sigma habirshawi*) (0), *N. hungarica* (34), *N. hybrida* (0), *N. insignis* (*v. insignis*) (0), *N. insignis* (*v. notabilis*) (0), *N. insignis* (*v. adriatica*) (0), *N. insignis* (*v. spathulifera*) (0), *N. insignis* (*v. mediterranea*) (0), *N. lanceolata* (0), *N. lineola* (=*N. pseudodelicatissima*) (0), *N. lineola* (=*N. delicatissima*) (0,1,6,10,11,12,13, 14,15,16,17,18,19,20,21,22,26,28,29,34), *N. littoralis* (0), *N. longissima* (*v. longissima*) (0,5,6,7,8,10,11, 13,14,16,18,22,23,24,25,28,29,34), *N. longissima* (*v. reversa*) (0), *N. lorenziana* (*v. lorenziana*) (0), *N. lorenziana* (*v. subtilis*) (0), *N. macilenta* (0), *N. marina* (0), *N. martiana* (0_), *N. maxima* (0), *N. media* (0), *N. migrans* (28), *N. minutissima* (0), *N. obtusa* (25,34), *N. ocellata* (0), *N. pacifica* (? Cupp) (25), *N. pacifica* (25), *N. palea* (0,25,28,34), *N. panduriformis* (*v. lata*) (0), *N. panduriformis* (*v. minor*) (0), *N. panduriformis* (*v. panduriformis*) (0,28), *N. paradoxa* (=*Bacillaria paxillifer*) (0,2,3,5,6,7,8,9,10,11,12,14,18, 25,28,34), *N. plana* (0), *N. pulchella* (0), *N. punctata* (*v. coarctata*) (0), *N. punctata* (*v. punctata*) (0), *N. recta* (0), *N. rigida* (0), *N. romana* (28), *N. scalaris* (28), *N. sicula* (18,20,34), *N. sigma* (*v. sigma*) (0,6,18,22), *N. sigma* (*v. intercedens*) (0), *N. sigma* (*v. sigmatella*) (0), *N. sigma* (*v. rigida*) (0), *N. sigmoidea* (*v. armoricana*) (0), *N. sigmoidea* (*v. sigmoidea*) (0), *N. sinuata* (22), *N. smithi* (0), *N. socialis* (*v. massiliensis*) (0), *N. socialis* (*v. socialis*) (0), *N. socialis* (*v. kariana*) (0), *N. sp* (20, 22,23,24,25,28,30,34), *N. spathulata* (*v. hyalina*) (0), *N. spathulata* (*v. spathulata*) (0), *N. spectabilis* (0), *N. subpacifica* (20), *N. valida* (0), *N. vermicularis* (28).

PSEUDONITZSCHIA Peragallo, 1897-1908

Pseudonitzschia nigrans (=*Nitzschia*) (19), *P. heimii* (24), *P. seriata* (18,24), *P. delicatissima* (18,24), *P. pungens* (0,1,2,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21, 22,25,26,28,29,34), *P. pungens* (*v. atlantica*) (25).

DENTICULOPSIS Simonsen, 1979

Denticula tenuis (0).

BACILLARIA (O.F. Muller) Hendey, 1964

Bacillaria paxillifer (=*B. paradoxa*) (0,2,3,5,6,7,8,9,10, 11,12,14,18,25,28,34).

HANTZSCHIA (Ehrenberg) Grunow, 1877

Hantzschia sp (22).

CYLINDROTHECA Van Heurck, 1880-85

Cylindrotheca closterium (=*Nitzs. closterium*) (0,2,6,9, 10,12,14,15,16,17,18,20,21,22,23,24,25,26,28,29,34), *C. fusiformis* (0).

BP CYMATONITZSCHIA (Lewis) Simonsen, 1974

Cymatonitzschia marina (=*Nitzschia marina*) (34), *C. marina* (=*Denticula seminae*) (=*D. marina*) (29).

PSEUDŒUNOTIA (Wallich) Grunow, 1880

Pseudœunotia doliolus (32).

Suborder Achnanthiineae

BT ACHNANTHES Bory, 1822 :

Achnanthes affinis (0), *A. brevipes* (*v. parvula*) (0), *A. brevipes* (*v. brevipes*) (0), *A. danica* (0), *A. delicatula* (0), *A. lanceolata* (0), *A. longipes* (0,26), *A. minutissima* (0), *A. parvula* (0), *A. sp* (22,28,29), *A. suchlandti* (0).

BP COCCONEIS Ehrenberg, 1838 :

Cocconeis britannica (0), *C. commutatus* (25), *C. costata* (0), *C. diminuta* (0), *C. dirupta* (*v. dirupta*) (0), *C. dirupta* (*v. flexella*) (0), *C. molesta* (*v. crucifera*) (0), *C. molesta* (*v. molesta*) (0), *C. pellucida* (*v. minor*) (0), *C. pellucida* (*v. pellucida*) (0), *C. pinnata* (0), *C. placentula* (28,29), *C. pseudomarginata* (0), *C. quarnerensis* (0), *C. scutellum* (*v. scutellum*) (0,28), *C. scutellum* (*v. ornata*) (0), *C. scutellum* (*v. stauroneiformis*) (0), *C. sp* (22,25), *C. thumensis* (0).

BT ANORTHONEIS (Donkin) Grunow, 1867

CAMPYLONEIS Grunow, 1862

Campyloneis grevillei (*v. regalis*) (0).

Classified according to Round (1990)

ARAPHID PENNALES

T ASTERIONELLOPSIS Round 1990

Asterionellopsis glacialis (33).

T STAUROSIRA (Ehrenberg) Williams & Round 1987

Staurosira capucina (19), *S. mutabilis* (19).

RAPHID PENNALES

B ENTOMONEIS Ehrenberg 1845

Entomoneis alata (=*Amphiprora alata*) (28,29,34)

E CYMBELLA Agardh 1830

Cymbella affinis (0), *C. amphicephala* (0), *C. cymbiformis* (0), *C. helvetica* (0), *C. parva* (0), *C. sp* (22, 28,29,34), *C. tumida* (0), *C. ventricosa* (0).

BP PLEUROSIGMA Smith 1852

Rhoicosigma mediterraneum (0), *R. oceanicum* (*f. minus*) (0).

Toxonidea balearica (0), *T. insignis* (28).

Classified according to Cupp 1943 (neither cited by Ricard (1987) nor by Round *et al.*, 1990)

AMPHIPRORA (Ehrenberg 1843) Cleve 1894

Amphiprora alata (=*Entomoneis alata*) (28,29,34), *Amphiprora gigantea* (*v. gigantea*) (0,29), *A. gigantea* (*v. decussata*) (0), *A. gigantea* (*v. sulcata*) (=*A. sulcata*) (0), *A. pulchra* (*v. pulchella*) (0), *A. sp* (12,18,24,26, 29,34).

REFERENCES

ARFI R., G. CHAMPALBERT, G. PATRITI, A. PUDDU, J. REYS, 1982. Etude préliminaire comparée du plancton du vieux-port, de l'avant-port et du Golfe de Marseille. *Tethys* **10** (3) : 211-217.

BALLE P., 1953. Fitoplancton de la Bahia de Palma de Mallorca. *Bol. Inst. Esp. Oceanogr.* **61** : 1-23.

BALLE P., 1954. Analisis cualitativo del fitoplancton de la Bahia de Palma de Mallorca en 1953. *Bol. Inst. Esp. Oceanogr.* **61**(68) : 3-13.

BALLE P., 1959. Analisis cualitativo del fitoplancton del puerto de Palma de Mallorca (desde Abril de 1956 a Diciembre de 1957). *Bol. Inst.Esp. Oceanogr.* **93** : 1-13.

BLANC F., M. LEVEAU, K.-H. SZEKIELDA, 1969. Effects eutrophiques au débouché d'un grand fleuve (Grand Rhône). *Mar. Biol.* **3** : 233-242.

BLANC F., M. LEVEAU, M.-C. BONIN, 1975. Ecosystème planctonique. Structure et fonctionnement en relation avec des phénomènes de dystrophie (Golfe de Fos). *Int. Rev. ges. Hydrobiol.* **60** (3) : 359-378.

BLASCO, D. 1970a. Ultraestructura de *Hemidiscus hardmanianus* Grev. y consideraciones sobre la filogenia de este género. *Inv. Pes.* **34** (2) : 229-235.

BLASCO D., 1970b. Estudio de la morfologia de *Chaetoceros didymus* al microscopio electronico. *Inv. Pes.* **34**(2) : 149-155.

BOURGADE B., 1977. Impact des rejets thermiques sur les populations phytoplanctoniques aux abords de la centrale thermique EDF Martigues-Ponteau. *Tethys* **8** (1) : 47-62.

CACHON J., M. CACHON-ENJUMET, 1964. *Leptospathium navicula* nov. gen. nov. sp. et *Leptophyllus dasypus* nov. gen. nov. sp., Péridiniens Noctilucidae (Hertwing) du plancton néritique de Villefranche-sur-Mer. *Bull. Inst. Océanogr. Monaco* **62** (1292) : 1-11.

CASTELLVI J., 1963. Pigmentos de la diatomea marina *Skeletonema costatum* (Grev.) en su dependencia de los factores ambientales y de la dinamica de las poblaciones. *Invest. Pesq* **24** : 129-137.

CRUZADO A., Z.R. VELASQUEZ, 1990. Nutrients and phytoplankton in the Gulf of Lions, northwestern Mediterranean. *Continental Shelf Res.* **10** (9/11) : 931-942.

CUPP E.E., 1943. Marine Plankton Diatoms of the West Coast of North America. U. of Calif. Press, Berkeley. 236 p.

DANGEARD P., 1932. Phytoplancton recueilli à Banyuls-sur-mer. *Arch. Zool. Exp. Gén.* 74 (Jubil), 317-355.

DELGADO M., 1986. Ecologia de las diatomeas costeras. Relacion plancton-benthos. Ph. D. Thesis. Univ. Barcelona, 261 p.

DELGADO M., 1987. Fitoplancton de las bahias del delta del Ebro. *Inv. Pesq.* **51**(4) : 517-548.

DELGADO M., J.M. FORTUO, 1990. Atlas de fitoplancton del Mar Mediterraneo. *Scientia Marina* **55** (Supp. 1) : 1-133.

DESCY J.P., C. WILLEMS, 1991. Contribution à la connaissance du phytoplancton de la Moselle (France). *Crypt. Algol.* **12** (2) : 87-100.

DEVEZE L., 1959. Cycle biologique des eaux et ecologie des populations planctoniques. *Rec. Trav. Sta. mar. Endoume* **15** (25) : 220.

ESTRADA M., 1979. Observaciones sobre la heterogeneidad del fitoplancton en una zona costera del mar Catalan. *Inv. Pesq.* **43** (3) : 637-666.

ESTRADA M., 1980. Composicion taxonomica del fitoplancton en una zona proxima a la desembocadura del rio Besos (Barcelona), de Octubre de 1978 a Marzo de 1979. *Inv. Pesq.* **44** (2) : 275-289.

ESTRADA M., 1991. Phytoplankton assemblages across a NW Mediterranean front : Changes from winter mixing to spring stratification. *Oecologia Aquatica* **10** : 157-185.

GOURRET M.-P., 1883. Sur les Péridiniens du Golfe de Marseille. *Ann. Mus. Hist. Nat. Marseille* **8**(1) : 1-37.

HERRERA J., R. MARGALEF, 1957. Hidrografia y fitoplancton de las costas de Castellon, de julio de 1956 a junio de 1957. *Inv. Pesq.* **10** : 17-44.

HERRERA J., R. MARGALEF, 1961. Hidrografia y fitoplancton de las costas de Castellon de julio de 1958 a junio de 1959. *Inv. Pesq.* **20** : 17-63.

JACQUES G., 1967. Aspects quantitatifs du phytoplancton de Banyuls-sur-Mer (Golfe du Lion). I. Pigments et population phytoplanctoniques dans le Golfe du Lion en mars 1966. *Vie Milieu* **18** (2b) : 239-263.

JACQUES G., 1969. Aspects quantitatifs du phytoplancton de Banyuls-sur-Mer (Golfe du Lion). III. Diatomees et Dinoflagelles de juin 1965 a juin 1968. *Vie Milieu* **20** (1-B), 91-126.

KIM K.T., 1980. Contribution à l'étude de l'écosystème pélagique dans les parages de Carry-le-Rouet (Méditerranée nord-occidentale). *Tethys* **9** (4) : 317-344.

LEGER G., 1971. Les populations phytoplanctoniques au point 42 47'N, 7 29'E (Bouee laboratoire du COMEXO/CNEXO). A. Généralités et premier séjour (21-27 fevrier 1964). *Bull. Inst. Oceanogr. Monaco* **69** : 5-41.

LOPEZ J.-J., P. ARTE, 1972. Aguas rojas en el Mediterraneo occidental. *Publ. tec. dir. gral. pesca.* **10** : 399-412.

MARGALEF R., 1945a. Fitoplancton neritico estival de Cadaques (Mediterraneo catalan). *Public. Inst. Biol. Apl.* **2** : 89-95.

MARGALEF R., 1945b. El fitoplancton estival de la Costa Brava catalana (Sector Blanes). *Publ. Biol. Inst. Esp. Est. Mediterr.* **1** : 48 p. 10 pl.

MARGALEF R., 1951. Ciclo anual de fitoplancton marino de la costa NE de la Peninsula Ibérica. *Publ. Inst. Biol. Apl.* **9** : 83-119.

MARGALEF R., 1957. Fitoplancton de las costas de Blanes (Gerona) de agosto de 1952 a junio de 1956. *Invest. Pesq.* Tomo **VIII**, 89-95.

MARGALEF R., 1964. Fitoplancton de las costas de Blanes (provincia de Gerona, Mediterraneo Occidental), de julio de 1959 a junio de 1963. *Inv. Pesq.* **26** : 131-164.

MARGALEF R., 1965. Distribucion ecologica de las especies del fitoplancton marino en un area del Mediterraneo occidental. *Inv. Pesq.* **28** : 117-131.

MARGALEF R., 1969. Composicion especifica del fitoplancton de la costa catalano-levantina (Med. occ.) en 1962-1967. *Inv. Pesq.* **33**(1) : 345-380.

MARGALEF R., 1971. Distribucion del fitoplancton entre Corcega y Barcelona, en relacion con la mezcla vertical del agua, en marzo de 1970. *Inv. Pesq.* **35**(2) : 687-697.

MARGALEF R., A. BALLESTER, 1967. Fitoplancton y produccion primaria de la costa catalana, de junio de 1965 a junio de 1966. *Inv. Pes.* **31**(1) : 165-182.

MARGALEF R., J. CASTELLVI, 1967. Fitoplancton y produccion primaria de la costa catalana, de julio de 1966 a julio de 1967. *Inv. Pesq.* **31**(3) : 491-502.

MARGALEF R., M. ESTRADA, 1981. On upwelling, eutrophic lakes, the primitive biosphere, and biological membranes. *Coastal Upwelling* **1** : 522-529.

MARGALEF R., M. ESTRADA, 1987. Synoptic distribution of summer microplankton (Algae and Protozoa) accross the principal front in the Western Mediterranean. *Inv. Pesq.* **51**(1) : 121-140.

MARGALEF R., J. HERRERA, 1963a. Hidrografia y fitoplancton de las costas de Castellon, de julio de 1959 a junio de 1960. *Inv. Pesq.* **22** : 49-109.

MARGALEF R., J. HERRERA, 1963b. Hidrografia fitoplancton de la costa comprendida entre Castellon y la desembocadura del Ebro, de julio de 1960 a junio de 1961. *Inv. Pesq.* **24** : 33-112.

MARGALEF R., J. HERRERA, 1964. Hidrografia y fitoplancton de la costa comprendida entre Castellon y la desembocadura del Ebro, de julio de 1961 a julio de 1962. *Inv. Pesq.* **26** : 49-90.

MARGALEF R., J. HERRERA, 1966. La produccion primaria en las aguas del puerto de Barcelona. *Inv. Pesq.* **30** : 45-48.

MARGALEF R., E. MORALES, 1960. Fitoplancton de las costas de Blanes (Gerona) de julio de 1956 a junio de 1959. *Inv. Pesq.* **16** : 3-31.

MASSUTI M., 1930. El plancton de la Bahia de Palma de Mallorca en 1929. *Not. Resum. I.E.O.* **43**(II) : 1-28.

MASSUTI M., 1944. Nuevos datos para el conocimiento del plancton del Mar de Baleares. Ann. Univ. Barcelona, Cronicas, Discursos, Mem Comunic. 1943 : 177-184.

MASSUTI M., 1948. Estudio del plancton del puerto de Mahon en el curso de un ano (1946). *Bol. Inst. Esp. Oceanogr.* **2** : 1-29.

MASSUTI M., R. MARGALEF, 1950. Introduccion al estudio del plancton marino. *Patr. J. Cierva*, 182 p.

MINAS H.-J., A. TRAVERS, M. TRAVERS, S. MAESTRINI, 1968. Première utilisation à Villefranche-sur-Mer de la bouée-laboratoire du COMEXO pour l'étude de la distribution du microplancton et de certains facteurs écologiques. *Rec. Trav. Stn mar. Endoume* **44** (60) : 13-42.

MORALES E., 1952. Plancton recogido por los laboratorios costeros. IV Fitoplancton de Blanes durante los meses de julio de 1950 a julio de 1951. *Publ. Inst. Biol. Aplic.* **10** : 67-79.

MORALES E., 1956. Fitoplancton de Blanes desde agosto de 1951 hasta julio de 1952. *Inv. Pesq.* **4** : 47-48.

MORALES E., E. ARIAS, 1965. Ecologia del puerto de Barcelona y desarrollo de adherencias organicas sobre placas sumergidas. *Inv. Pesq.* **28** : 49-79.

NAVARRO F. DE P., L. BELLON-URIARTE, 1945. Catalogo de la Flora del Mar de Baleares (con exclusion de las Diatomeas). *Not. Res. I.E.O.* **124**(II) : 161-295.

NAVARRO F., M. MASSUTI, 1929. Oceanografia, plancton y pesca en la Bahia de Palma de Mallorca en 1928. Instituto Espanol de Oceanografia, *Not. Res.* **2**(33) : 1-61.

NAVARRO F., M. MASSUTI, 1940. Composicion y ciclo anual del plancton superficial de la bahia de Palma de Mallorca. Instituto Espanol de Oceanografia, *Not. Res.* **2**(97) : 1-62.

PALAU M., C. CORNET, T. RIERA, M. ZABALA, 1991. Planktonic gradients along a Mediterranean sea cave. *Oecologia Aquatica* **10** : 299-316.

PAVILLARD J., 1909. Sur les Peridinees du Golfe du Lion. *Bul. Soc. Bot.* **9** : 277-284.

PAVILLARD J., 1916a. Recherches sur les Peridinees du Golfe du Lion. *Trav. Stna. Zool. Sète* **4** : 9-70.

PAVILLARD J., 1916b. Recherches sur les Diatomées pélagiques du Golfe du Lion. *Trav. Stna. Zool. Sète* **5** : 1-63.

PAVILLARD J., 1916c. Flagelles nouveaux épiphytes des diatomées pélagiques. *C.R. Acad. Sci. Paris.* **163** : 1-65.

PERAGALLO H., M. PERAGALLO, 1908. Diatomées marines de France et des districts maritimes voisins. Grez-sur-Loing. Tempère M.J., 1-491.

RAMPI L., M. BERNHARD, 1978. Key for the determination of mediterranean pelagic diatoms. CNEN, Rome, 71 p.

RICARD M., 1987. Atlas du phytoplancton marin. (A. Sournia, Ed). Vol. 2. Editions du Centre National de la Recherche Scientifique, Paris, 1-297.

ROUND F.E., R.M. CRAWFORD, D.G. MANN, 1990. The Diatoms. Biology and Morphology of the Genera. Cambridge University Press. Cambridge. 747 p.

TRAVERS A., 1962. Recherches sur le phytoplancton du Golfe de Marseille. 1. Etude qualitative des Diatomées et des Dinoflagelles du golfe de Marseille. *Rec. Trav. Stn Mar Endoume* **41 :** 7-69.

TRAVERS M., 1962. Recherches sur le phytoplancton du Golfe de Marseille. 2. Etude quantitative des populations phytoplanctoniques du Golfe de Marseille. *Rec. Trav. Stn mar. Endoume* **26** (41) : 70-139.

TRAVERS M., 1975. Inventaire des protistes du Golfe de Marseille et de ses parages. *Ann. Inst. Oceanogr.*, Paris (N.S). **51** (1) : 51-75.

TREGOUBOFF G., M. ROSE, 1957. Manuel de Planctonologie Méditerranéenne, I, II. Centre National Recherche Scientifique, Paris, 1-587.

VELÁSQUEZ Z.-R., 1995. Phytoplankton and Chlorophylls in the NW Mediterranean Sea. *Deep Sea Research* (submitted).

VELÁSQUEZ Z.-R., A. CRUZADO, 1990. Distributions of phytoplankton during cruise DISCOVERY in the NW Mediterranean. *CEC Water Pol. Res.* Reports, **20** : 93-130.

VELÁSQUEZ Z.-R., A. CRUZADO, N. MARBA, J. MERINO, J. PLUSS, 1991. An expert system for phytoplankton taxonomy. *Plankton Newsletter.* **15** : 43-47.

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