

Venerdì, 9 novembre 2012

9.00 Saluti di benvenuto

Sessione I: Microalghe**Moderatore: F. Bernardy-Aubry**

9.15 **Dalla Vecchia F., Matozzo V., Moro I.**

Risposte morfo-fisiologiche di *Scenedesmus rubescens* a diverse concentrazioni di ibuprofene

9.30 **Ellwood N.T.W., Godeas F., Albertano P.B.**

Identification of potential modes of nutrient acquisition in four morphologically distinct periphytic communities from the same lake using phosphatase kinetics

9.45 **Belmonte M., Galil B., Rubino F.**

The dinoflagellates' cyst bank in recent sediments of Haifa port (Israel, Eastern Mediterranean)

10.00 **Simionato D., Block M., La Rocca N., Jouhet J., Maréchal E., Finazzi G., Morosinotto T.**

Biodiesel from microalgae. The link between photosynthesis and productivity in *Nannochloropsis gaditana*

10.15 **Rossi C., Bellezza S., Antonaroli S., Bruno L.**

Ottimizzazione della crescita di microalghe verdi per la produzione di biodiesel

10.30 **Caroppo C., Giordano L., Bisci A.P.**

Phytoplankton and mussel culture modelling in the framework of the sustainable management of the coastal zones: the case of the Mar Piccolo in Taranto

10.45 **Bernardi Aubry F., Facca C., Socal G.**

Prima applicazione del Multimetric Phytoplankton Index (MPI) nella laguna di Venezia (maggio 2011-febbraio 2012)

11.00 – 11.30 COFFEE BREAK**Sessione II: Macrofite****Moderatore: E. Cecere**

11.30 **Armeli Minicante S., Calogero G., Citro I., Morabito M., Genovese G.**

Potential use of *Undaria pinnatifida* in renewable energy

11.45 **Wolf M.A., Alongi G., Catra M., Siracusa P., Moro I.**

Caulerpa taxifolia (Vahl) C. Agardh in the South-Italian coasts: secondary introduction from Australian natural populations

12.00 **Hernandez-Kantun J.J., Rindi F., Maggs C.A., Riosmena-Rodriguez R., Hall-Spencer J.M., Peña V.**

Studies on maerl/rhodolith-forming species (Corallinales: Rhodophyta): a molecular perspective of their diversity

12.15 **Buosi A., Sfriso A.**

Preliminary results of macrophyte check-list and environmental parameters in some areas of the Northern Adriatic Sea.

12.30 **Wolf M.A., Sciuto K., Schiavon M., Moro I.**

Barcoding P.A.T.H.S.: a new database for Plant and Algal Type and Historical Specimens

12.45 **Gnisci V., Cognetti de Martiis S., Belmonte A., Micheli C., Carli F.M., Marcelli M.**



RIUNIONE ANNUALE

ISCHIA, 9-10 NOVEMBRE 2012

Preliminary investigation on morphological and genetic variability of *Posidonia oceanica* (L.) Delile along the coast of Civitavecchia (Central Tyrrhenian sea)

13.00 – 15.00 PRANZO

Sessione III: Microalghe e Cianobatteri

Moderatore: I. Moro

15.00 **Accoroni S., Romagnoli T., Pichierri S., Totti C.**

Life cycle stages of the benthic dinoflagellate *Ostreopsis* cf. *ovata*

15.15 **Pagliara P., Caroppo C.**

Toxicity of three benthic dinoflagellates isolated from the Gulf of Taranto (northern Ionian Sea)

15.30 **Percopo I., Siano R., Rossi R., Soprano V., Sarno D., Zingone A.**

Azadinium dexteroporum sp. nov., a new species producing azaspiracids from the Mediterranean Sea

15.45 **Scalco E., Montresor M.**

Fattori che regolano il ciclo vitale della diatomea *Pseudo-nitzschia multistriata*

16.00 **Nanjappa D., Kooistra W. H.C.F., Zingone A.**

Morphological and molecular evidence for four additional species in the genus *Leptocylindrus* Cleve (Bacillariophyceae)

16.15 **Sciuto K., Rascio N., Andreoli C., La Rocca N., Moro I.**

Polyphasic comparison of two cyanobacterial strains from different Italian thermal districts

16.30 **Viaggiu E., Lucentini L., Congestri R.**

Cyanobacterial blooms and toxins in Italian water resources: state of the knowledge and guidelines for risk management

16.45 **D'Alelio D., Salmaso N., Gandolfi A.**

Frequent recombination and epidemic population structure in a freshwater cyanobacterium

17.00– 17.30 COFFEE BREAK

17.30 **Porzio L., Buia M.C., De Stefano M.**

Effetto dell'acidificazione sulle diatomee epifite di *Posidonia oceanica* (L.) Delile

17.45 **Cante M.T., Viera Rodriguez M. A., Stroobant M., Polifrone M., De Stefano M.**

La comunità epifita a diatomee sulle macroalghe (Gelidiacean species) di Gran Canaria (Canary Island)

18.00 **COMMEMORAZIONE PATRIZIA ALBERTANO**

18.30 **ASSEMBLEA SOCI**

20.30 **CENA SOCIALE (Albergo Villa Maria)**

RIUNIONE ANNUALE
ISCHIA, 9-10 NOVEMBRE 2012

Sabato, 10 novembre 2012

Sessione IV: Microalghe

Moderatore: M. De Stefano

- 9.00 **Pennesi C., Poulin M., Romagnoli T., De Stefano M., Totti C.**
Revision of the genus *Mastogloia*, section Ellipticae (Bacillariophyceae) through electron microscopy
- 9.15 **Majewska R., Gambi M.C., Totti C.M., De Stefano M.**
Diatoms associated with rhodophytes from Terra Nova Bay (Ross Sea, Antarctica)
- 9.30 **Pezzolesi L., Guidi F., Guerrini F., Ciminiello P., Dell'Aversano C., Pistocchi R.**
Growth interaction between *Ostreopsis* cf. *ovata* and the benthic dinoflagellates *Prorocentrum lima* and *Coolia monotis*
- 9.45 **Samorì G., Samorì C., Guerrini F., Pistocchi R.**
The potential of a newly isolated algal strain *Desmodesmus communis* for wastewater treatment and biomass production for energy recovery.
- 10.00 **Facca C., Sfriso A.**
Spatial variability of benthic diatoms in some Adriatic transitional systems

Sessione V: Macrofite

Moderatore M. Morabito

- 10.15 **Campolin M., Sfriso A.A., Buosi A., Facca C., Sfriso A.**
Stato ecologico di aree confinate in valli da pesca e in laguna aperta
- 10.30 **Sfriso A., Ferrari C., Rinaldi A.**
Atlante fotografico e chiavi tassonomiche delle Ochrophyta (Phaeophyceae e Xanthophyceae). Ambienti di transizione italiani e litorali adiacenti
- 10.45 **Manghisi A., Morabito M.**
Lectotypification of *Chondrus vidovichii* Meneghini [= *Acrodiscus vidovichii* (Meneghini) Zanardini] (Halymeniales, Rhodophyta) ...and a bit of history

11.00 – 11.30 COFFEE BREAK

- 11.30 **Petrocelli A., Portacci G., Cinelli F., Cecere E.**
Nuovi "alieni" nei mari italiani
- 11.45 **Bellissimo G., Lluch J.R., Orestano C., Tomasello A., Calvo S.**
Ecological effects of natural ocean acidification on benthic macroalgal communities
- 12.00 **Chiarore A., Patti F.P., Buia M.C.**
Plasticità ecologica di *Sargassum vulgare*. Approccio morfologico e molecolare di tre popolazioni dell'isola d'Ischia (Napoli)
- 12.15 **Rotini A., Belmonte A., Peirano A., Micheli C., Migliore L.**
Posidonia oceanica (L.) Delile from Monterosso al Mare (Ligurian Sea) characterization by multiple descriptors.
- 12.30 **Garrard S., Fioretti S., Mulas M., Buia M.C.**
Variabilità della comunità epifita di *Posidonia oceanica* lungo un gradiente di acidità

12.45 Arrivederci!

RIASSUNTI

Life cycle stages of the benthic dinoflagellate *Ostreopsis cf. ovata*

Accoroni S.¹, Romagnoli T.¹, Pichierri S.¹, Totti C.¹

¹Dipartimento di Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche, via Brecce Bianche 60131 Ancona (s.accoroni@univpm.it)

Blooms of the benthic dinoflagellates *Ostreopsis* spp. are reported worldwide in many tropical and temperate regions. Along the Mediterranean coasts, massive summer blooms of *Ostreopsis*, mostly generated by the genotype *O. cf. ovata*, have been associated with noxious effects on human health and also with mortality of benthic marine organisms, due to the production of palytoxin-like compounds. Although it has been shown that *Ostreopsis* can produce cysts, and several life cycle stages have been identified, the entire life cycle has not yet been fully described. In this study, we carried out an experiment on *O. cf. ovata* cultures, in order to observe the temporal sequence with which the different morphotypes succeed in a population and then to propose hypotheses on the life cycle stages.

Monoclonal cultures of *O. cf. ovata* were prepared by isolating single cells by the capillary pipette method from field samples (bloom occurred in the Conero Riviera, N Adriatic Sea). Cultures were maintained at a temperature of 21 ± 0.1 °C and a light intensity of $90\text{--}100 \mu\text{mol m}^{-2} \text{s}^{-1}$ with light: dark cycle 12:12 h. Two different experiments were set up: homothallic (one strain) and heterothallic (two strains). Cultures were maintained in nitrogen-free growth medium (P4+Se) to enhance cyst production. Subsamples were analyzed every 2 dd. Cell counts were made following the Utermöhl sedimentation method, through epifluorescence microscopy, after staining with DAPI and Calcofluor-White.

We found 11 different morphotypes, that we interpreted as isogametes, different maturation stages of planozygotes and hypnozygotes, and cysts. In particular, three types of cysts, a temporary (pellicle cyst) and two probable cysts of resistance, have been found. The number of newly formed hypnozygotes increased in the final part of the experiment. Although the percentage of hypnozygotes was significantly higher ($p < 0.001$) in the heterothallic experiment (11%) than in the homothallic (1%) and in the control (2%), mature dormant cysts were recorded without a significant difference in all experimental conditions.

Our results suggest that (i) the sexual reproduction in *O. cf. ovata* is stimulated by stress factors (depletion of N) and occur preferentially (but not only) in heterothallic conditions, and (ii) that other factors may affect the cyst maturation process.

Potential use of *Undaria pinnatifida* in renewable energy

Armeli Minicante S.¹, Calogero G.², Citro I.², Morabito M.³, Genovese G.³

¹Department of Environmental Sciences, Informatics and Statistics, Castello 2737/B, University Ca' Foscari Venezia, Italy (simona.armeli@gmail.com)

²CNR, Institute for Chemical-Physical Processes, Viale F. Stagnod'Alcontres 37, Messina, Italy

³Department of Biological and Environmental Sciences, Salita Sperone 31, University of Messina, Italy

Macroalgae show a broad range of applications and their importance in several sectors is steadily increasing worldwide. The seaweeds industry provides a wide variety of products that have an estimated total annual value of US \$ 5.5-6 billion. The industry uses 7.5-8 million tons of wet seaweed annually: about 47% of the total production is used for human consumption, 43% in the extraction of colloids, 7% in the production of maërl and the remaining 3% in the fields of pharmacology, cosmetics, agriculture and waste water treatments from aquaculture, sewage, agricultural and industrial run-off. Algal biomass are also employed in the field of renewable energies for the production of biogas.

Among alternative energies, the solar photovoltaic technology is one such source that can looked up to as vast research is being carried out and a significant improvement in performance has been achieved.

Dye-sensitized nanocrystalline solar cells (DSSCs) has become an important topic in solar cell research. DSSCs were inspired by the energy and electron transfer mechanisms in natural photosynthesis, and they are based on the photosensitization of nanocrystalline TiO₂ semiconductor electrodes by dyes.

In the present study, we utilized chlorophylls from samples of the brown alga *Undaria pinnatifida* as sensitizer in DSSCs to investigate the light to electron conversion efficiency.

We collected *U. pinnatifida* in Venice Lagoon, where it is a highly invasive species, presently removed as a waste. It causes concern all over the world because has the potential to displace native species, significantly alters habitat for associated fauna and disturbs navigation. Venice Lagoon is the largest Mediterranean transitional environment and the spot of the highest introduction of non-indigenous species. An exploitation of *U. pinnatifida* would result in the conversion of a waste into a valuable biomass.

Ecological effects of natural ocean acidification on benthic macroalgal communities

Bellissimo G.¹, Lluch J.R.², Orestano C.¹, Tomasello A.¹, Calvo S.¹

1 Dipartimento di Scienze della Terra e del Mare, Università di Palermo, viale delle Scienze, edificio 16, 90128 Palermo (giancarlo.bellissimo@unipa.it)

2 Laboratori de Botànica, Facultat de Farmàcia, Università di Barcellona, Av. Joan XXIII s/n, 08028 Barcellona, Spagna

Surface ocean CO₂ partial pressure is expected to rise in proportion with CO₂ increase introduced into the atmosphere by human activities, causing change in carbonate chemistry and a drop in pH seawater. Short-term laboratory and mesocosm experiments are inadequate to understanding of how increased ocean acidity may affect marine ecosystems. Areas with naturally high levels of CO₂ can help us to achieve a better understanding of this issue and can be realistically indicated as suitable natural laboratories for studying the effect of ocean acidification on shallow benthic systems.

The benthic macroalgae prove to be excellent indicators of the environmental status representing an integral response of the average environmental conditions. However, the impacts of lower pH on marine benthic algae are poorly understood and the effect of CO₂-induced seawater acidification on *Cystoseira* communities has not been investigated yet. Here we investigate the responses of a *Cystoseira brachycarpa* community in a shallow hydrothermal vent area off the coast of Panarea, in the Aeolian Islands (Tyrrhenian Sea, Italy). Two sites were selected where *C. brachycarpa* assemblages occurred at different pH values: one on the islet of Bottaro within a hydrothermally active area characterized by low mean pH (6.92 ± sd 0.08) and continuous gas emissions dominated by CO₂; the other on the islet of Lisca Nera, where no venting gas bubbles were observed, characterized by normal pH conditions (8.10 ± sd 0.06). Results showed differences between sites, not only in the structure and composition of the assemblages but also in the size and dominance of *C. brachycarpa*. Species richness, coverage and both diversity and R/P indexes were low and coralline macroalgae (encrusting and erected) were absent at the acidified station. The community also displayed a low reproductive capacity, with reproductive structures lacking in most species, including *C. brachycarpa*. Conversely, dense canopies of fertile *C. brachycarpa* and coralline algae like *Halimnion virgatum* and *Neogoniolithon brassica-florida* were found in the community at the reference site, showing similar composition and abundance to assemblages of literature data.

The dinoflagellates' cyst bank in recent sediments of Haifa port (Israel, EasternMediterranean)

Belmonte M.^{1,2}, Galil B.³, Rubino F.¹

¹CNR Istituto per l'Ambiente Marino Costiero, Talassografico "A. Cerruti",
74123 Taranto, Italia (belmonte@iamc.cnr.it)

²Università del Salento, Di.S.Te.B.A., 73100 Lecce, Italia

³National Institute of Oceanography, Israel Oceanographic and Limnological Research, POB 8030,
Haifa 31080, Israel

Studies of benthic resting stages of marine plankton provide information concerning planktonic assemblages that is difficult to obtain by the intermittent conventional plankton surveys due to the plankton's patchy distribution along horizontal, vertical and temporal gradients. Extensive multi-annual sampling efforts are thus required to attain adequate knowledge of the plankton assemblages at a particular region. The accumulation of encysted resting stages in the sediments provides multi seasonal, multiannual, occasionally multi decadal, integration of the water column assemblages, even to doubling the number of recorded species. Studies of dinoflagellate cysts indicated their utility as biological indicators of past and present environmental conditions such as eutrophication. Encysted resting stages accumulate primarily in enclosed sites such as ports, forming "seed banks" for certain taxa of marine plankton.

Haifa port, enclosing the Kishon estuary, Israel's most polluted river, is impacted by nutrient enrichment and industrial waste water, physically altered by construction and frequent dredging, and prone to establishment of ship-transported alien species. The port has several terminals servicing general cargo, containers, passengers, Ro/Ro, grain, chemicals and oil, and at its Kishon zone, a fishing wharf and a marina. We chose to survey Haifa port on the eve of a major port enlargement project, with the aim of recording the diversity and abundance of encysted resting stages in surficial sediments and examining the relationship between their structure and different environments within the port.

Our findings reveal a remarkably high diversity coupled with low density. Among dinoflagellates, *Gymnodinium uncatenatum* is reported for the first time in the Mediterranean Sea, and *Diplopelta parva*, *Nematodinium armatum*, *Oblea rotunda*, *Polykrikos hartmannii*, *Protoperidinium compressum*, *Scrippsiella ramonii*, *S. spinifera* and *Warnovia cf. rosea* are reported for the first time in the Levantine basin. Cyst assemblages respond to changes in nutrient levels and pollution: near the eutrophic Kishon estuary dinoflagellates' abundance diminished, and this trend held true both for full and empty cysts. Among the cysts present at all the stations were two morphotypes of the bloom-forming *Scrippsiella trochoidea*, and the potentially toxic *Alexandrium minutum*, associated with Paralytic Shellfish Poisoning (PSP); *Gymnodinium uncatenatum*, another causative of PSP, is present in the easternmost part of the port.

Prima applicazione del Multimetric Phytoplankton Index (MPI) nella laguna di Venezia (maggio 2011 – febbraio 2012)

Bernardi Aubry F., Facca C., Socal G.

*CNR- ISMAR Venezia, Castello 1364/a, Venezia
(fabrizio.bernardi@ismar.cnr.it)*

Il fitoplancton è uno degli elementi di qualità biologica indicati per la valutazione dello stato di “salute” delle acque di transizione (Water Framework Directive, WFD; CE 2000/60). In questo studio vengono esposti risultati ed incertezze relative alla prima applicazione dell’indice multimetrico MPI (Multimetric Phytoplankton Index) in laguna di Venezia nel periodo maggio 2011 – febbraio 2012.

Preliminary results of macrophyte check-list and environmental parameters in some areas of the Northern Adriatic Sea

Buosi A.¹, Sfriso A.¹

*Dipartimento di Scienze Ambientali, Informatica e Statistica (DAIS), Università Ca' Foscari
Venezia, Calle Larga 2137, 30123-Venezia, Italia*

The distribution of macrophytes and the main environmental parameters of the water column and surface sediment have been recorded, monthly, between May 2012 and October 2012, in five sites along the coast of the Northern Adriatic Sea. From west to east the sites are: Pellestrina, Lido-Malamocco, Porto Santa Margherita, Sistiana e Punta Salvore (Savudrija, Croatia).

For each station macrophytes were collected by SCUBA divers for taxonomic identification together with the main physico-chemical parameters and water and sediment samples for nutrient determination. In order to obtain the greatest number of species, samples have been performed on a ray of 100 m by collecting all the different species and the use of square frames (Cormaci et al., ISPRA 2008) was not considered suitable for this purpose.

The results showed that species richness and composition varied significantly among the stations, in particular the areas with the highest species richness were Salvore, Pellestrina e Lido-Malamocco but the recorded taxa were very different. Salvore is colonised both by many high quality taxa and the seagrass *Cymodocea nodosa* (Ucria) Ascherson, whereas Pellestrina and Lido-Malamocco exhibit a high biodiversity but many taxa are Ulvaceae. These macroalgae were never found at Salvore, begin to appear at Sistiana and increase moving towards Lido-Malamocco and Pellestrina.

In contrast the lowest number of taxa was recorded at Porto Santa Margherita. This station, that is located near the mouth of the Livenza river, has a high water turbidity that adversely affects the presence of macroalgae. The flora recorded at Sistiana was quite different, because the area is affected by a freshwater output from karstic rocks. As a consequence the number of species is lower than at Salvore or at Venice sites and their ecological value is intermediate.

The first environmental analyses seem to indicate in water turbidity and, in a minor extent, in nutrient concentrations the main responsible of the recorded differences.

Stato ecologico di aree confinate in valli da pesca e in laguna aperta

Campolin M., Sfriso A. A., Buosi A., Facca C., Sfriso A.

¹ Dipartimento di Scienze Ambientali, Informatica e Statistica, Università Ca' Foscari Venezia, Calle Larga, S. Marta 2137, 30123, Venezia

La laguna di Venezia presenta vaste aree confinate aperte e valli da pesca chiuse e gestite da privati che si occupano sia di produzione di specie ittiche tradizionali che di caccia. L'applicazione della WFD (2000/60/EC) a tutta la laguna veneta ci ha dato l'occasione per visitare e monitorare alcune valli chiuse e di predisporre un piano di campionamento per confrontare lo stato ecologico di un'area confinata di laguna aperta: Palude Maggiore, ed una valle arginata preclusa all'espansione di marea: Valle Dogà, entrambe poste nella parte più settentrionale della laguna e separate solo da un argine in pietra d'Istria. In ogni area sono state localizzate tre stazioni che sono state monitorate da giugno a settembre 2011 campionando sia la vegetazione che i parametri ambientali delle acque e dei sedimenti. I risultati evidenziano profonde differenze tra l'area arginata e la laguna aperta, soprattutto per quanto riguarda la vegetazione. Nella laguna aperta due stazioni, ad eccezione di *Vaucheria submarina* (Lyngbye) Berkeley, sono del tutto prive di macrofite e presentano pessime "Bad" condizioni ambientali, la terza stazione è posta nell'unica area confinata di tutta la laguna aperta che presenta ancora una popolazione di *Cymodocea nodosa* (Ucria) Ascherson e condizioni ecologiche elevate "High". La valle arginata, nonostante sia considerata un ambiente altamente modificato, e pertanto in base alla normativa sulle acque non deve essere classificata, presenta invece una vegetazione integra. Sono presenti ed ampiamente diffuse tutte le specie di fanerogame che colonizzano la laguna aperta tra cui dense popolazioni di *Ruppia cirrhosa* (Petagna) Grande, altrove ormai quasi completamente scomparsa, e molte specie di macroalghe non più rinvenute da decenni come: *Valonia aegagropila* C. Agardh, *Polysiphonia spinosa* (C. Agardh) J. Agardh e *Lamprothamnion papulosum* (Wallroth) J. Groves. Valle Dogà, come anche le valli limitrofe: Valle Crassabò e Valle Cavallino, presenta una vegetazione costituita da poche specie ma quasi tutte di elevato valore ecologico ed acque estremamente trasparenti. Abbondantissime sono anche le piccole Rhodophyta calcarizzate come *Hydrolithon boreale* (Foslie) Y. M. Chamberlain, *H. cruciatum* (Bressan) Y. M. Chamberlain e *Pneophyllum fragile* Kützing che riescono a colonizzare anche *R. cirrhosa*, specie che difficilmente si trova epifitata. Tutte queste specie sono assenti in tutti gli ambienti confinati della laguna aperta poiché le condizioni ecologiche sono profondamente alterate, soprattutto dal punto di vista morfologico. Infatti, attualmente nella laguna Veneta i principali fattori di impatto o di disturbo ambientale non sono le sostanze inquinanti o i nutrienti, che ormai presentano concentrazioni molto basse e, come per il fosforo reattivo, al limite della detenzione, ma i sedimenti risospesi sia dall'attività della pesca alle vongole filippine che dal ripristino morfologico di molte barene ormai scomparse. Alcune aree, come la Palude Maggiore, ormai presentano livelli bassissimi di nutrienti, assenza quasi totale di Ulvaceae, con condizioni idonee alla ricolonizzazione da parte delle fanerogame acquatiche, ma elevati livelli di torbidità. Inoltre, l'assenza di semi che possano innescare una ricolonizzazione da parte di queste piante ne impediscono un recupero in tempi ragionevoli. A tale scopo, in aree idonee sono stati effettuati dei trapianti di *Zostera noltii* Hornemann e *Zostera marina* Linnaeus e, visto il loro successo, è appena stato presentato un Life+ "Natura" alla Comunità Europea per il recupero ambientale di tutta la laguna Settentrionale con lo scopo di ripristinare progressivamente le condizioni ambientali ancora presenti nelle aree arginate.

La comunità epifita a diatomee sulle macroalghe (Gelidiacean species) di Gran Canaria (Canary Island)

Cante M.T.¹, Viera Rodríguez M.A.², Stroobant M.², Polifrone M.², De Stefano M.¹

¹ Dipartimento di Scienze Ambientali, 2nd Università degli studi di Napoli, Via Vivaldi 46 -81100, Caserta, Italy

² Dipartimento di Biologia, Facoltà di Scienze del Mare, Univ. de Las Palmas de G.C., Campus de Tafira, Apdo. 550 35017, Las Palmas De Gran Canaria, Spain
(e-mail:cantemariateresa@yahoo.it)

Il microfitobenthos rappresenta un importante componente degli ecosistemi marini e, nelle acque costiere, può fortemente contribuire alla produzione primaria totale comunemente attribuita principalmente al fitoplancton. La comunità epifita microalgale su fanerogame marine e macroalghe è rappresentato principalmente da diatomee pennate.

In questo studio, abbiamo analizzato per la prima volta, in termini di composizione in specie e di abbondanze relative, la struttura delle comunità a diatomee che colonizzano alcune specie di macroalghe provenienti da Gran Canaria, nell'ottica di verificare se le differenze nella morfologia dei loro talli, la stagionalità e la distribuzione spaziale possano agire come agenti selettivi nel processo di sviluppo delle microcomunità.

Gelidium canariense, *G. arbusculum*, *G. pussillum*, *Pterocladia capillacea* e *P. melonodea* sono state raccolte in tre località diverse sulla costa nord dell'isola a Bocabarranco (Galdar), Playas de Las Salina (Agaete) e Quintanilla (Arucas) durante l'inverno 2008 e l'estate 2009.

Identificazione tassonomica e conteggio delle cellule di diatomee è stata effettuata al microscopio elettronico a scansione (SEM).

Le abbondanze totali delle diatomee epifite in tutte le specie di Gelidiaceae sono relativamente basse in entrambe le stagioni di campionamento, inoltre non ci sono differenze nelle abbondanze nei vari siti di studio (Agaete, Bocabarranco, Quintanilla) a causa della loro ridotta distanza spaziale.

I risultati del nostro studio hanno evidenziato che la comunità epifita a diatomee in tutte le macroalghe analizzate è costituita da pochi generi caratterizzati da specifiche forme di crescita idonee allo stile di vita epifita. Diatomee monorafidee (*Cocconeis*, *Achnanthes*) e birafidee (*Amphora*) adnate costituiscono la componente primaria della comunità epifita a cui è associata una componente eretta (*Grammatophora*, *Licmophora*, *Tabularia*) e mobile (*Gomphonema*, *Navicula*), variabile in termini di generi e poco abbondante.

Phytoplankton and mussel culture modelling in the framework of the sustainable management of the coastal zones: the case of the Mar Piccolo in Taranto

Caroppo¹ C., Giordano L.², Bisci A.P.¹

1 Consiglio Nazionale delle Ricerche, Istituto per l'Ambiente Marino Costiero, Via Roma 3 – 74100 Taranto (carmela.caroppo@iamc.cnr.it)

2 Consiglio Nazionale delle Ricerche, Istituto per l'Ambiente Marino Costiero, Calata Porta di Massa – 80133 Napoli

Phytoplankton, which conduct a bulk of primary production and can rapidly respond to a wide range of environmental perturbations, represent a sensitive and important indicator for detecting ecological changes in coastal systems, like Mar Piccolo in Taranto. In this ecosystem, in the last fifty years, urban expansion and intensive agricultures have caused an increase in nutrients and organic matter levels, which are higher than the self-depurating capacities of the basin. Since 2000, to improve the water quality, a depuration plan has been implemented in Mar Piccolo.

In the framework of the Integrated Project, SPICOSA (Science and Policy Integration for COastal Systems Assessment), system-based models are being developed to provide higher-level information and decision-support tools for solving problematic issues in coastal zones. Particularly, the preliminary results on phytoplankton community dynamics and productivity obtained by constructing a system based simulation model are here presented.

The phytoplankton submodel provided us with a better quantitative understanding of primary production and has raised some questions concerning the controls on its production. The phytoplankton biomass variability is out of phase with the mussel biomass in a manner that resembles a predator-prey relationship, i.e. plankton bloom when the mussel population (grazing) is at a minimum and vice versa. During winter, plankton growth is favored because grazing is low and new nitrogen is added from fall-winter runoff. During summer, the phytoplankton biomass minimum appears to be primarily caused by grazing, due a minimum of diatoms, and limiting N/P ratios (phosphate is below detection levels in summer). During July-August period the phytoplankton community composition changes, with an increase in phytoflagellates and a decrease in diatoms. Our interpretation is that mussels have less good food to sustain their weight during the summer harvest period. In sum, this complicated sequence suggests a strong control on the phytoplankton by the mussel grazing.

The simulation of the phytoplankton groups succession provides a useful indicator of system response to human perturbations, a calibration parameter for the species-specific growth, an indicator of trophic changes, and a control on the growth of mussels reared in Mar Piccolo.

Plasticità ecologica di *Sargassum vulgare*. Approccio morfologico e molecolare di tre popolazioni dell'isola d'Ischia (Napoli)

Chiarore A., Patti F.P., Buia M.C.

Stazione Zoologica Anton Dohrn, Napoli (Italy)

Key-words: Plasticità ecologica, DNA, *Sargassum vulgare*, Acidificazione

Sargassum vulgare C. Agardh è un'alga bruna (Phaeophyceae) caratteristica dei fondali rocciosi della fascia infralitorale fino a circa 40 metri di profondità, cosmopolita, presente nel bacino del Mediterraneo ad eccezione dell'Adriatico settentrionale e del Golfo del Leone. Nel corso dell'ultimo decennio è stata osservata una riduzione della specie in alcune zone dell'isola d'Ischia (NA) dove prima era abbondante (Buia, oss. pers.). Recenti osservazioni sulla distribuzione, la morfologia e la caratterizzazione genetica della specie hanno evidenziato la spiccata plasticità ecologica ed adattabilità di *S. vulgare* anche in condizioni estreme di ambienti acidi. Nel presente studio sono state condotte osservazioni comparative sulla morfologia e la distribuzione della specie in un sito dell'isola d'Ischia caratterizzato da emissioni di CO₂, che determinano un abbassamento del pH dell'acqua, ed in due siti di controllo a pH normale.

Le tipicità morfologiche sono state confrontate con i risultati ottenuti da analisi molecolari volte a identificare la presenza di un morfotipo di *S. vulgare* geneticamente differenziato e caratteristico di ambienti con bassi valori di pH. Per la caratterizzazione genetica sono stati utilizzati: due marcatori plastidiali (il gene *psbA* che codifica per la proteina D1 che lega la clorofilla nel fotosistema II, ed il gene *rbcl* che codifica per la subunità maggiore del ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCo), il DNA mitocondriale (*cox2* e *cox3* codificanti la citocromo ossidasi) utile per studi filogenetici e di popolazione in quanto ha genotipo aploide e vi è poca ricombinazione ed uno spaziatore intergenico (ITS2) del rDNA. Vengono qui presentati i risultati dell'osservazione morfologica e del gene *psbA*.

Frequent recombination and epidemic population structure in a freshwater cyanobacterium

D'Alelio D.¹, Salmaso N.¹, Gandolfi A.¹

*1 Research and Innovation Centre, Fondazione Edmund Mach, via Mach 1, 38010 S. Michele all'Adige (TN)
(dom.dalelio@gmail.com)*

Based on increasing knowledge, cyanobacteria seem particularly prone to gene-flow, in a way similar to other bacteria. In previous investigations, the freshwater cyanobacterial genus *Planktothrix* showed remarkable signals of both homologous and non-homologous recombinations. However, it is not clear how frequent recombination in this genus is – when compared to mutation rates – and if this phenomenon is able to impact population structuring and evolution. In the present work, we analysed genetically, by means of multi-locus sequence typing (MLST), 290 strains isolated in seven neighbouring Italian lakes, located in the subalpine district. A minimum of 22 and a maximum of 77 strains per lake were analysed. Four out of six house-keeping loci were polymorphic, determining the presence of 20 distinct multi-locus genotypes. A high proportion of recombinant sequence-types (STs) was detected. Nonetheless, many STs were over-represented in different lakes, suggesting strong clonality at local scale. Multiple genetic analyses suggested i) the existence of three major groups of genotypes involved in a number of inter-group recombination events, ii) recombination rates comparable to mutation ones but having a higher impact on the overall evolutionary dynamics, iii) population biology indexes usually associated to prokaryotes characterized by an epidemic population structure, such as pathogenic bacteria.

Risposte morfo-fisiologiche di *Scenedesmus rubescens* a diverse concentrazioni di ibuprofene

Dalla Vecchia F., Matozzo V., Moro I.

Dipartimento di Biologia Università di Padova Via U. Bassi 58/, 35131 Padova
(francesca.dallavecchia@unipd.it)

L'inquinamento da farmaci rappresenta un problema ambientale emergente, a causa del loro ampio impiego in ambito animale ed umano. Infatti i farmaci e i loro metaboliti, escreti con le urine e/o feci animali ed umane, si riversano negli ambienti acquatici dove sono degradati o dove possono persistere a lungo; talvolta possono interagire sinergicamente con altri composti presenti nelle acque, tra i quali, prodotti di igiene personale e ciò può portare ad un aumento della loro tossicità per gli organismi acquatici.

Ibuprofene (*RS*)-acido 2-[4-(2-metilpropil)fenil]propanoico è il farmaco antinfiammatorio non steroideo che maggiormente si trova sia nelle acque di scarico che nei fiumi e laghi in Europa. Poiché in letteratura sono disponibili poche informazioni riguardo agli effetti di ibuprofene sulle microalghe, abbiamo ritenuto interessante investigare gli effetti di questa molecola a diverse concentrazioni (62.5 µg/l, 250 µg/l e 1000 µg/l) sulla microalga d'acqua dolce *Scenedesmus rubescens*.

In particolare è stata analizzata la curva di crescita di colture di questa microalga di controllo e trattata con ibuprofene, mediante misure di densità ottica. Sono state effettuate anche analisi di tipo morfologico e ultrastrutturale e analisi del contenuto in clorofille e carotenoidi.

Dai risultati preliminari ottenuti possiamo concludere che:

la curva di crescita delle colture della microalga *Scenedesmus rubescens* nelle diverse condizioni sperimentali testate mantenute sia a 36 µmol fotoni/m²s⁻¹ che a 20 µmol fotoni/m²s⁻¹ mostra lo stesso andamento. In fase stazionaria, nelle colture trattate con ibuprofene si osservano cellule morte e ciò risulta particolarmente evidente per le colture alla concentrazione di 1000 µg/l.

All'intensità luminosa di 36 µmol fotoni/m²s⁻¹ il contenuto in clorofille totali diminuisce in maniera sostanziale già il settimo giorno dall'inoculo sia nelle colture trattate con ibuprofene che in quelle di controllo, suggerendo che l'intensità luminosa a cui le alghe sono state mantenute non sia ottimale per la crescita dell'organismo.

L'incremento del rapporto carotenoidi/clorofille nelle colture mantenute a 36 µmol fotoni/m²s⁻¹, più evidente in quelle trattate con il principio attivo, suggerisce che sia l'intensità luminosa utilizzata che l'esposizione a ibuprofene rappresentino una condizione stressante per *Scenedesmus rubescens*.

Le analisi morfologiche e ultrastrutturali evidenziano nelle cellule un aumento delle inclusioni di probabile natura lipidica, molto evidente nelle colture trattate con le maggiori concentrazioni di ibuprofene in fase stazionaria alla fine della quale le colture trattate con 250 e 1000 µg/l di ibuprofene presentano una spiccata colorazione arancio, indice dell'aumento dei carotenoidi secondari. Ciò ci permette di ipotizzare per ibuprofene un ruolo di elicitore nella produzione di questi pigmenti.

Identification of potential modes of nutrient acquisition in four morphologically distinct periphytic communities from the same lake using phosphatase kinetics

Ellwood N.T.W.¹, Godeas F.², Albertano P.B.²

¹*Dipartimento di Scienze Geologiche, Università Roma Tre, Largo di San Leonardo Murialdo 1, 00146 Roma;*

²*Dipartimento di Biologia, Università di Roma 'Tor Vergata', Via della Ricerca scientifica snc, 00133 Roma.*

Growth forms of phototrophic periphyton communities can vary quite considerably from prostrate cells growing in close contact with a surface to thick mats of intertwined filaments to perpendicular filaments or stalks with only a basal attachment to the surface. The resulting form of the community has normally been associated with the constraints imposed by the physical environment. In lakes (and in streams), only a few studies have associated phytobenthos form with the mode of nutrient uptake. Nutrient sources in lacustrine environments can be terrestrially loaded, hyporheic, aquatic or organic detritus in sediments or trapped in periphyton biomass. Diverse growth forms are proposed to have evolved due to this diversity in nutrient source. During a study of the periphyton of Lake Albano, it was noted that four very distinct periphytic communities co-existed within the lake. It was also noted that during the study the water in the lacustrine environment was oligo-mesotrophic (TP ranging from 18 to 23 $\mu\text{g L}^{-1}$). Observations of the four communities taken from three sites in Lake Albano revealed the presence of diverse communities that were identified on the basis of their dominant species. Each site was not shaded and samples taken at roughly the same depth between September 2009 and February 2010. The phosphomonoesterase and phosphodiesterase kinetic parameters of the four identified periphytic communities were quite distinct. The growth form and mode of nutrient acquisition may be the reason of the diverse phosphatase kinetics observed.

Spatial variability of benthic diatoms in some Adriatic transitional systems

Facca C., Sfriso A.

Dipartimento di Scienze Ambientali, Informatica e Statistica, Università Ca' Foscari Venezia, Calle Larga Santa Marta 2137, 30123 Venezia (facca@unive.it)

The spatial distribution of benthic diatoms was investigated in the Venice lagoon in June-July 2003, in Goro and Lesina lagoons in July 2004 and in Grado-Marano lagoon in July 2007. A total of 192 surface sediment samples (1 cm top-layer) were processed in replicate in order to determine diatom cell abundance, biomass as carbon content and the taxonomic composition by means of conventional light microscopy. Moreover, the main environmental parameters were measured with the aim to correlate the diatom variability to the water and surface sediment main characteristics.

Most of the samples (165) were collected in the Venice lagoon, which is characterized by the highest extension and the more marked environmental gradients and anthropic pressures.

On the whole 122 taxonomic entities were identified; but, site by site, the number of taxa and the species richness varied significantly, being the lowest (4 taxa and Margalef richness 0.23) in a confined area of the Venice lagoon and the highest (24 taxa and Margalef richness 1.72) in the Grado-Marano lagoon. 100 taxa belonged to the subclass Bacillariophycidae, 8 to Coscinodiscophycidae and 14 to Fragilariophycidae. On average, in the Venice, Goro and Lesina lagoons, the most abundant taxon was *Thalassiosira* sp., which is known to prefer constant nutrient availability. The contributes of the genus *Cocconeis*, *Navicula* and *Tabularia* was significant too.

The highest cell abundance and biomass were recorded in the Venice lagoon, where the values varied between 0.26 and 3.61 x 10⁶ cell/ml (wet sediment) and between 8.06 and 609 µg C/ml (wet sediment), respectively. The lowest cell abundance (0.10 x 10⁶ cell/ml, wet sediment) in the Grado-Marano lagoon did not coincide with the lowest biomass, due to *Synedra* occurrence. Cell sizes in the surface sediments varied greatly as a consequence of species characterized by large cell volume such as some *Gyrosigma*, *Paralia*, *Pleurosigma*, *Surirella* and *Synedra*. The occurrence of colonial species was negligible.

Water depth and light availability were the parameters which mainly affected benthic diatom variability in term of both cell abundance and diversity. Other variables, such as nutrient concentrations in water and in surface sediments and grain-size, had a marked influence on species occurrence, being correlated with species richness and Shannon diversity index. No relationship was found with planktonic diatoms even though the water column depth ranged between 20 and 270 cm.

Variabilità della comunità epifita di *Posidonia oceanica* lungo un gradiente di acidità

Garrard Samantha, Fioretti Sara, Mulas Martina, Buia Maria Cristina

Gruppo Ecologia del Benthos, Laboratorio di Ecologia Funzionale ed Evolutiva,
Stazione Zoologica Anton Dohrn di Napoli, Punta San Pietro, Ischia (Napoli)
(samantha.garrard@szn.it)

Grazie alla longevità delle sue foglie, *Posidonia oceanica* (L) Delile ospita una comunità epifita particolarmente ricca e diversificata, che gioca un ruolo fondamentale nella rete trofica di questo ecosistema costiero. Gli epifiti algali, con bassi rapporti C/N e contenuti in cellulosa, hanno una maggiore palatabilità rispetto alla pianta, che ha di conseguenza pochi consumatori diretti: il pesce *Sarpa salpa* Linnaeus e il riccio *Paracentrotus lividus* Lamarck. In generale l'attività di erbivoria sulle foglie di *Posidonia* non è molto elevata, anche se vengono riportati casi in cui una intensa pressione di grazing della fauna ittica può rallentare/inibire la crescita fogliare.

Nelle praterie superficiali attorno al Castello Aragonese di Ischia si osservano banchi di salpe particolarmente numerosi che pascolano attivamente sulle foglie di *Posidonia*. Questa attività sembra particolarmente intensa nella stretta fascia interessata da emissioni gassose che in questa area acidificano naturalmente la colonna d'acqua; in particolare, nelle zone a pH 7.8, le foglie di *Posidonia* risultano particolarmente corte, diminuendo la disponibilità di substrato per lo sviluppo della comunità epifita associata.

Per quantificare la pressione di grazing sulle foglie e quella dell'acidificazione sugli epibionti, sono state effettuate indagini non distruttive (*visual census*) in due siti a pH normale (8.17) e due a pH intermedio (7.8). Campionamenti limitati alle sole foglie adulte sono serviti per valutare in laboratorio il ricoprimento dei singoli gruppi di epibionti attraverso analisi di immagine.

I risultati dimostrano che la riduzione in lunghezza delle foglie nei siti a pH 7.8 rispetto a quelli di controllo è superiore al 50% e che deve essere attribuita all'attività di grazing delle salpe, i cui morsi si riscontrano nel 75-85% delle foglie mangiate (che rappresentano il 97% delle tipologie riscontrate). L'attività dei ricci, al contrario, prevale nelle stazioni a pH normale, dove la copertura algale è significativamente maggiore. L'analisi d'immagine attesta una rilevante riduzione, nei siti acidificati, delle macroalghe calcaree, sia incrostanti sia erette, soprattutto sul lato esterno delle foglie adulte. Andamento opposto si registra per altri organismi calcarei, Spirorbidi e Briozoi: completamente assenti i primi nelle zone acide, indifferenti i secondi. Sono in corso ulteriori ricerche per valutare gli effetti della riduzione della comunità epifita sulla composizione tassonomica e funzionale della fauna vagile associata.

Preliminary investigation on morphological and genetic variability of *Posidonia oceanica* (L.) Delile along the coast of Civitavecchia (Central Tyrrhenian Sea)

Gnisci V.¹, Cognetti de Martiis S.¹, Belmonte A.², Micheli C.², Carli F.M.¹, Marcelli M.¹

¹ *Laboratorio di Oceanologia Sperimentale ed Ecologia Marina, DEB-Università degli Studi della Tuscia. Molo Vespucci, snc, 00053 Civitavecchia, Roma.
(vale.gnisci@unitus.it)*

² *ENEA Centro Ricerche Casaccia, Roma. UTRINN-BIO Laboratorio Biomasse e Bioenergie. Via Anguillarese 301, 00123 S. Maria Di Galeria, Roma*

The coastal area of Civitavecchia (Rome, Italy) is characterized by the presence of a large number of anthropic uses: power plant production, tourism, fishing, aquaculture, recreational activities. All these features have a strong impact on high-value existing ecosystems. As shown in many studies conducted in last 20 years (Casola *et al.*, 2003; Mare del Lazio *et al.*, 1996), those uses cause damages on *Posidonia oceanica* meadows, decreasing the coverage, the shoot density and receding the lower limit of meadows. Because of the high geomorphological heterogeneity of this area, *Posidonia oceanica* forms little meadows which, however, play a key role in coastal ecosystem dynamics. The aim of the study is to evaluate the actual state of health of *Posidonia oceanica* meadows along the northern coast of Latium included between Santa Severa and Marina di Tarquinia (Central Tyrrhenian sea). This has been investigated through the analyses of structural (shoots density and cover) and functional (phenological and lepidochronological analyses) descriptors and through the evaluation of genetic variability among populations of *Posidonia oceanica*.

Bibliografia

Ardizzone G. D., Belluscio A. (1996). Le praterie di *Posidonia oceanica* delle coste laziali. In "Il mare del Lazio". Convenzione Regione Lazio. Università degli Studi di Roma "La Sapienza": 194-217 pp.

Casola E., Magnifico G., Plastina N., Scardi M., Valiante L.M., Vinci D. (2002). Analisi descrittiva della prateria di *Posidonia oceanica* nel tratto di mare compreso tra S. Severa e Marina di Tarquinia (Lazio). Società Italiana di Ecologia – XIII Congresso Nazionale.

Studies on maerl/rhodolith-forming species (Corallinales: Rhodophyta): a molecular perspective of their diversity

Hernandez-Kantun J.J.¹, Rindi F.², Maggs C.A.³, Riosmena-Rodriguez R.⁴, Hall-Spencer J.M.⁵, Peña V.⁶

1 Irish Seaweed Research Group, Ryan Institute, National University of Ireland, Galway, Ireland

2 Dipartimento di Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche, 60131 Ancona

3 School of Biology and Biochemistry, The Queen's University of Belfast, 97 Lisburn Road, Belfast BT9 7BL, Northern Ireland

4 Departamento de Biología Marina, Universidad de Baja California Sur (UABCS) Apartado postal 19-B, km. 5.5 Carretera al sur, La Paz, B.C.S. 23080, Mexico

5 University of Plymouth, School of Marine Science and Engineering, Plymouth, UK

6 UMR 7138, Systématique, Adaptation et Evolution, Muséum National d'Histoire Naturelle, case postal n° 39, 57 rue Cuvier, 75231, Paris, France

f.rindi@univpm.it

Maërl beds are habitats formed by branched unattached thalli of calcareous red algae with important associated diversity (flora and fauna), significant extension and considerable commercial value. In general, coralline algae have been difficult and sometimes impossible to identify using morphological information due to their phenotypic plasticity. On the other hand, maërl-forming species have been identified based on old descriptions (from early XXth century in some occasions) raising many questions on the actual diversity, phylogeography and distribution. In this study, we present new data on the molecular diversity of maërl-forming species from Europe (Mediterranean and Atlantic Europe), Caribbean and Gulf of California at different levels in their molecular variation. Information obtained from SSU rDNA, *psbA*, *cox2-3* and ITS rDNA is presented. SSU and *psbA* placed maërl-forming corallines in the genera *Hydrolithon*, *Lithophyllum*, *Lithothamnion*, *Mesophyllum*, *Neogoniolithon* and *Phymatolithon* (Corallinales). The molecular diversity of maërl-forming corallines is higher than previously believed for the genera *Lithophyllum*, *Mesophyllum* and *Neogoniolithon*, and several cryptic species were found for some morphospecies (e.g. *Lithophyllum dentatum*, *L. incrustans* and *L. margaritae*). Using *psbA*, *cox2-3* and ITS sequences an update of the distribution of European maërl-forming species is presented. The main discovery is that *P. purpureum* has an important presence in Irish maërl beds and its occurrence was detected in the Mediterranean. In conclusion the use of molecular data, ample taxon sampling, abundant samples and type specimens were useful to clarify phylogenetic, phylogeographic and taxonomic aspects in these important habitat-forming organisms.

Diatoms associated with rhodophytes from Terra Nova Bay (Ross Sea, Antarctica)

Majewska R.¹, Gambi M.C.², Totti C.M.³, De Stefano M.¹

¹ Dipartimento di Scienze Ambientali, Seconda Università di Napoli, via Vivaldi 43, 81100 Caserta
(roksana.majewska@unina2.it)

² Laboratorio di Ecologia Funzionale ed Evolutiva, Stazione Zoologica "Anton Dohrn", Villa Dohrn,
Punta S. Pietro, 80077 Ischia (Napoli)

³ Dipartimento di Scienze del Mare, Università Politecnica delle Marche, via Brecce Bianche, 60131
Ancona

Epiphytic diatoms are important constituents of the Southern Ocean coastal water ecosystem, being a key element in many of the Antarctic trophic chains. However, only limited information exists relating to these microalgal communities. Here we describe our findings of a study on epiphytic diatoms from Terra Nova Bay (Ross Sea, Antarctica) based on material collected during the summer campaigns spanning from 1990 to 2004. Observations of diatoms associated with three rhodophyte species (*Iridaea cordata*, *Phyllophora antarctica*, and *Plocamium cartilagineum*) were carried out with the use of SEM. A total of 73 diatom taxa (32 genera) were distinguished, of which 20 taxa exceeded 3 % of total abundance. *Cocconeis fasciolata*, *Navicula perminuta*, and *Fragilariopsis nana* appeared in every sample. The ANOSIM test as well as nMDS analysis indicated the nature of host organism as a major factor influencing associated diatom community structure, whereas depth, site, and time of sampling seemed to be less important. The epizoic communities associated with sessile fauna epiphytic on macroalgae differed significantly from those associated with macroalgal surface. A pronounced difference between the communities epiphytic on various host macroalgae species was also observed, though, most of the dissimilarities occurred between diatom taxa of the same growth form.

Lectotypification of *Chondrus vidovichii* Meneghini [= *Acrodiscus vidovichii* (Meneghini) Zanardini] (Halymeniales, Rhodophyta) ... and a bit of history

Manghisi A.¹, Morabito M.¹

¹Department of Biological and Environmental Sciences, University of Messina, Salita Sperone 31, 98166, Messina – Italy (toni.manghisi@gmail.com)

Acrodiscus vidovichii (Meneghini) Zanardini 1868 is the only species of the genus *Acrodiscus* (J. Agardh) Zanardini, a poorly known endemic Mediterranean genus of the Halymeniales (Rhodophyta).

In 1841, Meneghini attended to the conference “*Terza riunione degli scienziati italiani tenuta in Firenze nel Settembre 1841*”, where he presented his manuscript “*Algologia Dalmatica*” to his colleagues, asking for their review. In the conference acta, the secretary of the session of Botany and Plant Physiology reported the novelties of the manuscript, including the newly described species and their latin diagnoses, but unfortunately without the tables. Among others, there was *Chondrus vidovichii*. The next year, J. Agardh described a new species *Cryptonemia dichotoma*, collected in Nice, on which he later (1851) erected the section *Acrodiscus* of the genus *Cryptonemia* itself. However, Zanardini (1843) had already considered *Chondrus vidovichii* and *Cryptonemia dichotoma* as synonyms and made the combination *Cryptonemia vidovichii*, the basionym of Meneghini having priority. Finally, Zanardini (1868) erected the section *Acrodiscus* to the rank of genus with the only species *A. vidovichii*, again acknowledging the priority of Meneghini’s name.

The taxonomic status of this entity has been further obfuscated by the lack of the original collection on which Meneghini based his description, being the type material absent in commonly browsed Meneghini’s herbaria housed at both Florence and Leiden.

After an extensive search in both national (FI, MCVE, PAD, PI) and international (ADRZ, BM, L, PC) institutional herbaria, as well as in institutional libraries, we were able to discover Meneghini’s unpublished manuscripts and tables, and – as a consequence – to recognize an herbarium specimen that is the best candidate for the lectotypification of this species.

Morphological and molecular evidence for four additional species in the genus *Leptocylindrus* Cleve (Bacillariophyceae)

Nanjappa D.¹, Kooistra W.H.C.F.¹, Zingone A.¹

¹*Ecology and Evolution of Plankton Laboratory, Stazione Zoologica Anton Dohrn, Villa Comunale
80121 Naples, Italy*

Diatoms are among the most productive photoautotrophic organisms on Earth. *Leptocylindrus* is a radial centric diatom genus within which two species, *L. danicus* and *L. minimus*, are reported as abundant in coastal waters worldwide. In the Gulf of Naples, *L. danicus* is found all year round, with major blooms in summer, while *L. minimus* recurs in autumn. However, the diversity of the genus has not been investigated in detail so far, not only in the Gulf of Naples but also elsewhere. We analysed 85 strains isolated from the Gulf of Naples and strain CCMP 1856 from the Atlantic US coast using nuclear rDNA (18S, D1/D2 region of the 28S and ITS), the plastid 16S rDNA, the large subunit of the ribulose biphosphate carboxylase gene (*rbcl*) and the photosystem II gene, *psbC*. Morphology of the strains was investigated using light and electron microscopy. Phylogenetic and morphological analysis grouped the strains into five clades, suggesting the existence of five distinct species. Among the five clades, two matched the description of *L. danicus* Cleve that have subcentral pore on the valve and forms spiny resting spores following sexual reproduction. Genetically, they were nearest sisters and they showed subtle morphological differences; one of these is described as a new species, *L. hargravesii*. The taxon in another clade was previously reported as *L. danicus* var. *apora*, differing from the nominal species because it lacks the pore in the valve and does not form resting spores. This taxon is raised to the species status, the name being *L. aporus*. A fourth clade consisted of a species new to science, which had distinctively convex valves, for which we propose the name *L. convexus*. Finally, the strains in the basal clade matched the description of *L. belgicus* Meunier, so far considered as synonym of *L. minimus* Gran. Nevertheless, based on marked ultrastructural differences, the new genus *Tenuicylindrus* is erected for this clade, with *T. belgicus* as the type species. *L. minimus* was not found in the Gulf of Naples, but its 18S sequence from GenBank differed from those of all strains in the present study. The five *Leptocylindrus* species found in the Gulf of Naples showed different seasonal distributions, though with overlaps; based on isolation of strains in weekly net samples. *L. danicus* and *L. aporus* showed opposite seasonal distributions. The former occurred year round except during summer, rarely attaining high concentrations, whereas the latter was found from the summer throughout mid-autumn, producing intense blooms in summer. Other species showed a more restricted period of occurrence. A so far unknown diversity, also reflected in functional aspects, is therefore revealed in these species which are at the base of the diatom phylogenetic tree. However, the large phylogenetic distances coupled with very similar morphology indicates morphological stasis in *Leptocylindrus* and *Tenuicylindrus* species, which makes visual differentiation problematic in some cases.

Toxicity of three benthic dinoflagellates isolated from the Gulf of Taranto (northern Ionian Sea)

Pagliara P.¹, Caroppo C.²

1 Dipartimento di Scienze e Tecnologie Biologiche e Ambientali, Università del Salento, Via Prov. Lecce-Monteroni, 73100 Lecce (patrizia.pagliara@unisalento.it)

2 Consiglio Nazionale delle Ricerche, Istituto per l'Ambiente Marino Costiero, Via Roma 3, 74100 Taranto

Harmful Algal Blooms (HABs) due to the abundant proliferation of microalgae have spread worldwide and become a global problem causing enormous economic loss and serious impacts on human health. This algal proliferation can cause negative impacts to other organisms via production of natural toxins. Indeed, HABs are often associated with large-scale marine mortality events and various types of shellfish poisonings. The phenomenon is more frequent than in the past, also in temperate waters, so it is very important not only to survey the presence of potential harmful algae but also to further investigate their toxicity.

In this work we report on the occurrence and toxicity of three harmful microalgae (*Amphidinium carterae*, *Coolia* cfr. *monotis* and *Ostreopsis* cfr. *ovata*) isolated from the Gulf of Taranto (northern Ionian Sea). Our findings confirmed the association of the three dinoflagellates both in benthic and planktonic assemblages, already observed in other temperate and tropical areas. *Amphidinium* and *Coolia* abundances did not reach high values during the sampling period while *Ostreopsis* abundances were lower than those reported by other authors for the north western Mediterranean Sea and the northern Adriatic Sea, both on macroalgae and in the water column.

The toxicity of the three cultured strains was tested by *Artemia salina* and hemolysis tests as well as by the observation of their effects on the first stages of the sea urchin development.

The sea urchin embryonic development *in vitro* was completely inhibited by the contemporary presence of the three species. But this action could be ascribed to the sole *Ostreopsis* as the addition of the single species to the sea urchins embryos evidenced no effects in presence of *Amphidinium* or *Coolia* cells, and an irregular segmentation in presence of the sole *Ostreopsis*. In particular, this latter species exerted a cytotoxic effect in a dose-dependent manner with a production of deformed embryos even at very low cell concentration.

Besides, we evaluated the effect of each dinoflagellate cell lysate on the sea urchin development. Also in this case *Ostreopsis* has proved to be the most toxic species.

However, the *A. salina* test evidenced that only *Amphidinium* and *Ostreopsis* lysate were able to strongly affect *Artemia* nauplii vitality. Furthermore, *Ostreopsis* exerted a very strong hemolytic activity in contrast with that observed with *Amphidinium* and *Coolia* lysates which was very low. Our results highlight the importance to monitoring the presence of these dinoflagellates whose effects may also be reflected on the early life stages of marine organisms, especially those species, as the sea urchins, important from both an ecological and economic point of view.

Revision of the genus *Mastogloia*, section *Ellipticae* (Bacillariophyceae) through electron microscopy

Pennesi C.¹, Poulin M.², Romagnoli T.¹, De Stefano M.³, Totti C.¹

¹Dipartimento Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche, via Brecce Bianche, 60131 Ancona (c.pennesi@univpm.it)

²Research & Collections, Canadian Museum of Nature, PO Box 3443, Station D, Ottawa, ON KIP 6P4, Canada

³Dipartimento di Scienze Ambientali, 2nd Università di Napoli, via Vivaldi 43, 81100 Caserta, Italia

The genus *Mastogloia* Thwaites ex Smith includes at least 410 taxa living as epiphytes on seaweeds and seagrasses. The systematics of *Mastogloia* is still partly unexplored and most of the taxa are described only by means of historical observations at light microscope. Therefore, a revision of its classification and phylogeny is highly recommended. Recently we revised the Hustedt's section *Sulcatae* (Pennesi et al. 2011, 2012). Here we present the revision of the section *Ellipticae* which is near completion. Fourteen *Mastogloia* taxa belonging of the section *Ellipticae* were morphologically described through scanning electron microscopy, including four new taxonomic entities for science: *M. matthaei* Pennesi & Poulin, *M. rosae* Pennesi, *M. stellae* Pennesi & Poulin and *M. aspera* var. *elliptica* Pennesi & Totti. They were collected as epiphytes on seagrasses from several tropical (Indonesia), subtropical (Egypt, Greece, Republic of Malta, Turkey) and temperate (Slovenia, Italy) regions of the world. All these taxa show a typical elliptical valve outline that characterizes the section *Ellipticae*.

This study provides novel information on the frustule ultrastructure concerning small-sized taxa (<30 µm) and big-sized taxa (>30 µm) and gives update of their current geographical distribution.

References

Pennesi C., Poulin M., De Stefano M., Romagnoli T., Totti C. (2011). New insights to the ultrastructure of some marine *Mastogloia* species section *Sulcatae* (Bacillariophyceae), including *M. neoborneensis* sp. nov. *Phycologia*, 50(5): 548–562.

Pennesi C., Poulin M., De Stefano M., Romagnoli T., Totti C. (2012). Morphological studies of some marine *Mastogloia* (Bacillariophyceae) belonging to section *Sulcatae*, including the description of new species. *Journal of Phycology*, 48, 1248–1264.

***Azadinium dexteroporum* sp. nov., a new species producing azaspiracids from the Mediterranean Sea**

Percopo I.¹, Siano R.⁴, Rossi R.³, Soprano V.³, Sarno D.¹, Zingone A.²

¹*Taxonomy and Identification of Marine Phytoplankton Service, Stazione Zoologica Anton Dohrn, Villa Comunale 80121 Naples, Italy (isabella.percopo@szn.it)*

²*Ecology and Evolution of Plankton Laboratory, Stazione Zoologica Anton Dohrn, Villa Comunale 80121 Naples, Italy*

³*Istituto Zooprofilattico Sperimentale del Mezzogiorno, Via Salute 2, 80055 Portici, Italy*

⁴*IFREMER, Centre de Brest, DYNECO/Pelagos, BP 70 29280 Plouzané, France*

Azaspiracids comprise a group of marine lipophilic biotoxins implicated in the shellfish-mediate azaspiracid poisoning syndrome (AZP) in humans. This syndrome has often been confused with the diarrhetic shellfish poisoning (DSP) as it produces similar symptoms, including headaches, diarrhea, nausea, vomiting, and stomach cramps. The first known azaspiracid poisoning (AZP) occurred in the Netherlands in 1995 after consumption of mussels (*Mytilus edulis*) cultivated on the west coast of Ireland. It was only in 2009 that the microalgal species responsible for this syndrome was identified and described as *Azadinium spinosum* Elbrächter et Tillmann based on strains isolated from the North Sea. Two other species were described from the same geographic area in the following years, *A. obesum* Tillmann et Elbrächter and *A. poporum* Tillmann et Elbrächter, which do not produce AZA toxins, while two more taxa, *A. cf. poporum* isolated from the Pacific Ocean and *A. cf. spinosum* found in samples from Argentinian waters, still await a proper classification. A fourth species, *A. caudatum*, formerly known as *Amphidoma caudata*, has been recently transferred to the genus, thus notably widening its geographic range. A tiny thecate dinoflagellates isolated from the Gulf of Naples (South Tyrrhenian Sea, Mediterranean Sea) has been described as *Azadinium dexteroporum* sp. nov. Morphological and phylogenetic analyses well support the attribution of *A. dexteroporum* to the genus *Azadinium* and its separation from the other known species. *A. dexteroporum* shares the presence of a small antapical spine with the type species *A. spinosum*, but differs from the latter and from other *Azadinium* species for the position of the ventral pore and the marked concavity of the second intercalary plate (2a), which appears collapsed with respect to the other plates. The type material of the new species produces azaspiracid-3 and -7, along with a recently described molecule (compound 2, 830 MW), although in low amounts. This is the first evidence of an algal culture producing AZA-7, so far only found in contaminated invertebrates, as well as the first finding of an AZA-producing species in the Mediterranean Sea.

Nuovi “alieni” nei mari italiani

Petrocelli A., Portacci G., Cinelli F., Cecere E.

IAMC, C.N.R., UOS Taranto, via Roma 3, 74123 Taranto
(antonella.petrocelli@iamc.cnr.it)

L'introduzione di specie aliene rappresenta una seria minaccia per la biodiversità mondiale, sia in ambiente terrestre che acquatico, poiché spesso tali specie riescono a soppiantare quelle autoctone, modificando completamente la struttura degli ecosistemi. Tale fenomeno è strettamente legato all'incremento, negli ultimi decenni, degli scambi commerciali ed è fortemente condizionato dal cambiamento climatico. Nel Mar Mediterraneo, sino ad oggi sono state rinvenute circa 1000 specie aliene introdotte principalmente a causa dell'apertura del Canale di Suez (1869) e attraverso le attività di acquicoltura. Pertanto, gli ambienti di transizione dove insistono attività di acquicoltura, e in particolare di molluschicoltura, sono i più esposti a questo rischio. Infatti, in Mediterraneo, la Laguna di Thau (Francia), la Laguna di Venezia e il Mar Piccolo di Taranto, nell'ordine, sono considerati i principali hot spot per l'introduzione di macroalghe aliene. Nel Mar Piccolo di Taranto, la prima segnalazione del fenomeno risale addirittura agli inizi degli anni '20 da parte della professoressa Irma Pierpaoli, algologa anconetana, ospitata per le sue ricerche presso l'Istituto Talassografico di Taranto, la quale osservò “..... lo sviluppo, sia pure temporaneo, di specie di altri mari, importate a Taranto continuamente colle navi provenienti dai luoghi più diversi....”. Successivamente, da quando, nel 1986, è incominciato lo studio sistematico della flora e vegetazione del bacino, sono state segnalate numerose specie di macroalghe aliene, motivo per cui il Mar Piccolo è stato incluso in LIFEWATCH, un'infrastruttura di ricerca a livello europeo, nell'ambito della quale è stato elaborato uno show case sulle specie aliene per valutare la vulnerabilità degli ambienti marini e terrestri all'invasività di tali specie. In particolare, negli ultimi due anni, sono state rinvenute per la prima volta nel bacino ben 4 specie, e precisamente: *Ascophyllum nodosum* (Linnaeus) Le Jolis (Ochrophyta, Fucales), *Colpomenia peregrina* Sauvageau (Ochrophyta, Ectocarpales), *Grateloupia minima* P.L. Crouan et H.M. Crouan (Rhodophyta, Halymeniales), e *Polysiphonia morrowii* Harvey (Rhodophyta, Ceramiales). Per *A. nodosum* e *G. minima*, il ritrovamento nei mari di Taranto rappresenta anche la prima segnalazione per il Mediterraneo. Tutte queste specie sono state osservate nel Primo Seno, in una località che ospita rivendite e magazzini di molluschi locali ed importati, dove sono, o sono state, presenti anche altre specie di macroalghe aliene (es. *Grateloupia turuturu* Yamada e *Undaria pinnatifida* (Harvey) Suringar). Inoltre, altre 2 specie, segnalate in anni passati e non più ritrovate per diverso tempo, sono state nuovamente rinvenute di recente; esse sono: *Agardhiella subulata* (C. Agardh) Kraft et Wynne e *Codium fragile* (Suringar) Hariot subsp. *fragile*. Nel settembre scorso, lungo il litorale di Marina di Pisa, sono stati rinvenuti spiaggiati due talli di *Codium fragile* subsp. *atlanticum* (A.D. Cotton) P.C. Silva. Il loro rinvenimento rappresenta la prima segnalazione per il Mediterraneo. E' ipotizzabile che questa specie sia stata introdotta con le acque di zavorra delle navi che giungono nel porto di Livorno o con specie di molluschi importate e destinate alla vendita. Infatti, per la gran parte delle specie aliene, che in alcune località sono diventate invasive, è stata ipotizzata, e in alcuni casi anche dimostrata, la stretta relazione tra la loro presenza in zone differenti da quella nativa e l'importazione di molluschi eduli, come nel caso di *U. pinnatifida* e *A. nodosum*, rinvenute nel Mar Piccolo, che vengono utilizzate per mantenere fresco il prodotto durante il trasporto.

Studio condotto nell'ambito del Progetto Bandiera CNR “RITMARE” (Ricerca Italiana per il MARE)

Growth interaction between *Ostreopsis* cf. *ovata* and the benthic dinoflagellates *Protoceratium lima* and *Coolia monotis*

Pezzolesi L.¹, Guidi F.¹, Guerrini F.¹, Ciminiello P.², Dell'Aversano C.², Pistocchi R.¹

¹Centro Interdipartimentale di Ricerca per le Scienze Ambientali, Università di Bologna,
Via S'Alberto 163, 48123 Ravenna, Italy (laura.pezzolesi@unibo.it)

²Dipartimento di Chimica delle Sostanze Naturali, Università degli Studi di Napoli Federico II, Via
D. Montesano 49, 80131 Napoli, Italy

Proliferation of the benthic dinoflagellates *Ostreopsis* spp. are reported in many tropical and temperate regions worldwide. In the last decade, blooms of *O. cf. ovata* have become increasingly frequent in the Mediterranean Sea, as well as other tropical and temperate areas worldwide, and resulted in relevant benthic biocenosis sufferings and human health problems. Besides putative palytoxin, the production of several ovatoxins has been reported in different strains of *O. cf. ovata*. *Ostreopsis* spp. are generally present in association with other benthic species, namely *Coolia monotis* and *Prorocentrum* spp.

C. monotis is a species quite common in temperate and tropical waters, where it has been frequently detected at low concentrations during warmer periods. It was reported to produce a toxin, named cooliatoxin, that was believed to be structurally related to yessotoxin based either upon the molecular weight and symptoms induced in mice; however, more recently it has been reported the production of cooliatin, which is a cyclononane derivative, in *C. monotis* from South China Sea. Despite this evidence of toxicity, the Mediterranean strains of *C. monotis* have never been linked to toxic effects. On the contrary, Mediterranean *P. lima* strains have reported toxicity due to the production of okadaic acid and other related toxins.

The study was therefore aimed to investigate the interaction existing among these species at different environmental conditions, especially at various temperatures. Adriatic strains of the three dinoflagellates were grown at different temperatures in monospecific and combined cultures. *O. cf. ovata* was able to compete with the other species at all the tested conditions, reporting always the best growth. However, in the combined cultures, different growth patterns were observed due to the competition for nutrient resources. As for the toxin production, differences in the toxin content between *O. cf. ovata* cells grown in presence of the other dinoflagellates or alone were detected. These compounds seems to be not involved in allelopathic mechanisms, but it has not to be excluded that other allelopathic compounds can be released in the extracellular medium.

Effetto dell'acidificazione sulle diatomee epifite di *Posidonia oceanica* (L.) Delile

Porzio L.¹, Buia M.C.,²De Stefano M.¹

¹Dipartimento di Scienze Ambientali, Seconda Università di Napoli, via Vivaldi 43, 81100, Caserta, (lucia.porzio@szn.it; De Stefano mario.destefano@unina2.it)

²Laboratorio di Ecologia Funzionale ed Evolutiva, Stazione Zoologica Anton Dohrn, Punta San Pietro, 80077, Ischia, Napoli (mariacristina.buia@szn.it)

L'aumento di pCO₂ nell'atmosfera sta provocando l'acidificazione degli oceani. Prospettive basate su modelli matematici hanno infatti annunciato un abbassamento del pH della superficie oceanica di circa 0.4 unità. Per tale motivo è fondamentale migliorare la conoscenza sulla risposta degli organismi marini ad un tale fenomeno, così come sugli effetti a lungo termine a livello di ecosistema. Il sito del "Castello" (Isola di Ischia, Napoli) può essere considerato un laboratorio naturale per simulare uno scenario futuro di acidificazione a causa della presenza di emissioni naturali di CO₂. Tra le comunità bentoniche costiere, più suscettibili alle pressioni antropiche, le praterie di *Posidonia oceanica* (L.) Delile giocano un importante ruolo strutturale e funzionale. La comunità a diatomee contribuisce in maniera significativa alla biodiversità epifita delle foglie di *P. oceanica* e cambiamenti dell'abbondanza potrebbero causare importanti cambiamenti sull'intera rete trofica.

Recenti ricerche hanno evidenziato diverse risposte sulle comunità vegetate, suggerendo che l'aumento di pCO₂ non favorisca tutti gli organismi fotosintetici come ipotizzato in precedenza. Inoltre, il fenomeno dell'acidificazione combinato con altri fattori quali l'eutrofizzazione e l'aumento della temperatura, potrebbero causare un significativo decremento dell'abbondanza e della biodiversità algale. Ad oggi nessuno studio riguardante la risposta della comunità a diatomee all'acidificazione è stato effettuato, provocando una carenza importante nella conoscenza dell'effetto sugli ecosistemi di tale fenomeno.

In questo lavoro vengono presentati i risultati preliminari di uno studio sui cambiamenti di abbondanza e diversità della comunità a diatomee, epifita di *P. oceanica*, in risposta ai cambiamenti stagionali e di pH presenti al sito del "Castello".

Foglie adulte e intermedie sono state campionate in inverno e primavera 2011. Tre porzioni di foglia (parte apicale, mediana e basale) sono state considerate nella valutazione della comunità a diatomee.

Più di 22 generi sono stati identificati utilizzando il Microscopio Elettronico a Scansione (SEM) e *Cocconeis* è risultato il genere dominante. La densità cellulare segue il gradiente di età della foglia, con abbondanze maggiori nella porzione apicale, soprattutto nelle foglie intermedie. Cambiamenti qualitativi e quantitativi sono stati osservati nei campioni raccolti lungo il gradiente di pH. Il genere *Cocconeis* è rimasto quello dominante sebbene con un'abbondanza minore nel sito acidificato. Generi appartenenti sia al gruppo delle diatomee erette (*Lichmophora*, *Gomphonemopsis*) che a quelle adnate (*Amphora*) hanno diminuito significativamente la loro abbondanza in correlazione con la scomparsa delle macroalghe incrostanti calcaree. Le forme mobili (*Navicula*) sembrano invece aumentare di misura la loro abbondanza in ambiente acidificato, specialmente in termini di diversità.

Ottimizzazione della crescita di microalghe verdi per la produzione di biodiesel

Rossi C.¹, Bellezza S.¹, Antonaroli S.², Bruno L.¹

¹Dipartimento di Biologia e ²Dipartimento di Scienze e Tecnologie Chimiche, Università di Roma "Tor Vergata", via della Ricerca Scientifica snc 00133 Roma (laura.bruno@uniroma2.it)

Lo studio delle microalghe per la produzione di biocarburanti è un campo di ricerca attualmente in espansione. Particolare importanza riveste la selezione di specie che siano in grado di produrre elevate quantità di biomassa e allo stesso tempo di garantire una buona resa in lipidi, da cui ottenere biodiesel, a costi contenuti.

In carenza di azoto molte specie di microalghe accumulano lipidi, che in genere contengono acidi grassi saturi e monoinsaturi, considerati i migliori componenti del biodiesel. In queste condizioni però si ha generalmente anche una diminuzione della biomassa.

Lo scopo di questo studio era quello di testare variate condizioni di crescita ai fini di ottimizzare la produzione di biomassa e di FAME (esteri metilici di acidi grassi) in sette ceppi di microalghe verdi.

In particolare, sono stati studiati quattro ceppi di *Scenedesmus* (*S. acuminatus*, *S. obliquus*, *S. rubescens* e *Scenedesmus* sp.) e tre ceppi di *Desmodesmus* (*D. abundans*, *D. communis*, *D. opoliensis*). Le colture sono state cresciute con o senza la fonte d'azoto, a due irradianze differenti: $120 \pm 20 \mu\text{mol fotoni m}^{-2}\text{s}^{-1}$ e $200 \pm 20 \mu\text{mol fotoni m}^{-2}\text{s}^{-1}$, mentre la temperatura e l'umidità relativa erano costanti, rispettivamente 20° C e 50%.

Per tutti i ceppi coltivati alle diverse condizioni di crescita, venivano eseguite osservazioni in microscopia ottica per verificare le eventuali variazioni morfometriche delle cellule, costruite curve di crescita per la valutazione e il monitoraggio della crescita e valutata la produzione e la produttività di biomassa mediante stima dei pesi secchi iniziali e finali. Al termine del periodo di crescita, dalla biomassa prodotta da ciascuna specie veniva estratta la frazione lipidica in cloroformio e metanolo e gli acidi grassi, in essa contenuti, venivano sottoposti a esterificazione e caratterizzati mediante analisi in gas-cromatografia. Venivano, inoltre, effettuate analisi in microscopia confocale (CLSM) dopo colorazione con il fluorocromo rosso nilo per la localizzazione dei lipidi neutri all'interno delle cellule.

I risultati hanno mostrato che la coltura di *Desmodesmus abundans* cresciuta in condizioni di privazione di azoto e di più alta irradianza aveva il più alto contenuto in FAME (34,6% del peso secco), mostrando anche il miglior compromesso tra produzione di biomassa e di biodiesel. Gli acidi grassi principali erano C16:0 e C18:0, considerati dal punto di vista qualitativo i migliori per la produzione di biodiesel. Inoltre in privazione di azoto il rapporto tra acidi grassi insaturi e saturi era prossima allo zero, caratteristica in linea con gli standard europei e americani. Osservazioni al CLSM dopo colorazione con rosso nilo sono state utili per monitorare l'accumulo di granuli lipidici nelle varie condizioni di crescita, confermando che le maggiori quantità di lipidi sono state ottenute in privazione di azoto.

***Posidonia oceanica* (L.) Delile from Monterosso al Mare (Ligurian Sea) characterization by multiple descriptors**

Rotini A.¹, Belmonte A.², Peirano A.³, Micheli C.², Migliore L.¹

1 Università di Roma Tor Vergata; 2 ENEA Centro Ricerche Casaccia, Roma; 3 ENEA Centro Ricerche Marine, S. Teresa-La Spezia.

This study was conducted on the *Posidonia oceanica* meadow of Monterosso al Mare (Santa Teresa-La Spezia, Italy), a Protected Marine Area. Sampling was carried out in July 2010 and February 2011. In each of the three sampling stations, 63 shoots were collected for phenological analyses, biochemical determinations and RAPD marker analyses. The study is based on different approaches:

- structural descriptors at individual (shoot phenology and biomass) or population level (bed density);
- biochemical descriptors: total protein content, pigments (chlorophyll a/b, carotenoids) and phenolic compounds;
- genetic descriptors: Random Amplified Polymorphic DNA (RAPD) markers.

According to all descriptors, in the Monterosso al Mare meadow difference among stations were identified (East, Central and West portion); particularly, the descriptors highlight a peculiar structure in the Central portion, different from the other two.

These results account for the usefulness of all the different descriptors in the characterization of meadows; they highlight different aspect and could be used together or in different grouping, according to the need of the environmental survey.

The potential of a newly isolated algal strain *Desmodesmus communis* for wastewater treatment and biomass production for energy recovery

Samorì G.¹, Samorì Chiara¹, Guerrini F.², Pistocchi R.^{1,2}

¹Centro Interdipartimentale per la Ricerca Industriale (CIRI), Università di Bologna, via Sant'Alberto 163, 48123 Ravenna, Italy

²Centro Interdipartimentale per la Ricerca per le Scienze Ambientali (CIRSA), Università di Bologna, via Sant'Alberto 163, 48123 Ravenna, Italy

The concept of microalgae cultivation in wastewater treatment has optimized the potential of the microalgae-based biofuel production. These microorganisms contains lipids, polysaccharides, proteins, pigments and other cell compounds, and their biomass can provide different kinds of biofuels such as biodiesel, biomethane and ethanol. The algal biomass application strongly depends on the cell composition and the production of biofuels appears to be economically convenient only in conjunction with wastewater treatment. As preliminary studies, in view of the development of a wastewater treatment pilot plant for nutrient removal and algal biomass production, a biological wastewater system was carried out on a laboratory scale growing a newly isolated freshwater algal strain, *Desmodesmus communis*, and a natural consortium of microalgae in effluents generated by a local wastewater reclamation facility. Batch cultures were operated by using *D. communis* under different growth conditions to better understand the effects of CO₂, nutrient concentration and light intensity on the biomass productivity and biochemical composition. The results were compared with those obtained using a natural algal consortium. *D. communis* showed a great vitality in the wastewater effluents with a biomass productivity of 0.138 - 0.227 g L⁻¹ d⁻¹ in the primary effluent enriched with CO₂, higher biomass productivity compared with the one achieved by the algal consortium (0.078 g L⁻¹ d⁻¹ reached). Biomass composition was richer in polysaccharides and total fatty acids (TFAs), which is the substrate for ethanol and biodiesel production, respectively, as the ammonia concentration in the water decreased; moreover *D. communis* showed positive response in terms of non-polar lipid (49.2 wt%), TFA (13.2 wt%) and C/N ratio (28.1) increment under variations of light and nutrient condition. Semi-continuous cultures were operated by using *D. communis* and the primary effluent at different hydraulic retention times (HRTs) of 1.5-, 3- and 5-day to better characterize the nutrient removal efficiency as well as the algal growth rate and the variability of the biomass composition. This experiment showed that: *i*) biomass productivity of 0.14 g L⁻¹ d⁻¹ was kept constant at each HRT; *ii*) minimum HRT to complete the ammonium removal was 3 days; *iii*) biomass composition of *D. communis* could be affected by the different HRTs decreasing the N content as the HRT increases, obtaining a culture with N content of 5 wt% at 5-day HRT. The possibility to reduce the N content which may lead to the release of toxic, free ammonia during biogas producing process, make the algal biomass attractive as substrate in the anaerobic digestion process for energy recovery. We conclude that the newly isolated algae *D. communis* can be a good candidate for wastewater treatment in open pond systems producing a biomass with a composition which showed to be flexible under certain conditions and adjustable for its application in energetic recovery processes.

Fattori che regolano il ciclo vitale della diatomea *Pseudo-nitzschia multistriata*

Scalco E., Montresor M.

Laboratorio di Ecologia ed Evoluzione del Plancton, Stazione Zoologica Anton Dohrn, Villa Comunale, 80121 Napoli, Italia (eleonora.scalco@szn.it)

Molte microalghe unicellulari hanno cicli vitali complessi che includono stadi con diversa funzione e morfologia. Conoscere le varie fasi che compongono il ciclo vitale ed i fattori che regolano la transizione fra fasi diverse è estremamente rilevante sia per la comprensione della dinamica di popolazione delle varie specie, sia per ottimizzare i sistemi di coltivazione. *Pseudo-nitzschia multistriata* è una diatomea pennata planctonica, produttrice della neurotossina acido domoico, e presente nel Golfo di Napoli nei mesi estivo-autunnali. Il ciclo vitale di questa diatomea include una fase di crescita vegetativa, in cui le cellule si dividono per scissione binaria, ed una fase sessuata, nell'ambito della quale avviene ricombinazione genetica e vengono prodotte cellule di taglia massima. *P. multistriata* ha un ciclo vitale eterotallico in cui due tipi riproduttivi ('+' e '-') devono entrare in contatto affinché possa avvenire la riproduzione sessuata.

Sono stati condotti diversi esperimenti allo scopo di identificare i fattori esogeni ed endogeni che inducono la riproduzione sessuata in questa specie. Si è osservato che i due tipi riproduttivi devono raggiungere una concentrazione soglia prima che possa iniziare il differenziamento dei gameti; questo è stato confermato anche dalla correlazione inversa fra la densità dell'inoculo delle due colture parentali e il tempo necessario per la comparsa dei gameti. E' stata anche osservata una riduzione della percentuale di stadi sessuati in colture incubate in condizioni di rimescolamento idrodinamico rispetto a quelle incubate in condizioni statiche; in quest'ultima condizione sperimentale le cellule potevano infatti sedimentare sul fondo delle bottiglie aumentando la densità cellulare e favorendo così il successo della riproduzione sessuata. Questi risultati dimostrano che la riproduzione sessuata in *P. multistriata* è un evento dipendente dalla densità delle cellule dei due tipi riproduttivi. I processi biologici densità-dipendenti prevedono in genere la presenza di mediatori chimici. Nel caso della diatomea oggetto di questo studio, è stato possibile indurre la formazione di gameti in colture monoclonali esposte al terreno condizionato dalla crescita di una coltura di tipo riproduttivo opposto. Questo suggerisce l'esistenza di un mediatore chimico in grado di indurre la meiosi in una frazione della popolazione. Si inoltre osservata una riduzione della crescita delle cellule vegetative in concomitanza con l'inizio della fase sessuata; resta da capire se questo sia un effetto della stessa sostanza che induce la formazione di gameti.

I risultati ottenuti ampliano le conoscenze sui meccanismi che regolano il ciclo di vita di questa diatomea planctonica, dimostrando che la transizione dalla fase vegetativa alla fase sessuata è regolata da mediatori chimici. Queste informazioni rappresentano una base sperimentale che permetterà studi futuri volti alla caratterizzazione delle molecole chimiche coinvolte nel processo e/o a studi molecolari finalizzati alla caratterizzazione dei geni coinvolti nelle diverse fasi del ciclo vitale.

Polyphasic comparison of two cyanobacterial strains from different Italian thermal districts

Sciuto K., Rascio N., Andreoli C., La Rocca N., Moro I.

Department of Biology, University of Padova, Via U. Bassi, 58/B, 35131 Padova, Italy
(katia.sciuto@unipd.it)

Cyanobacteria are a group of prokaryotic microorganisms including both coccoid and filamentous forms. Their prokaryotic nature, the presence of many cryptic species and the coexistence of different classification systems make particularly difficult the taxonomic identification of these organisms. Currently, more and more authors agree that a polyphasic approach is necessary to correctly identify cyanobacterial strains (Komárek 2010, Moro et al. 2010, Sciuto et al. 2011). In the light of their capability to produce bioactive compounds and since some studies suggest that the production of metabolites by cyanobacteria is species-specific or even strain-specific (Biondi et al. 2008, Sharp et al. 2009), it is important to know the cyanobacterial composition of certain environments, such as thermal springs exploited for therapeutic purposes. For several years our laboratory has been involved in the characterization of cyanobacteria colonizing the Euganean thermal District (Padova, Italy) (Ceschi-Berrini et al. 2004, Moro et al. 2007a, 2007b, 2010), highlighting how these organisms are responsible for most of the mud therapeutic properties. Particularly, a filamentous strain, isolated from this environment and characterized as *Phormidium* sp. ETS-05 (where the acronym 'ETS' stands for 'Euganean Thermal Springs'), showed high contents of polyunsaturated fatty acids with anti-inflammatory properties higher than those of other commonly used pharmaceuticals (Lalli et al. 2004). Ischia thermal District (Naples, Italy), another Italian thermal environment, is known since ancient time and it is visited by thousands of people for therapeutic purposes every year. However, scarce information is available on the biogeochemistry growing in this environment and on its therapeutic potential. For these reasons, and in order to draw a parallel to the Euganean thermal District, recently we have started a study on the biodiversity of Ischia thermal springs. This survey has led to a first publication on a filamentous cyanobacterium, named *Protolyngbya* sp. strain ITD-01 (where the acronym 'ITD' indicates 'Ischia Thermal District') (Sciuto et al. 2011). Here we present results about another cyanobacterium isolated from Ischia District, the coccoid strain ITD-02. The performed molecular and phylogenetic analyses underlined how this organism is strictly related to another coccoid cyanobacterium, isolated from the Euganean thermal District and previously characterized as *Cyanobacterium aponinum* PCC 10605 (Moro et al. 2007b). From this starting point, we have carried out a polyphasic approach to compare the two organisms, including morphological, ultrastructural, biochemical, and physiological analyses. The obtained data allow us to ascribe strain ITD-02 to the genus *Cyanobacterium*, but the question regarding its belonging to the species *C. aponinum* or to a different species is still open.

- | | |
|-----------------------------|--|
| Biondi et al. 2008. | J. Appl. Microbiol. 105, 105-115. |
| Ceschi-Berrini et al. 2004. | Arch. Hydrobiol. Suppl. Algal. Stud. 113, 73-85. |
| Komárek 2010. | Hydrobiologia 639, 245-259. |
| Lalli et al. 2004. | European patent 05100038.8. |
| Moro et al. 2007a. | Caryologia 60, 133-136. |
| Moro et al. 2007b. | Algal. Stud. 123, 1-15. |
| Moro et al. 2010. | Eur. J. Phycol. 45, 143-154. |
| Sciuto et al. 2011. | Fottea 11, 31-39. |
| Sharp et al. 2009. | Appl. Environ. Microbiol. 75, 2879-2888. |

Atlante fotografico e chiavi tassonomiche delle Ochrophyta (Phaeophyceae e Xanthophyceae)

Ambienti di transizione italiani e litorali adiacenti

Sfriso A.¹, Ferrari C.², Rinaldi A.²

¹ Dipartimento di Scienze Ambientali, Informatica e Statistica, Università Ca Foscari Venezia,
Calle Larga, S. Marta 2137, 30123 Venezia (sfrisoa@unive.it)

² ARPA - Sede Struttura Oceanografica Daphne (c/o C.R. Marine) Viale Vespucci 2, 47042
Cesenatico (Forli-Cesena)

Con l'uscita di questo secondo Atlante si prosegue l'interessante esperienza di pubblicare un manuale-Atlante tecnico-specialistico propedeutico alla definizione sistematica delle specie vegetali più comuni presenti negli ambienti di transizione italiani e dei litorali adiacenti. Il volume va ad integrare le conoscenze contenute nel precedente Atlante Quaderno Arpa "Chlorophyta multicellulari e fanerogame acquatiche", pubblicato nel 2010.

Questo Atlante contiene 51 tavole fotografiche, appartenenti al gruppo tassonomico delle Ochrophyta, corredate da 855 foto. Di queste, 46 tavole riguardano le macroalghe multicellulari appartenenti alle Phaeophyceae, 1 tratta la Xanthophyceae *Vaucheria submarina* (Lyngbye) Berkeley mentre le altre 4 presentano una descrizione fotografica dei cicli riproduttivi di alcuni generi di maggior rilevanza: *Ectocarpus*, *Dictyota*, *Fucus* e *Vaucheria*.

L'Atlante dà un contributo al riconoscimento della nostra flora sia mediante tavole fotografiche, sia mediante chiavi di determinazione tassonomica con classificazioni scalari partendo dal phylum, attraverso classi, ordini, famiglie, generi e da ultimo specie e taxa intraspecifici. Le varie macrofite vengono rappresentate come appaiono nel loro ambiente, sono inoltre descritti dettagli morfologici derivati da fotografie fatte al microscopio. Viene delineata la loro morfologia, si riportano informazioni sugli habitat abitualmente occupati e sulla loro distribuzione nelle lagune e nei mari italiani.

E' uno strumento di immediata e diretta utilizzabilità da parte di tutti coloro, appartenenti sia alle Agenzie Ambientali che agli Istituti Scientifici, che operano nello studio e nel monitoraggio degli ambienti marino costieri e di transizione.

Il valore delle macrofite algali in termini di indicatori dello stato di qualità di questo o quell'ambiente è conosciuto, le stesse disposizioni legislative, sia comunitarie che nazionali, si sono ben orientate su tale linea sottolineando con forza la necessità di considerare questa matrice biologica un importante indicatore di qualità ambientale e quindi una matrice da monitorare nel tempo. Le macrofite sono, infatti, uno dei 4 elementi biologici richiesti dalla WFD (2000/60/2000) per il monitoraggio dello stato ecologico degli ambienti di transizione e marino-costieri e l'applicazione del MaQI (Macrophyte Quality Index) è obbligatoria dal 2010 da quando l'indice è stato accettato ed adottato ufficialmente dal MiATTM per gli ambienti di transizione italiani (Sfriso 2010, http://www.apat.gov.it/site/IT/APAT/Pubblicazioni/Documentazione_tecnica.html).

Sfriso, A. (2010). Macrophyte Quality Index (MaQI) per la valutazione dello stato ecologico dei sistemi di transizione dell'ecoregione-Mediterranea. In: Bonometto, A., Gennaro, P., Boscolo Brusà, R. (Eds.). Linee Guida per l'applicazione del Macrophyte Quality Index (MaQI). Implementazione della Direttiva (2000/60/CE). ISPRA, pp. 34.

Biodiesel from microalgae The link between photosynthesis and productivity in *Nannochloropsis gaditana*

Simionato D.¹, Block M.^{2,3,4,5}, La Rocca N.¹, Jouhet J.^{2,3,4,5}, Maréchal E.^{2,3,4,5},
Finazzi G.^{2,3,4,5*}, Morosinotto T.^{1,*}

¹Dipartimento di Biologia Università di Padova; ²Laboratoire de Physiologie Cellulaire et Végétale, Unité Mixte Recherche 5168, Centre National Recherche Scientifique; ³Université Grenoble 1 ;
⁴Institut National Recherche Agronomique ; ⁵Commissariat à l'Energie Atomique et Energies Alternatives, Institut de Recherches en Technologies et Sciences pour le Vivant, F-38054 Grenoble, France.

(diana.simionato@unipd.it)

Microalgae of the genus *Nannochloropsis* are capable of accumulating large amounts of triacylglycerols when exposed to nutrient limitation (in particular nitrogen, N), opening the possibility of a biotechnological exploitation for biodiesel production. Whereas most microalgae stop growing upon N starvation, *Nannochloropsis gaditana* has the remarkable property of maintaining its growth rate at least during 5 days after removal of nitrogen from the medium. During this period, extensive triacylglycerol accumulation occurs in parallel to biomass accumulation. Fatty acid molecular species found in triacylglycerols accumulated during N deprivation harbor signatures suggesting that they mainly stem from freshly synthesized fatty acids, only a small proportion of fatty acids being originated from a recycling of membrane glycerolipids. Chloroplast galactoglycerolipids, which are essential for the integrity of thylakoids, appear unaltered in their fatty acid composition but their relative amount decreased. Nevertheless, a basal level of galactolipids is kept sufficient in starved cells, suggesting that the chloroplast integrity is partially impaired but not abolished. Consistent with this, N starved *Nannochloropsis* cells contain less photosynthetic membranes but are still able to perform photosynthesis. A spectroscopic and biochemical characterization of the photosynthetic apparatus shows however that N starvation modifies the photosynthetic apparatus, leading to a change in pigment composition and a decrease in the content of all the major electron flow complexes, including Photosystem II, Photosystem I and the cytochrome *b₆f* complex. The Photosystem II content is particularly diminished in N starvation, leading to the partial inhibition of linear electron flow from water to CO₂. The latter is partially compensated for by activation of alternative electron pathways such as cyclic electron transport. Overall, these changes allow cells to modify their energetic metabolism in order to maintain photosynthetic efficiency for growth and fatty acid synthesis.

Cyanobacterial blooms and toxins in Italian water resources: state of the knowledge and guidelines for risk management

Viaggiu E.¹, Lucentini L.², Congestri R.¹

¹ Department of Biology, Laboratory of Biology of Algae, University of Rome 'Tor Vergata', Via della Ricerca Scientifica snc, 00133 Rome, Italy (emanuela.viaggiu@uniroma2.it)

² Department of Environment and Primary Prevention, Section of Inland Water Hygiene, Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Rome, Italy

The incidence of toxic cyanobacterial blooms is increasing in Italy and worldwide. The potent, hepatotoxic peptide toxins (microcystins) occur annually in most countries and this cyanotoxin family is considered a major concern in the European context. Microcystins have been identified as undisputed health hazards. Emerging cyanotoxins are also of concern in Europe; e.g. cylindrospermopsin, which was viewed as limited to subtropical waters but has been recently found in several European countries. The management of cyanobacteria and cyanotoxins in source and by treatment water is one of the priority issues in the research activity of many countries.

European research in the field has generated significant risk management capability, although this is still regionally unbalanced. In April 2012, a COST (European Cooperation in Science and Technology) ESSEM (Earth System Science and Environmental Management) Action ES 1105 "Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management" has started to coordinate the actions in the European country. The network aims to transfer knowledge and know-how to all European regions: widening awareness, spreading relevant technical competence, and sharing risk management expertise. This will provide tools to end-users by pooling and coordinating expertise and to harmonize methods and practices across Europe, thereby protecting public health, enterprises and investments.

Past Italian initiatives in the field involved the constitution of a research group (National group for cyanobacteria risk management in water for human consumption) aimed to develop safety plans and alert levels framework for the control of drinking water in Italy. Consistently with WHO strategies and based on existing knowledge on toxic cyanobacteria in our country, the Italian guidelines (Rapporti ISTISAN 2011) were developed to provide updated information on monitoring methodologies, early warning and risk management of cyanotoxins in water for human consumption. This also included sampling requirements, recommended actions in response to threshold breaches and treatment options to provide a graduated response to the onset and progress of a cyanobacterial bloom in source water. Particular attention was paid to data on the spreading of *Planktothrix rubescens* in 36 Italian lakes and reservoirs, which winter bloom values in some cases exceeded 50×10^9 cell L⁻¹ with an associated microcystin-LR (MC-LR) equivalent concentration higher than 34×10^3 µg L⁻¹.

This work is dedicated to Patrizia Albertano who introduced us to the taxonomy and ecophysiology of toxigenic cyanobacteria.

Barcoding P.A.T.H.S.: a new database for Plant and Algal Type and Historical Specimens

Wolf M.A.¹, Sciuto K.¹, Schiavon M., Moro I.¹

¹*Department of Biology, University of Padova, Via U. Bassi, 58/B, Padova, Italy
(marionadelheid.wolf@unipd.it; katia.sciuto@unipd.it)*

In the last years molecular techniques have become integral part of systematic studies. In particular, DNA barcoding is spreading as a good method to correctly identify taxa in a rapid, repeatable, and reliable manner. A DNA barcode consists of a standard, short, genomic region that is universally present in target lineages and has sufficient sequence variation to discriminate among species.

For years our research group has been involved in several projects regarding the identification of plant organisms, using the DNA barcoding. The necessity of these studies arose both from purely systematic questions and on behalf of privates or public institutions. The organisms considered in our researches range from cyanobacteria and microalgae to seaweeds and, only recently, plants.

One of the major problems in our studies was the availability of molecular data from type and historical specimens. In fact, type specimens are fundamental for comparison in systematics and nomenclature studies, as stated by the International Code of Botanical Nomenclature, and, more in general, specimens from historical collections are useful to know the distribution of taxa in space and time. DNA barcoding technique has allowed us to study historical specimens of great scientific value, because only small amount of starting material is required, thus preserving these irreplaceable sources of information.

We have decided to make available to everyone the sequences of type and historical material produced during our researches in a public database, called Barcoding PATHS (Plant and Algal Type and Historical Specimens).

This database will represent a library of reference sequences, easily to update and against which putative new species or other plant material can be compared. A match of a sequence from an unknown organism to one of the reference sequences can provide a rapid and reproducible identification. This will greatly increase the speed at which routine identification can be carried out and will be a good tool to solve taxonomic questions, inferring evolutionary history and determining chronological distributions of populations.

We hope that our initiative can help also to solve the problem of misidentification of specimens. This is connected, for example, with a number of superfluous and synonymised species recorded for some taxa and with the presence of sequences attributed to incorrect species in public databases.

We have just begun some 'PATHS' of this project and we open up the possibility of collaborations with other research groups, museums, and historical gardens involved in similar DNA barcoding studies, in order to increase the molecular data regarding type and historical specimens and make them accessible to everyone.

***Caulerpa taxifolia* (Vahl) C. Agardh in the South-Italian coasts: secondary introduction from Australian natural populations**

Wolf M.A.¹, Alongi G.², Catra M.², Siracusa P.¹, Moro I.¹

¹Department of Biology, University of Padova, via U. Bassi, 58/B, Padova

²Department of Biological, Geological and Environmental Science, University of Catania, Via A. Longo 19, Catania (marionadelheid.wolf@unipd.it)

The genus *Caulerpa* (Caulerpales, Chlorophyta) comprises about 75 species of siphonous algae native from tropical and subtropical marine environments and recently spreading into more temperate habitats (Dalton 2000). Many taxa form discrete well-delimited units with relatively little morphological variability. However some *Caulerpa* species exhibit plasticity in growth forms that seem to be related to substrate, light intensity, and water motion.

This is the case of a species sampled along the southern west coasts of Sicily (Marina di Modica, Italy) and preliminarily identified by molecular analyses, using the plastid gene *TufA* (encoding for the elongation factor TU) as *C. distichophylla* Sonder (100% nucleotide identity). This species, never recorded for the Mediterranean Sea, exhibits a delicate thallus with narrow stolons, fronds, and pinnules. This morphology is in strong contrast with the robust and quite large habitus of the invasive, cold-tolerant strain of *C. taxifolia* (Vahl) C. Agardh. Despite this, in the phylogenetic reconstruction *C. distichophylla* results sister taxon to *C. taxifolia*. Between these two different taxa the sequence divergence (0.29% on 691 bp) is only slightly greater than the intra-specific genetic divergence found within *C. taxifolia* (0.2% on 820 bp), suggesting that they may represent morphotypes of a single species, as reported by previous studies (Famà et al., 2002). Moreover molecular analyses of a more variable genetic region, the internal transcribed spacer ITS region of the ribosomal DNA, support this conspecific identification. In fact, the nucleotide divergences found between these entities fall into the intra-specific divergence range reported for the ITS marker (0- 3.6%) (Jousson et al., 2000). *C. taxifolia* was introduced in the Mediterranean for the first time in 1984 from a public aquarium and has covered more than 131 km² of near-shore waters (Meinesz et al., 2001), outcompeting native species and seriously reducing biodiversity. The invasive strain, now known as the “invasive aquarium strain”, mainly differs from native tropical populations for its larger size, vigorous growth and tolerance to cold water. Molecular studies have revealed that the Mediterranean and Californian populations are of Australian origin (Queensland) and in particular of Moreton Bay, a colder and eutrophic region, similar to the niche that the invasive alga now occupies in the Mediterranean (Phillips and Price, 2002). Despite this, the phylogenetic reconstruction of *C. taxifolia* populations, based on ITS sequences, shows that the Marina di Modica entity does not cluster together with the invasive “aquarium-Mediterranean strain” nor with the Moreton Bay strain. The Italian samples form, instead, a well-supported, separate clade with entities of *C. taxifolia* of other Australian natural populations. As reported in another study about *C. taxifolia* from Turkey (Eastern Mediterranean) (Cevik et al., 2007), our genetic and morphological data suggest that a new primary introduction from these tropical areas of Australia is possible.

Cevik et al., 2007. *Estuarine, Coastal and Shelf Science*, 74: 549-556.

Dalton, 2000. *Nature*, 406: 447.

Famà et al., 2002. *J. Phycol.*, 38: 1040-1050

Jousson et al., 2000. *Nature*, 408: 157

Meinesz et al., 2001. *Biol. Invas.*, 3:201-10

Phillips and Price, 2002. *Mar Ecol Prog Ser*, 238: 61-71