A Proposal for Forming a SCOR WG:
Global Patterns of Phytoplankton Dynamics in Coastal Ecosystems:
Comparative Analysis of Time Series Observations

1. Introduction

Background & Rationale

Marine ecosystems are changing rapidly in response to natural processes, human activities, and climate change. These drivers of change have become the subject of an increasingly intense focus from both research and management perspectives. There are important scientific questions that need to be addressed with regard to natural vs human-induced changes including: 1) the qualitative characters of the ecosystem responses ("what changes?"), 2) their amplitudes ("by how much?"), and 3) their timing and spatial and temporal scales ("when and where are rates of change most profound?"). Phytoplankton are excellent indicators of marine ecosystem change. They are ecologically and biogeochemically important and relevant indicators, since they conduct a large share of system-scale primary production and hence C cycling and they are highly sensitive to a suite of environmental stressors. There is much accumulated evidence that diverse ocean regions undergo strong and sometimes abrupt changes in phytoplankton composition, and productivity at roughly decadal intervals (i.e. regime shifts). This variability is associated with corresponding changes in atmospheric, hydrologic, chemical, and higher trophic-level biological processes and state variables. However, our understanding of global change is incomplete because we have not adequately explored, inventoried, nor compared available observational data. Nor do we know how to anticipate the timing and direction of the next major shifts.

The understanding of climate change vs anthropogenic influence in coastal ecosystems is important in sustainable management of coasts. A recent example of a climate change-induced shift in biological communities was reported by Cloern et al. (2007) for San Francisco Bay. The abrupt change in the biological communities was first detected as increasing phytoplankton biomass and the occurrences of new seasonal blooms that began in 1999, overriding the influence of changes in the input of nutrients. There were coincidental higher level biotic changes, including sharp declines in the abundance of bivalve molluscs, the key phytoplankton consumers in this estuary, and record high abundances of several bivalve predators: Bay shrimp, English sole, and Dungeness crab. The phytoplankton increase is consistent with a trophic cascade resulting from heightened predation on bivalves and suppression of their filtration control on phytoplankton growth. These community changes in San Francisco Bay across three trophic levels followed a state change in the California Current System in the form of sudden increased upwelling intensity, amplified primary production, and strengthened southerly water flows. These diagnostic features of the East Pacific ''cold phase'' led to strong recruitment and immigration of juvenile flatfish and crustaceans into estuaries where they feed and develop. This study utilized three decades of observations to reveal a previously unrecognized mechanism of ocean–estuary connectivity. This shows that interdecadal oceanic regime shifts can propagate into estuaries and coastal waters, altering their community structure and efficiency of transforming land-derived nutrients into algal biomass.

In October 2007, nearly 100 phytoplankton ecologists gathered in Rovinj, Croatia and attended the AGU Chapman Conference: "Long Time-Series Observations in Coastal

Ecosystems: Comparative Analyses of Phytoplankton Dynamics on Regional to Global Scales" (http://www.agu.org/meetings/chapman). They initiated an analysis of phytoplankton changes in many different coastal marine ecosystems around the world, but the comparison and synthesis of the differences between those ecosystems are a huge task, it could not be completed during the 5 day conference and therefore a smaller working group that works over a longer period, is needed to continue the analysis of these valuable data sets not only in science, but also for management needs.

Proposed SCOR Working Group

We are proposing to form a SCOR Working Group to focus on coastal ecosystems (estuaries, fjords, bays, sounds, open waters of the continental shelf, etc.) where perturbations from terrestrial, atmospheric, oceanic sources and human activities converge to cause changes that ramify across local and global scales. Human pressure on coastal regions and continental margins is increasing with expanding urbanization and the conflicting demands of tourism, agriculture and aquaculture, water diversions, wind parks and other developments. Our proposal to develop a SCOR Working Group grew out of the recent AGU Chapman Conference: "Long Time-Series Observations in Coastal Ecosystems: Comparative Analyses of Phytoplankton Dynamics on Regional to Global Scales" (convened by James Cloern and Nenad Smodlaka, October 8-12, 2008, Rovinj, Croatia). This conference convened over 150 researchers, managers and agency representatives from many countries and provided an excellent opportunity to identify and compare long-term coastal phytoplankton data sets broadly distributed throughout the northern and southern hemispheres.

There was a strong consensus at this conference that a more detailed, global comparison of phytoplankton time series would be timely, technically feasible, and an extremely valuable next step to more fully understand commonalities and contrasts with regard to ecological responses to natural and man-made changes captured by our global network of coastal phytoplankton time series.

Such an analysis must be an international cooperative effort. The relevant data sets are in many places and have been collected by many independent researchers, agencies and nations. Many of the necessary data are available now, and the Working Group can begin immediately. Endorsement and sponsorship by SCOR will help us attract and retain approvals and financial support from national agencies.

The Chapman Conference was a meeting organized by individual scientists and managers; not by an organization. The WG formation would carry forward the momentum by helping set up the platform to work with scientists in various regions on a continuing basis for several years and also possibly to take a lead in promoting a second Chapman conference in the near future (as yet, there is no actual activity for organizing the second Chapman conference). Without an organizational approach in the form of a SCOR WG, there will be no platform to gather scientists to more fully analyze and synthesize these valuable data sets.

2. The Nature of the Scientific Opportunity and Management Needs

Phytoplankton

Phytoplankton are dominant marine primary producers; they mediate nutrient flux and cycling as well as transfer of organic matter to higher trophic levels, including invertebrate grazers, planktivorous fish, and carnivores. Hence, they are a key link between nutrients and secondary production. As key primary producers, phytoplankton reflect immediate effects of changes in the input of nutrients in coastal ecosystems. Because different phytoplankton groups require different nutrient ratios, their composition responds to changes in the ratios of ambient nutrients. For example, diatoms require silicate and their relative abundance may be regulated by Si concentrations relative to other nutrients. Phytoplankton productivity and floristic composition are subject to physical forcings such as horizontal exchange between estuaries and the open sea (Cloern et al. 2007) and vertical mixing regimes, and they are also regulated by light fluctuations, and temperature. Changes in phytoplankton productivity and composition can be driven by climatic forcing and variability such as monsoons (Yin 2002), typhoons or hurricanes (Paerl et al. 2001, 2006) and rainfall (Paerl 1995; Adolf et al. 2006). In addition, phytoplankton are broadly distributed and abundant, and can be quantified by relatively simple and intercomparable sampling methods. Finally, demographic traits of phytoplankton make them particularly suitable for comparative analysis of ecosystem changes across regional to global scales.

Regional and Global Comparisons

We believe that large-scale (between-region and between-ocean) comparisons of phytoplankton time series are the essential next step. Local- and regional-scale observational programs are maintained in coastal marine waters of all continents, but their data remain largely isolated. Our goal is to locate, assemble, and synthesize multi-decadal observations to obtain quantitative and descriptive depictions of phytoplankton variability as an indicator of environmental change. We envision a global phenology of phytoplankton at the land-sea margin and a conceptual model from which coastal ocean observing systems can be built. As a logical outgrowth of (and next step following) the Chapman Conference, the working group will focus on a comparative analysis of ecosystems to address three guiding questions:

1. *What are the dominant scales of variability in phytoplankton biomass, abundance, floristic composition, species composition, and/or species diversity? Is there evidence for secular trends or regime shifts? With which criteria can we best differentiate long-term from episodic, seasonal and interannual signals?*

2. *Is there evidence for external forcings of variability and change (e.g., effects of climate change, basin scale oscillations, land-based inputs, atmospheric deposition, alien species)? Are changes coherent in space and/or time?*

3. *Are there consistent patterns among ecosystems in terms of relationships between environmental drivers, responses in phytoplankton biomass and changes in species/floristic composition?*

To date, relatively few between-region comparisons of phytoplankton time series have been completed. All previous comparisons have been at smaller scales (within an individual current system, or at one ocean basin), compared to the global scale that include inter-regional comparisons that we are proposing.

The Chapman Conference was focused on the land-sea interface where changes are driven by complex interactions between human disturbance and climate variability. This proposed

working group will continue to focus on coastal ecosystems influenced by connectivity to land: estuaries, river plumes, mangroves, bays, lagoons, inland seas.

Existing time series data of phytoplankton

Many researchers and governmental agencies around the world have relied on phytoplankton as a key indicator of water quality monitoring programs and many data sets have been presented in the Croatia AGU Chapman conference. Those data sets are included in Table 1 (attached at the end of this document).

Data availability for the proposed WG

We already have a number of data sets with excellent global representation of coastal systems that are available for the WG. They will be contributed by the members and associate members, as shown in Table 2.

Table 2. Data available from participants of the proposed WG members and associate members.

Name	Country	Ecosystem	Series
Susan Blackburn	Australia	South Pacific Ocean	1993-2007
Robert Le Borgne	New Caledonia, France	West Coast of South Africa SW Pacific	1993-2007
Jacob Carstensen	Denmark	Kattegat, Atlantic	1993-2007
James E. Cloern	U.S.	North & South San Francisco Bay, Western Paficic	1969-2007
Lawrence W. Harding, Jr.	U.S.	Chesapeake Bay, North Atlantic	1989-2007
Snejana P. Moncheva	Bulgaria	Black Sea	1954-2003
McQuatters-Gollop, Abigail	UK	CPR (North-East Atlantic including European shelf; North Sea, Irish Sea, English Channel, North-West Atlantic including Scotian Shelf, Grand Banks; North Pacific)	1948-2007
N. Ramaiah	India	Bay of Bengal, Indian Ocean	1962-1965, 2001-2006
Clarisse Odebrecht	Brazil	Patos Lagoon estuary and Cassino Beach surf-zone, South America (32º S)	1986, 1988-1990, 1992-2009
Hans W. Paerl	U.S.	Neuse River-Pamlico Sound, Atlantic	1993-2006
Elgin S. Perry	U.S	Chesapeake Bay, Atlantic	1985-2004
C J M Philippart	The Netherlands	Wadden Sea, North Sea	1995-2004

Ted Smayda	U.S.	Narragansett Bay, Atlantic	1974-2007
Kedong YIN, Paul J. Harrison	China (Hong Kong)	Subtropical South China Sea	1991-2004
A. Zingone	Italy	Gulf of Naples, Mediterrenean Sea	1984-1991, 1995-2009

We will consult with other individuals (in Table 1) about their willingness to participate in our WG analysis and synthesis. Scientists and managers are willing to contribute their data sets for specific purposes such as synthesis, correlations, and comparisons in general, which has been demonstrated in Cloern and Jassby (2008) who received over 100 data sets (the condition was that the data would only be used for this specific purpose). In addition, we hope to have a second Chapman conference in the near future under the SCOR WG leadership, which would provide the opportunity for identification of more data sets and to conduct a more thorough regional and global time series synthesis.

The analysis and synthesis of many datasets are crucial to achieve the WG objectives. The WG members and associate members have the necessary skills to complete the tasks proposed in this WG since they have all conducted analysis and synthesis of their data for regional ecosystems. For example, Cloern and Jassby (2008) have synthesized many data sets in the paper "Complex seasonal patterns of primary producers at the land-sea interface". The WG participants have two statisticians, Carstensen and Perry. The WG participants not only have skills in manipulation of large databases, but also have comprehensive knowledge of phytoplankton ecology in the context of environmental change, anthropogenic influence and climate change. Lastly, they have contributed numerous publications emphasizing the importance of synthesizing human and climatic drivers of phytoplankton community structure and function.

The data sets listed above are by no means complete (they were from the Chapman Conference only). The CPR dataset, although not included in the original proposal, is included here as the CPR has comprehensively sampled phytoplankton biomass as well as the abundance of nearly 200 phytoplankton taxa in coastal ecosystems including the North Sea, Irish Sea, English Channel, European Shelf, North Pacific, Grand Banks, and Scotian Shelf as well as the open ocean since 1948. No other ecological datasets have sampled marine and coastal plankton at this comprehensive spatial and temporal scale.

Data Archiving and Database Centre

There is certainly a need for compiling and archiving those data sets into a mega database. We will facilitate migration of individual datasets to a permanent and secure electronic archive based on the scientist's willingness of participation and data accessibility. Requirements for development of a fully-stocked phytoplankton data-base greatly exceed the resources of this WG. However, we expect to produce a small working proto-type, based on some existing archive (to be identified) to demonstrate the value of sharing data through an international databse, as demonstrated by SCOR WG125: Global Comparisons of Zooplankton Time Series.

Methodological opportunities and issues

Several methodological issues affect the analysis of phytoplankton time series and only a brief summary is given here. However, even though these issues will complicate our work, we can still obtain a meaningful global comparison.

The first issue is diversity of the sampling methodology. No phytoplankton sampling method is perfect, and there have been differences in sampling methodology both within and between data sets, particularly for earlier data. However, we do not expect these differences to be a serious technical barrier to between-region comparisons. A key reason for this is that our analysis focuses on comparisons of anomaly time series rather than of regional climatology. Hence, we are primarily interested in the temporal variability of relative abundance, not the spatial variability of absolute abundance. Several of the proposed WG members have expertise in evaluating effects of changes in sampling methodology within individual time series.

A second issue is consistency of taxonomic identification within and among data sets. Again, we are primarily comparing anomalies relative to local norms, and looking for when, where, and how long the community changes. We also expect that all or most of our analyses will be weighted on the better-known taxa that dominate the community in each region.

A third issue is the volume, accessibility, and diversity of data. The situation here is much improved over even a few years ago. Good computer tools for dealing with the diverse origin and moderately large data sets are now more available, cheaper, more flexible and user-friendly. We anticipate that this trend will continue. Although data management work will be necessary, we do not expect that electronic assembly and consolidation of the phytoplankton data sets will be a major technical problem. In fact, we have already assembled several key data sets as part of the Chapman Conference.

The final issue is the use of statistical tools. During the Chapman Conference, several statistical experts were invited to help participants to perform statistical analyses on their own data set. They demonstrated how to deal with temporal and spatial autocorrelation, and with data gaps. This knowledge will be utilized by our SCOR WG in the next phase of global time series analysis. Application, evaluation, and bundling of these statistical tools for distribution/publication will be another important WG product.

3. Proposed Terms of Reference

- Identify existing long time series of phytoplankton data in coastal oceans around the world
- Facilitate migration of individual data sets to a permanent and secure electronic archive (Requirements for development of a fully-stocked phytoplankton data-base greatly exceed the resources of this WG. However, we expect to produce a small working proto-type, based on the existing archive (to be identified) to demonstrate the value of sharing data through an international database.)
- Develop the methodology for global comparisons for within-region and within-time-period data summarization (e.g. spatial, seasonal and annual averaging, summation within taxonomic and functional group categories). The goal is to clarify what level of detail provides the optimal tradeoff (i.e. information gain vs. processing effort).
- Based on the above, develop priorities and recommendations for future monitoring efforts and for more detailed re-analysis of existing data sets.

- We will carry out a global comparison of phytoplankton time series using (in parallel) a diverse suite of numerical methods. We will examine:
  - Synchronies in timing of major fluctuations, of whatever form.
  - Correlation structure (scale and spatial pattern) for particular modes of phytoplankton variability (e.g. changes in total biomass, species composition shifts, among different geographic distribution).
  - Amplitude of variability, both for total biomass and for individual dominant species, and a comparison to the amplitude of population fluctuations.
  - Likely causal mechanisms and consequences for the phytoplankton variability, based on spatial and temporal coherence with water quality time series.
- Through comparative analysis, we will address the 3 guiding questions.

4. Time Frame and Expected Products

We will begin work in 2010 and will continue for three years. We will convene annual WG meetings (each about 4-5 days), and a larger open attendance workshop or conference in the final or penultimate year. For each year, expected activities and products include:

Year 1: Summarize and evaluate methods, results, and questions arising from the phytoplankton time series analyses that have been completed to date. For the proposed new comparative analyses, select and prioritize the set of regional time series, and the suite of variables from each time series that will be compared (e.g. total phytoplankton biomass, major groups and/or species-level phytoplankton taxonomic composition, phenology, and physical and biological environmental indices). Identify and address obstacles to pooled analyses (e.g. incomplete processing, differences in formatting, differences in resolution). Develop the "best practice" recommendations for data sampling and analysis methodologies.

Year 2: Begin comparative analyses. Evaluate sensitivity and specificity of data analysis (statistical) tools, and improve their availability and "user-friendliness". Identify time scales and time intervals of particular interest. Post selected tools and data on a web or ftp site (initially closed, and eventually public).

Year 3: Complete comparative analyses of phytoplankton and environmental time series, incorporating any new data that have become available during years 1-3. Identify synchronies (if any) in timing of fluctuations, and quantify correlation time and space scales. Prepare interpretive paper(s) for symposium presentation and publication. Prepare recommendations for "best practice" time series sampling and analysis methodologies.

5. Proposed Working Group membership

Our primary selection will be based on a broad experience with phytoplankton time series, combined with geographic representation and local knowledge of the content for each regional data set. Our suggested list of full members (total 10) includes the following candidates:

Co-Chair, Kedong Yin, Australian Rivers Institute, Griffith University, Brisbane, Queensland, Australia, k.yin@griffith.edu.au

His data set will cover subtropical coastal waters in the South China Sea, which receives the outflow of the 2nd largest river (Pearl River) in China.

Yin's research interests include: coastal dynamics of nutrients; eutrophication processes; ecology and oceanographic processes of harmful algal blooms, in coupling

processes with environmental variability, and climate changes; and a plenary speaker on "the dynamics of phytoplankton species composition in subtropical waters of south China during the last 15 years".

Co-Chair, Hans W. Paerl, Institute of Marine Sciences, University of North Carolina at Chapel Hill, Morehead City, North Carolina, USA, hpaerl@email.unc.edu

His interest is to examine how phytoplankton composition change responds to natural disasters.
Paerl is the Kenan Professor of Marine and Environmental Sciences and his research interests include; microbially-mediated nutrient cycling and primary production dynamics of aquatic ecosystems, environmental controls of harmful algal blooms, and assessing the causes and consequences of man-made and climatic (storms, floods) nutrient enrichment and hydrologic alterations of inland, estuarine and coastal waters. His studies have identified the importance and ecological impacts of atmospheric nitrogen deposition as a new nitrogen source supporting estuarine and coastal eutrophication. In 2003, he was awarded the G. Evelyn Hutchinson Award by the American Society of Limnology and Oceanography for his work in these fields and their application to interdisciplinary research, teaching and management of aquatic ecosystems.

Susan I. Blackburn (female), CSIRO Marine and Atmospheric Research and the Aquafin CRC, Hobart, 7001, Australia; susan.blackburn@csiro.au

Her data represent temperate waters in the south Pacific Ocean.
Dr Susan Blackburn is a Principal Research Scientist with CSIRO Marine and Atmospheric Research and Head of the CSIRO Collection of Living Microalgae. Her research spans phytoplankton environmental issues and bioapplications of microalgae. Working with harmful algal bloom (HAB) species for over 20 years, Dr Blackburn has combined ecophysiological studies in culture with field studies to elucidate regulation of HABs and interrogate life history details, toxin production, molecular characterization and processes, and trophic interactions, particularly of HAB species in south eastern Australian waters. Within CSIRO, nationally and internationally Dr Blackburn research informs system-wide environmental management and prediction of phytoplankton dynamics and algal blooms through biogeochemical modelling.

Jacob Carstensen, National Environmental Research Institute, Denmark, jac@dmu.dk

His data set represents a temperate inland sea (Kattegat) of the Atlantic Ocean.

Carstensen is a statistician working within marine ecology, in particular long-term trends of ecosystem quality indicators in response to anthropogenic pressures. Particular scientific fields of interests are: biogeochemical processes, phytoplankton community structure and bloom mechanisms, hypoxia, and nutrient management for marine ecosystems.

James E. Cloern, U.S. Geological Survey, Menlo Park, California, USA, jecloern@usgs.gov

His data are from San Francisco Bay and represent many phenomena associated with anthropogenic influence vs climate change.
Cloern has strong expertise in phytoplankton ecology, particularly phytoplankton response to eutrophication and climate changes. He is very experienced in the synthesis of long term data set, and wrote "Phytoplankton bloom dynamics in coastal ecosystems:

a review with some general lessons from sustained investigation of San Francisco Bay, California" in 1996. In 2001, he comprehensively reviewed global data in coastal waters and wrote a conceptual review that was published in Mar Ecol Prog Series, "Our evolving conceptual model of the coastal eutrophication problem", which has greatly stimulated coastal eutrophication research. The paper has been cited 373 times.

Paul J. Harrison, Atmospheric, Marine and Coastal Environment Program, Hong Kong University of Science and Technology, Hong Kong SAR, China Harrison@ust.hk

Harrison is a biological oceanographer with expertise in nutrient dynamics and phytoplankton ecology and recent interest in eutrophication, harmful algal blooms and hypoxia. He is a member of SCOR WG 132 "Land-based Nutrient Pollution and the Relationship to Harmful Algal Blooms in Coastal Marine Systems" and will coordinate activities between the two WGs if this WG is funded.

McQuatters-Gollop, Abigail (female), Sir Alister Hardy Foundation for Ocean Science, Citadel Hill, Plymouth, PL1 2PB, United Kingdom, abiqua@sahfos.ac.uk

Working on the CPR data set which includes a measure of phytoplankton biomass as well as the identification and abundance of nearly 200 phytoplankton taxa in the North Sea, Irish Sea, English Channel, European Shelf, North Pacific, Grand Banks, and Scotian Shelf as well as the open ocean since 1948.

Clarisse Odebrecht (female), Institute of Oceanography, Federal University of Rio Grande-FURG, Cx.P. 474, 96201-900 Rio Grande, RS, Brazil, doclar@furg.br

Her data are from South America coastal temperate waters (Patos Lagoon estuary and sandy beach surf-zone).

She is a Professor and leader of the research group: Ecology of Marine Phytoplankton and Microorganisms at the Federal University of Rio Grande-FURG, Brazil. Her main research topics include: taxonomy and ecology of marine phytoplankton, harmful algal blooms, coastal eutrophication and studies on microalgae in marine aquaculture.

N. Ramaiah, National Institute of Oceanography, Dona Paula, Goa 403 004, India; telephone: +91 832 2450515; fax: +91 832 2450602; email: ramaiah@nio.org)

His data represent coastal tropical waters in the India Ocean.

Katja Philippart (female), Royal Netherlands Institute for Sea Research (The Netherlands), Texel, The Netherlands, katja@nioz.nl

Her data are from the Wadden Sea, another example where major engineering works have occurred along the coast.

Philippart is a marine ecologist and her research combines laboratory experiments, field studies, statistical analysis of long-term field observations and modeling techniques to investigate the underlying mechanisms of long-term dynamics within shallow marine coastal communities. Her emphasis is on understanding the role of human influences (eutrophication, fisheries and global warming) within these ecosystems in regulating primary and secondary producers, within the North Sea, Venice Lagoon and the Banc d'Arguin. At present, she coordinates relevant research projects, viz. JetSET (long-term field observations in the western Wadden Sea), and the recently funded national research project (2008-2013) dedicated to monitoring primary production in the western Wadden Sea as a baseline for management of human activities in coastal waters (IN PLACE). She is the Editor-in-Chief of the Journal of Sea Research since 2000, co-

author of Marine Coastal Dimension of Climate Change in Europe (EU-IES, 2006, Ispra), and the leading author of Climate Change Impacts on the European Marine and Coastal Environment (ESF-Marine Board, 2007, Strasbourg).

Adriana Zingone (female), Stazione Zoologica A. Dohrn, Villa Communale, Italy, zingone@szn.it

Her data set are in the Gulf of Naples, Mediterranean Sea

Zingone is an expert in taxonomic and morphological studies on marine microalgae, and spatial distribution of phytoplankton diversity in marine waters. Her research findings based on biological time series data contributed to revising paradigms and myths of phytoplankton ecology. She also reviewed seasonal patterns in plankton communities in a pluri-annual time series at a coastal Mediterranean site (Gulf of Naples): an attempt to discern recurrences and trends.

Potential Candidates for Associate Members include:

Borgne, Robert Le, Centre IRD de Noumea, B.P. A5, 98848 Nouméa Cédex, New Caledonia, leborgne@noumea.ird.nc

His data are from coastal waters off Abidjan, Western Africa and Noumea, SW Pacific in New Caledonia

Elgin, Perry, USA, eperry@chesapeake.net

Perry has worked with Harding on the Chesapeake Bay long time series data set.

Dr. Perry is a statistics consultant providing experimental design and data analysis expertise to researchers involved with environmental research and regulation. Dr. Perry was trained in applied mathematics at the Univ. of Maryland in an interdisciplinary program that included course work and research in mathematical statistics, numerical analysis, and zoology. The majority of Dr. Perry's consulting experience involves collaboration with clients who are conducting research and monitoring of Chesapeake Bay. These clients include: the U.S Geological Survey, USEPA Chesapeake Bay Program, Maryland Sea Grant, Maryland Department of Natural resources, Horn Point Laboratory, Chesapeake Biological Laboratory, Wye Research and Education Center, Virginia Department of Environmental Quality, and U.S. Army Corps of Engineers.

Malone, Thomas C., Ocean US Office for Integrated and Sustained Ocean Observations (US), Washington, DC, **USA**, t.malone@ocean.us

He is working with GOOS and his participation will be helpful for coastal observation systems that plan to incorporate phytoplankton into their monitoring program in the future.

Malone has published over 100 peer-reviewed papers on phytoplankton and coastal ecosystem dynamics, science and policy, and integrated ocean observing systems. Chair, IOC-WMO-UNEP-ICSU Coastal Global Ocean Observing System Panel (1998-2000), and Co-Chair, IOC-WMO-UNEP-ICSU Coastal Ocean Observations Panel (2002-2005)

Moncheva, Snejana P. (female), Institute of Oceanography, BAS, Bulgaria, snejanam@abv.bg

Her data set is an extremely long time series (1954-2003) from the Black Sea.Perry,

Picher, Grant, Marine and Coastal Management, Private Bag X2, Rogge Bay 8012, South Africa gpitcher@sfri2.wacpe.gov.za.

He has access to a 20 yr time series of dinoflagellate abundance from the South African coastal upwelling zone.

Smayda, Theodore J., Graduate School of Oceanography University of Rhode Island Kingston, RI 02881 USA tsmayda@gso.uri.edu

Smayda has a rare long term data set for Narragansett Bay during 1974-2007, another case study for temperate waters.

Smayda is a well known phytoplankton ecologist. His major research themes include seminal works on phytoplankton suspension, species succession in marine environments and population dynamics related to diatom and harmful algal blooms. Armed with the skills of knowing the major marine species, an enviable knowledge of the international literature and a constantly inquisitive mind, Smayda continues to delve into insights related to the dynamics that drive phytoplankton blooms. His recent collaborations with the freshwater phytoplankton ecologist Colin Reynolds in generating his present concepts on species strategies, community assembly and development of blooms offer another cornerstone from which to examine the HAB paradigm. His first comments on the importance of life cycles, nutrients and eutrophication in driving the spreading of the bloom phenomena on a global basis were quickly adopted by others and presented or reiterated in colleague's publications. In this regard, he has been a trend setter of ideas that have stimulated others to explore further. In 2002, he received **XHAB2002/ISSHA Yasumoto Lifetime Achievement Awards.**

Yoo, Sinjae, Korea Ocean Res. & Dev. Inst. Sa-Dong 1270, Ansan, South Korea sjyoo@kordi.re.kr

His data set from satellite images represents temperate coastal waters in Pacific Ocean where anthropogenic influence from land runoff is increasing.

Yoo has been studying interannual variation of chlorophyll *a* in the North Pacific ecosystems using satellite image data. He also has been studying primary productivity of the Yellow Sea and East Sea by using ship-board and satellite observations.

6. Funding

We will contact various organizations such as LOICZ, IMBER, GEOHAB, PICES, IOC, ICES and Census of Marine Life and expect to attract co-sponsorship and additional financial support in the form of travel funding for associate WG members, especially from the developing countries.

Full members from developed countries will be asked to cover part of the cost of their own travel and accommodation from other sources, if SCOR has a budget limitation to fully support our proposed WG.

Our proposal has been strongly supported by PICES and PICES will fully support an associate member, Sinjae Yoo.

7. Interactions with other organizations or programs.

We will maintain our interactions with organizations such as IMBER, LOICZ, GEOHAB, PICES, IOC and CoML during the WG's active period. For example, we will send them our annual meeting notices before meetings and our annual reports for their feedback.

We will try to establish a strong interaction and working relationship with the SCOR WG 125 on zooplankton time series and SCOR WG 132 on HABs. This interaction will be very beneficial as they are dealing with the similar challenge of analyzing global time series data sets.

References

Adolf, JE, CL Yeager, ME Mallonee, WD Miller, and LW Harding. 2006. Environmental forcing of phytoplankton floral composition, biomass, and primary productivity in Chesapeake Bay, USA. Estuarine, Coastal and Shelf Science 67:108-122.

Cloern, JE, AD Jassby, JK Thompson, KA Hieb. 2007. A cold phase of the East Pacific triggers new phytoplankton blooms in San Francisco Bay. PNAS 104: 18561–18565.

Cloern, JE, AD Jassby. 2008. Complex seasonal patterns of primary producers at the land-sea interface. Ecology Letters 11: 1294-1303.

Paerl, HW, and 10 others. 2001. Ecosystem impacts of three sequential hurricanes (Dennis, Floyd, and Irene) on the United States' largest lagoonal estuary, Pamlico Sound, NC. PNAS 98: 5655–5660.

Paerl HW, LM Valdes, JE Adolf, BM Peierls, LW Harding Jr. 2006. Anthropogenic and climatic influences on the eutrophication of large estuarine ecosystems. Limnol. Oceanogr. 51: 448-462.

Paerl HW. 1995. Coastal eutrophication in relation to atmospheric nitrogen deposition: current perspectives. Ophelia 41: 237-259

Yin, K. 2002. Monsoonal Influence on Seasonal Variations in Nutrients and Phytoplankton Biomass in Coastal Waters of Hong Kong in the Vicinity of the Pearl River Estuary. Mar. Ecol. Prog. Ser. 245: 111-122.

Table 1. Data sets presented at the Chapman Conference in 2007, Croatia.

Theme 1: dominant scales of variability in phytoplankton biomass, abundance, floristic composition, species composition, and/or species diversity			
Name	**Country**	**Ecosystem**	**Series**
Paulo C. Abreu	Brazil	Patos Lagoon Estuary	1986-1990, 1993-2007
Susan I. Blackburn	Australia	Huon Estuary, Tasmania	1996-2005
H. O. Briceño	U.S.	Biscayne Bay, Florida Bay, Florida Shelf	1989-2007
Francisco.P. Chavez	U.S.	Monterey Bay	1988-2007
James E. Cloern	U.S.	North & South San Francisco Bay	1969-2007
Valerie David	France	Gironde Estuary	1978-2003
S. Fonda Umani	Italy	Gulf of Trieste	1986-2005
Miles Furnas	Australia	Great Barrier Reef Lagoon	1992-2007
S.A. Gaeta	Brazil	Brazil Coastal Waters	2004-2007
Charles L. Gallegos	U.S.	Rhode River Estuary	1969-2007
Amatzia Genin	Israel	N Gulf of Aqaba	1988-2007
Rita A. Horner	U.S.	Washington Coast	1997-2007
Arantza Iriarte	Spain	Bilbao & Urdaibai . Estuary	1997-2007
Jacco C. Kromkamp	The Netherlands	Oosterschelde/Westerschelde	1987-2006
Robert Le Borgne	France	Ivory Coast, New Caledonia	1969-1979, 1979-1989
WKW Li	Canada	Bedford Basin	1967-2007
Michael W. Lomas	U.S.	Bermuda Atlantic Series	1989-2007
Emma Orive	Spain	Nervion River Estuary	2000-2006
Elgin S. Perry	U.S	Chesapeake Bay	1985-2004
N. Ramaiah	India	Bay of Bengal	1962-1965, 2001-2006
Diana Sarno	Italy	Gulf of Naples	1984-1991, 1995-2008
Dietmar Straile	Germany	Lake Constance	1980-2006
Sanna Suikkanen	Finland	Northern Baltic Sea	1979-2003
Alexander Vershinin	Russia	NE Black Sea	2001-2006
Hidekatsu Yamazaki	Japan	Tokyo Bay	1996-2006
Theme 2: evidence for external forcings of variability and change			
Name	Country	Ecosystem	Series
Ana B. Barbosa	Portugal	Ria Formasa Lagoon	1991-1993

Vanda Brotas	Portugal	Tagus Estuary	1999-2007
Rita B Domingues	Portugal	Guadiana River Estuary	1999-2005
Naomi Greenwood	U.K.	Liverpool Bay	1989-2006
Malcolm S. Robb	Australia	Swan Canning Estuary	
Bradley Eyre	Australia	Moreton Bay & Brunswick Estuary	1984-1991; 1995-2007
David G. Borkman	U.S.	Narragansett Bay	1959-1997; 1999-2006
Jonathan H. Sharp	U.S.	Delaware Bay	1980-2003; 1950s – present
Larry W. Harding, Jr.	U.S.	Chesapeake Bay	1989-2007
Hans W. Paerl	U.S.	Neuse River-Pamlico Sound	1993-2006
Clarisse Odebrecht	Brazil	Patos Lagoon Estuary, Cassino Beach	1987, 1989-1990, 1992-2006
M Ribera d'Alcalà	Italy	Gulf of Naples	1979-2006
Alina Tunin-Ley	France	Ligurian & Tyrrhenian Seas	1908-1914, 1929-1931, 1969-1970, 1984, 1988, 2002-2005
Nenad Smodlaka	Croatia		1987-2007
Jacob Carstensen	Denmark	Kattegat	1993-2007
Daniel Conley	Sweden		
Hans Christian Eilertsen	Norway	Norwegian Coast/Barents Sea	1974-2007
Karen Helen Wiltshire	Germany	North Sea Helogland	10 years
Xavier Desmit	The Netherlands	North Sea	1975-2003 ; 1990-2006 (Phyto)
Martina Loebl	Germany	Belgian, Dutch, German Coastal	1990-2005
C J M Philippart	The Netherlands	Wadden Sea	1995-2004
Jennifer L. Martin	Canada	Bay of Fundy	1980-2007
Michael L. Parsons	US	N Gulf of Mexico	
Trevor Platt	Canada	NW Atlantic, remote sensing	1990-2005

Theme 3: consistent patterns among ecosystems in terms of relationships between environmental parameters, phytoplankton biomass and changes in species/floristic composition			
Name	Country	Ecosystem	Series
Malcolm C. Baptie	U.K.	North Sea, UK NE coast	1969-2007

Mauro Bastianini	U.K.	Gulf of Venice	1986-2007
Suncica Bosak	Croatia	N Adriatic Sea	1998-2006
Eileen Bresnan	Scotland	NE Scotland Coastal	1997-2007
Maria Degerlund	Norway	Norwegian coast/Barents Sea	3 decades
R. H. Freije	Argentina	Bahía Blanca Estuary	1978-2006
Inga Hense	Germany	Baltic Sea	1975-2006
Carlton D. Hunt	U.S.	Boston Harbor, Cape Cod Bay, Massachusetts Bay	1992-2008
Tapan Kumar Jana	India	Sundarban Mangrove Forest	1988-2001
R. Kraus	Croatia	Northern Adriatic	1972-2006
Dongyan Liu	China	Jiaozhou Bay	
A. Lincoln MacKenzie	New Zealand	Marlborough Sound, Tasman & Golden Bays	1993-2007
Ivona Marasović	Croatia	Northern Adriatic	1962-1982
Snejana P. Moncheva	Bulgaria	Black Sea	1954-2003
Patricija Mozetic	Slovenia	Gulf of Trieste	1984-2006
Tatyana Osadchaya	Ukraine	Black Sea	1998
Edward J. Phlips	U.S.	Indian River Lagoon	1997-2007
Igor G Polikarpov	Ukraine	Sevastopol Bay	1937-1938, 1960-1968, 2001-2007
Kevin G. Sellner	U.S.	Chesapeake Bay	1984-2007
Ted Smayda	U.S.	Narragansett Bay	1974-2007
Kuninao Tada	Japan	Seto Inland Sea	1991-2006, 1973-2005
Norbert Wasmund	Germany	Baltic Sea, Mecklenburg Bight	1979-2006
Kedong YIN	Hong Kong	Hong Kong Coastal	1991-2004
A. Zingone	Italy	Gulf of Naples	1984-1991, 1995-2009