nano news

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- NF-POGO Alumni Network for Oceans -

Networking for the future of the oceans

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pogo Partnership for Observation of the Global Oceans

From the Editorial Board

The 4th issue of the NANO News is presented here with a great honor. The editorial board is delighted to denote continuing and rapid development of the NF-POGO Alumni Network for Oceans thanks to active engagement of the alumni and invaluable support of the NANO friends. It's been two and a half years since the Network was 'born' and it can be designated with pride that the major aims of the NANO are being met. In particular, members of the NF-POGO Alumni Network for Oceans share their efforts in ocean observations in attempting to better understand the changing ocean for the brighter future of our Planet.

In this issue we talk about the success and hardship of the NANO Regional Research projects, one of the most significant achievements of the Network in 2012. For these projects NANO alumni from different countries have combined their efforts to make a contribution to the research topics of oceanographic observations in their regions. In addition, highlights from the NANO coordination meeting in Brazil, Blue Planet Symposium and POGO-14 are presented here for your attention. Furthermore, we would like to introduce you to Dr. Gerry Plumley, a great friend of NANO and a former coordinator of the NF-POGO Centre of Excellence in Bermuda. In his article Gerry kindly provides insights of his experience of being a NANO 'friend'. In this issue we also continue to talk about research successes of the NANO alumni. These research communications are a vivid introduction to a life of an alumnus after NF-POGO programs. We believe that sharing research experiences with peers is an essential component of keeping the Network together and we look forward to receiving more updates from our alumni in the future.

NANO News has been a platform for communication of NANO achievements to the scientific society beyond NANO. Release of the current volume wouldn't be possible without the invaluable contribution from our authors. Thank you everyone for investing your time and effort, this is the greatest gratitude an alumnus can give to the Nippon Foundation and POGO. Thank you Dr. Vivian Lutz and Dr. Victoria Cheung for your advice and edits for this issue. And certainly, we are always grateful to NANO patrons, Dr. Trevor Platt, Dr. Shubha Sathyendranath and Dr. Sophie Seeyave for their passion and continuing support to NANO. We are also happy to congratulate Sophie on the arrival of her newborn son!

NANO has been a great journey and many challenges are still ahead us.

With very best wishes

Olga Shatova
Editor-in-chief

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nano news

NF-POGO Alumni E-Newsletter – Volume 04, May 2013

This issue:

Cover: The Polar ship NPo. Almirante Maximiano around Clarence Island, Antartica Peninsula
Photo kindly provided by Camila Signori

Have any nice photos to share? E-mail us your sea-scapes, underwater photos or photos of field work and we'll include them in NANO News!

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A review of NANO's achievements and future perspectives

Victoria Cheung - Scientific Coordinator POGO and NANO

A small meeting of the regional coordinators of NANO projects took place on 21 November 2012 in Ilhabela, Brazil. This was held back-to-back with the "Oceans and Society: Blue Planet" Symposium, which the POGO Secretariat and several NANO Friends, as well as several alumni were attending. The meeting was attended by Lilian Krug, Guillermina Ruiz, Maria Fernanda Coló Giannini, Natália Rudorff Moraes, Vivian Lutz, Milton Kampel (Latin American project), Ousmane Diankha, Olga Shatova (African project), Hoang Cong Tin, Laura David (South-East Asian project), Kanthi Yapa (Indian Sub-Continent project), Alexandra Kraberg (NANO Friend) and Sophie Seeyave (POGO Secretariat).

First, Sophie Seeyave welcomed the participants on behalf of POGO. Presentations were then given by Lilian Krug and Olga Shatova on the progress of NANO to date (website, newsletters, membership), followed by presentations on the regional projects by Hoang Cong Tin (South-East Asia), Kanthi Yapa (Indian Sub-Continent), Guillermina Ruiz (Latin America) and Ousmane Diankha (Africa). These were followed by some group discussion where ideas and advice were shared between the different regions. The meeting allowed an opportunity for the participants from the regional groups to discuss and draft outline proposals for 2013.

In December 2012, a NANO African Regional Research Project Workshop was held in Dakar, Senegal on the topic of "Monitoring Coastal Pollution and Erosion in North and West Africa". The meeting was attended by seven alumni from the following countries: Ghana, Cote d'Ivoire, Nigeria, Senegal, and Tunisia. In addition, three senior scientists from the alumni countries, a former NF-POGO visiting professor and the previous NF-POGO Centre of Excellence Coordinator were in attendance. Lectures and practical sessions were well presented and well received. Working sessions provided opportunities for NANO scholars to collate data and/or implement plans for completion of the 2012 research project; highlights included agreement on uniform practices for trace element/ heavy metal analysis and inter-laboratory AAS instrument calibration. Several short breakout sessions during the week as well as most of the last day(s) of the workshop were devoted to preparing a written draft of the 2013 proposal to continue the NANO Africa Regional Research Project.

The next phase of NANO regional projects are soon to commence and a number of proposals are being considered for NANO activities. One of the major changes recommended during the NANO African Regional Research Project Workshop was to separate the 2012 research project into two projects for 2013, one focused on pollution, the other focused on coastal erosion. For the coastal erosion project a workshop is scheduled to take place in early June in Tunisia. This will involve ten participants who will provide bathymetric, wind and wave time series data in a local coastal area for developing a wave refraction model for simulations during the workshop.

In the Latin American region there will be a continuation in the synergistic activities between NANO and ANTARES networks from the first year. Pigment samples will be collected at each of the participating ANTARES stations, which will then be analysed during a workshop which is scheduled in the second part of the year. This will enable the training of NANO Alumni and young ANTARES participants in a 'hands on' HPLC pigment analysis and well as in routine HPLC equipment maintenance.

In the South-East Asia Region, proposals from the meeting in Ilhabela articulated around two objectives: Continuation of the Harmful Algal Bloom modelling project, with the addition of pigment analyses by HPLC, and the added participation of alumni from other countries (Indonesia and Thailand); and the extension of the project to the study of Sargassum seaweed using remote sensing.

In the Indian sub-continent regional project, proposed work includes a continuation of the monitoring of HAB species in the coastal waters of India and Sri Lanka. This will include analyses of the data collected during the period of 2012-2013 from Indian and Sri Lankan coast; use of multipurpose spectrophotometer and underwater radiometer to study the spectral characteristics of phytoplankton, detritus and CDOM; deployment of SPATT (Solid Phase Adsorption Toxin Tracking) for biotoxin studies; and organising a HAB workshop/ training course for Sri Lankan participants for the establishment of a common research methodology.

In addition to the NANO Regional Projects, a new NF-POGO Centre of Excellence in Oceanography will soon be announced. Following on from the successes of the NF-POGO Centre of Excellence previously hosted at BIOS for four years, the next phase of the Centre will commence this year in a POGO member institute. Training at the Centre will promote excellence in integrated, multidisciplinary oceanography on a global scale and will include practical training courses and hand-on analyses.

Attendees of the 2012 NANO Meeting in Ilhabela. Photo by Vivian Lutz.

14th POGO Annual Meeting in Cape Town, South Africa

Dr. Victoria Cheung – Scientific Coordinator POGO and NANO

The annual POGO Meeting was hosted this year by the Marine Research Institute (Ma-Re) of the University of Cape Town, South Africa, from 22-24 January 2013. The meeting held at the Lagoon Beach Hotel Conference Centre was well attended, with over 60 participants from 16 countries coming together for POGO's 14th Annual meeting. In addition to POGO member institutions, key partner organisations including the Intergovernmental Oceanography Commission (IOC) and its project office for International Oceanographic Data and Information Exchange (IODE), the Global Ocean Observing System (GOOS), the Global Alliance of CPR Surveys (GACS) and Group on Earth Observations (GEO) attended the meeting. Additionally, representatives from the Nippon Foundation attended the annual meeting and presented their vision and philosophy for the development of human resources and network building. The Nippon Foundation is a key partner supporting POGO's capacity building programmes, without which NANO would not exist.

At the start of the meeting a keynote presentation was given by Prof. George Philander, the world renowned expert on ocean-atmosphere interactions who has made significant contributions to the understanding and modeling of large scale climate variability, including the phenomenon of El Niño. He emphasised the need for capacity building in developing countries, and the challenges associated with it. The meeting was then officially opened by South Africa's Minister of Science and Technology, Hon. Mr Derek Hanekom.

Participants of the 14th POGO meeting in South Africa. Photo: POGO

In addition to reporting upon POGO's activities from 2012 including capacity building programmes, presentations and discussions included the new GEO task "Oceans and Society: Blue Planet"; international programmes and activities supported by POGO; new developments in ocean observing and outreach; and South African Ocean Observing programmes. A visit to the CSIR/SANAP Glider facility gave an insight to the "behind the scenes" activities required for successful operation of the gliders, designed to measure various oceanic properties autonomously over great distances in the ocean.

The meeting enabled discussion for ways in which to manage the plethora of data from ocean observations that are available and methods that could be considered to evaluate how the data are used and by whom. Additionally, the meetings allowed POGO members to share information and identify areas where international collaboration could be initiated. Ideas of ways in which POGO members could be involved in a celebration of the 500th year anniversary of the Magellan Expedition were explored comparing ocean observation as it was then with today's advanced technologies.

The penultimate plenary session included a series of presentations from members on ocean observations carried out in various regions, including the Central Pacific, the South Pacific, the Southern Ocean, the Sea of Japan, the East China Sea, the Indian Ocean, the North Atlantic, the mid-Atlantic, the Mediterranean Basin and the Arctic.

The next POGO annual meeting will be hosted by CSIRO and IMAS in Hobart, Australia from 22-24 January 2014.

Hooked on NANO

Dr. Gerry Plumley - NANO Projects Coordinator

NANO continues to be a fun, challenging, and rewarding part of my life. I enjoy capacity building. My religious upbringing likely planted the seeds for capacity building but it was George Happ at the University of Alaska and Tony Knap at BIOS who taught me how to identify promising young, energetic and talented scientists, how to build a network with these scientists and their senior mentors, how to leverage relatively small amounts of money, and how to put this all together and let the enthusiasm of science work its magic. I was always thrilled that people were willing to pay me to be involved in such activities.

It turns out that the capacity building efforts of POGO and NANO are a very good fit for my interests. Let me take a second to backtrack. I first became involved with POGO through the NF-POGO Centre of Excellence (CofE) in Bermuda, starting in 2008. As the local coordinator of the CofE, I was privileged to help guide 40 young scientists, we always called them Pogonians, through their training during the four year run of the CofE at BIOS. Overall, the lessons I learned from working with these young Scholars are far too numerous to describe here, so I will focus on

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one valuable experience learned through the CofE. One component of the CofE was to deliver Regional Training Programmes in developing countries; in this role I participated in programmes in Brazil, Vietnam, and India. I took vacations in other developing countries (e.g., Ecuador, Thailand, the Philippines) to broaden my exposure to the local environments and work conditions experienced by CofE Scholars. An important insight from these regional training programmes and travel in developing countries was a better appreciation of the day-to-day work life of scientists in developing countries; in short, what was feasible, what was not. I began to see how it would be possible to implement changes in the CofE that would make the programme even more beneficial to the young scholars when they returned home. In a more recent follow up conversation with Karen Wiltshire at the POGO 14 meeting in Cape Town (January 2013), I found a kindred spirit. Karen's idea was to teach CofE Scholars so-called 'best practices', those using state-of-the-art technologies, combined with 'most-likely practices', or how to make the best possible use of limited equipment and resources.

By the time I attended the inaugural NANO meeting in London in 2010, I was in a position to enjoy renewing friendships with previous CofE Scholars as well as young scientists that had participated in various NF-POGO training programs, such as the Regional Training Programme I had attended in Brazil (and would soon attend in Vietnam and India). At the London meeting I watched NANO Alumni work through their first networking assignments and thought it an exhausting chore; the young dynamos loved it. They wanted more. It was easy to see and feel the excitement. Rekindled and new friendships, now focused on a common task of creating local ocean networks, engendered a spirit of camaraderie that was visibly evident. Contagious too; I was soon hooked on NANO.

I now find myself in Thailand, learning Thai. I more deeply appreciate what young NANO Alumni go through as they leave their native language behind, stepping into a world dominated by English. As I struggle with the Thai language, with its long lists of rules and ever-confusing five tones, I am able to appreciate more fully the challenges faced by Alumni as they speak English. I am frequently proud of myself for getting across town in a taxi and getting the waiter to deliver the food I thought I had ordered. I cannot for the life of me imagine giving a scientific presentation in Thai; not now, not ever. Another, experience for me, another insight into the life of NANO Alumni, another insight into how to make NANO stronger.

I recently attended a NF-NANO Regional Workshop in Senegal (December 2012). Seven CofE Scholars were present, each having spent 10 months in Bermuda. Many of the Scholars attended the CofE during the same 'academic year', so they were able to renew already-established friendships; others, having attended the CofE at different times, were meeting for the first time. The eye-opening revelation for me was to learn that most of the NANO Alumni, all from Africa, had never visited an African country outside their home country. These world travelers, having logged collectively trips to London, Bermuda, São Paulo, New Caledonia, as well as many cities in the US and throughout Europe, had not had the opportunity to visit and experience other African laboratories and culture. With this insight, I gained new found respect into the seemingly simple yet extremely effective role of regional workshops and training programmes, whether hosted by the NF-POGO Visiting Professorships Programme, the CofE Regional Training initiatives, or by NANO, in bringing students together. As we all know, nations have borders, the ocean does not. Ocean scientists in neighboring countries should not be distracted by politics and cultural differences. NANO is doing a great job of bringing the world together and, importantly, doing it while the Alumni are young enough to have many years in front of them to help narrow the political divide.

In summary, POGO has a new flagship programme, NANO, of which they should be proud. I am certainly pleased and honored to have participated in NANO in the past and hope to continue to contribute in the future.

Gerry with the participants of CofE Bermuda 2009/10 (*Top left*, photo by N. Priyadarshani) and 2011/12 (*Top right*, photo by M. Orchowska), NANO Africa Regional Project meeting (*Bottom left*; photo by B. Foli) and Regional CofE India 2012 (*Bottom right*; photo by G. Plumley)

Blue Planet Symposium: dialogues about ocean and society

Li Zhai and Elisee Toualy

BLUE PLANET
Oceans and Society

A kick-off symposium for the new GEO marine task entitled "Ocean and Society: The Blue Planet" was held from November 19 to 21, 2012 in Ilhabela, São Paulo State, Brazil. Sixty eight participants from 24 countries comprising leaders and representatives of various international organisations and networks including the new GEO Director, Dr. Barbara Ryan, research scientists, postdoctoral and graduate students attended the symposium. Four main components of the Blue Planet Task were discussed: (i) Global Ocean Information and Coordination and Access; (ii) Operational Systems for Monitoring of Marine and Coastal Ecosystems; (iii) Global Operational Ocean Forecasting Network; (iv) Application of Earth Observations and Information to Sustainable Fishery and Aquaculture Management. These four components of the Blue Planet Task are lead primarily by POGO, CEOS, GOOS and GODAE OceanView. The symposium successfully highlighted each of these components through special sessions. Main objectives of this Blue Planet symposium were: (i) to learn more about the various relevant on-going activities; (ii) to coordinate better the ocean-related tasks within GEO; (iii) to address with a collective voice to GEO member nations and participating organisations the main issues of the Blue Planet Task; (iv) to raise awareness of societal benefits of ocean observations to the broader community, targeting in particular policy makers and funding agencies; (v) to seek new avenues for enhancing implementation of ocean observation systems and; (vi) to promote capacity building globally, especially in developing countries.

The meeting participants concluded that the key outcomes from the Blue Planet Symposium were to: (1) Continue developing the Blue Planet Task and establishing further synergies between the various task components; (2) Draft a White Paper to elaborate the contributions of the various programs and elements of the Blue Planet Task and (3) Publish the key contributions of the symposium in the form of a book entitled "Ocean and Society: Blue Planet Symposium".

The next part of this symposium was concretized as actions to follow. Action 1: Blue Planet Mission Statement and Vision, will provide the Blue Planet future strategy and will serve the basis for

the White Paper. Action 2: Blue Planet White Paper, the draft of White Paper with the main idea that this platform will provide the roadmap for the Blue Planet implementation and will both inspire and capture the imagination of the citizens and their institutions. Action 3: Blue Planet Web-Site. Action 4: Blue Planet Symposium 2013, with focus on the organization of the symposium for the year 2013. Action 5: Blue Planet internal communication, this is to elaborate the communication strategy within the Blue Planet community.

The participants and the Blue Planet community strongly thank the Canadian Space Agency (CSA), GEO, INPE and POGO for the co-sponsoring of this symposium.

More information on the Blue Planet Symposium and the GEO Marine Task Group visit http://www.faro-project.org/blue_planet/announcement.html

Attendees of the Blue Planet Symposium. Photo: Blue Planet Committee

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NANO REGIONAL PROJECTS

Workshop "Monitoring Coastal Pollution and Erosion in North and West Africa"
Africa Regional Research Project

Yosra Khammeri

Summary

The kickoff workshop for the NANO Africa Regional Research Project was held at the University of Cheikh Anta Diop, Ecole Superieure Polytechnique in Dakar Senegal, from 10 - 14 December 2012.

The meeting objectives included:

1) an opportunity for the NANO Scholars to meet each other, as many had not met previously, in fact, for five of the seven NANO Scholars present had never visited another African country prior to this meeting in Senegal;

2) a chance to review progress to date on the 2012 NANO Africa Regional project and finalize plans for completion of the funded research project; and

3) make plans and initial drafts for the proposal(s) to be submitted that would provide financial support to continue the North Africa NANO Research Projects in 2013.

The meeting was attended by seven alumni from different African countries: Ousmane Diankha from Senegal, Edward Akintoye Akinnigbagbe from Nigeria, Lazare Akpetou from Cote d'Ivoire, Bennet Atsu Foli and Lailah Gifty Akita from Ghana, Houssem Smeti and Yosra Khammeri from Tunisia, with 3 senior scientists from the alumni countries: professors Hamadi Boussetta and Mohamed Banni (Tunisia) and Dr. Adesina Adegbie (Nigeria), as well as a former NF-POGO visiting professor Vladimir Koutitonsky and the Centre of Excellence Coordinator Gerry Plumley.

Overall the workshop was very successful. It brought about questions and clarifications from experts on issues regarding coastal pollution and erosion The workshop was composed of a series of lectures, practical and discussion sessions and presentations by the alumni. Lectures and practical sessions were well presented and well received.

Working sessions were held on standardizing chemical pollution, measurements between alumni countries, data sharing and concrete plans for follow-up. Regarding erosion, methods to be used for future work were discussed. Working sessions provided opportunities for NANO scholars to collate data and/or implement plans for completion of the 2012 research project; highlights included agreement on uniform practices for trace element/heavy metal analyses and inter-laboratory AAS instrument calibration. Several short breakout sessions during the week as well as most of the last day of the workshop were devoted to preparing a written draft of the 2013 proposal to continue the NANO Africa Regional Research Project. One of the major changes recommended during the workshop was to separate the 2012 research project into two projects for 2013, one focused on pollution, the other focused on coastal erosion.

Clockwise: Participants of the workshop; Lailah Akita performing sample processing in the laboratory; Prof. Vladimir Koutitonsky giving a lecture on Hydrodynamics of sediment transport

Background

Monitoring of coastal chemical pollution and erosion in North and West Africa can benefit from inter-calibration of methods that have been used for pollution monitoring and training of young scientists working in this field. Presently, heavy metal pollution of coastal regions is on the rise as a result of urbanization, industrial development and agricultural runoff into coastal sea waters causing major ecological problems, such as eutrophication, oxygen depletion and decrease of fish levels. However, research in the field of coastal pollution and erosion lacks research facilities, cooperation between institutions, professional training of personnel and modern data management tools.

Implementation of pigment analysis using HPLC in Antares coastal time-series stations
The Latin American Regional Project

Guillermina Ruiz

During the second half of 2012 much progress has been made to achieve the goals we have set for the Latin American Regional Project (LA-NANO). In the first place, the 6 participating ANTARES-ChloroGIN time series stations (figure 1) had the opportunity to sail and collect pigment samples. A total of 105 pigment samples along 28 cruises were collected (table 1) and finally gathered by the end of February 2013 at the Ocean Ecology Branch, NASA-Goddard Space Flight Center where they will be analyzed by HPLC, thanks to the mediation of Dr. Shubha Sathyendranath. Results of HPLC analysis will serve for the purpose of inter-comparison of methods at stations that already have access to HPLC, and as the first time pigment composition data – at other stations.

In November 2012 many of the participants of this project met in Ilhabela, Brazil, at the Blue Planet Symposium. It was an enriching experience to be present at many excellent talks and see great posters in the field of oceanography, including long-term observation programs and modeling exercises. Very relevant discussions followed those talks on topics such as enhancing data sharing and interdisciplinary work. Following the symposium, the NANO Project Coordination Meeting was held among the present NANO Alumni and NANO Friends. During this meeting I gave a short oral presentation on the progress of the LA-NANO project and we discussed with the attendants the four regional project proposals for the year coming. In Ilhabella I met in person many of the people I have been working with through the internet since the beginning of the LA-NANO project, which was very rewarding.

Shipping the samples to NASA, however, proved to be far more complicated than expected. Even though we operated with an expert courier agency, we faced several administrative burdens that caused undesired delays. These were due to the strong custom regulations applied to shipping overseas the dry ice (a hazardous substance for the aviation authorities) required to freeze the samples. Notwithstanding these drawbacks, samples arrived to NASA thanks to the support of Dr. Robert Frouin and the commitment of all the participants involved. Not to mention that this was only possible thanks to the financial support obtained through this Nippon Foundation project.

At least 20 people participated in the first phase of the Latin American Regional Project and made possible sending 105 pigment samples to GSFC, NASA

Station	Participants	Cruises	Samples
Ubatuba (Brazil)	Milton Kampel, Maysa Pompeu, Larissa Velerio, Aline Valerio, Natalia M. Ruddorf	6	6
EPEA (Argentina)	Vivian Lutz , M. Guillermina Ruiz, Valeria Segura, Ana Dogliotti, Ezequiel Cozzolino	2	8
Ensenada (Mexico)	Eduardo Santamaría del Ángel, Mariana Callejas Jiménez, Adriana G. Silveira, Roberto M. Núñez	3	6
IMARPE (Peru)	Jesús Ledesma, Violeta León, Luis Escudero	5	13
Cartagena (Colombia)	Mary Luz Páez Cañón, Liseth J. Silva, Gustavo Tous	6	18
CARIACO (Venezuela)	Yrene Astor, Frank Muller Karger, Jaimie Rojas	6	54
Total	At least 20 participants from 6 different countries	28	105

Todo a babor! A new direction has been planned for the next edition of the LA-NANO project. In the long term, we think that a sustainable solution to overcome the above obstacles is to develop HPLC centers in Latin America and put them on the same level with recognized international laboratories. Besides continuing the synergy between NANO and Antares-ChloroGIN networks, the plan is to organize a workshop in one center having HPLC facilities and experts pursuing the goal of training NANO Alumni and young ANTARES-ChloroGIN scientists in the HPLC principles and functioning. By then, we will have received NASA results and we will have the chance to discuss and interpret those results together and with the guidance of experts in the field during the workshop. Moreover, another goal of the LA-NANO 2013 is to evaluate the technical and budgetary challenges of each ANTARES station to conduct HPLC pigment analysis locally and design a strategic plan to ensure these analyses are systematically carried out at all ANTARES stations. The development of such HPLC centers will potentiate the possibilities of gathering essential in situ data for the whole community working on biogeochemical models and climate change; specially due to the notorious under-sampling of the oceans in the Southern hemisphere compared to the Northern hemisphere. All together, capacity building and equipment improvement will empower Latin American research centers not only to provide valuable raw data but also scientific knowledge.

In the personal field, I expect to keep being involved in NANO. I am getting started on the field of bio-optics and satellite images of ocean color processing. I look forward to contributing to the second phase of this project, and maybe have the chance to meet again with other Alumni and fellows in the workshop to consolidate what we have achieved so far working on a final outcome from this interesting enterprise. Someone at Ilhabela meeting said … "NANO is the future POGO…" Well, I think it depends on each of us becoming part of it.

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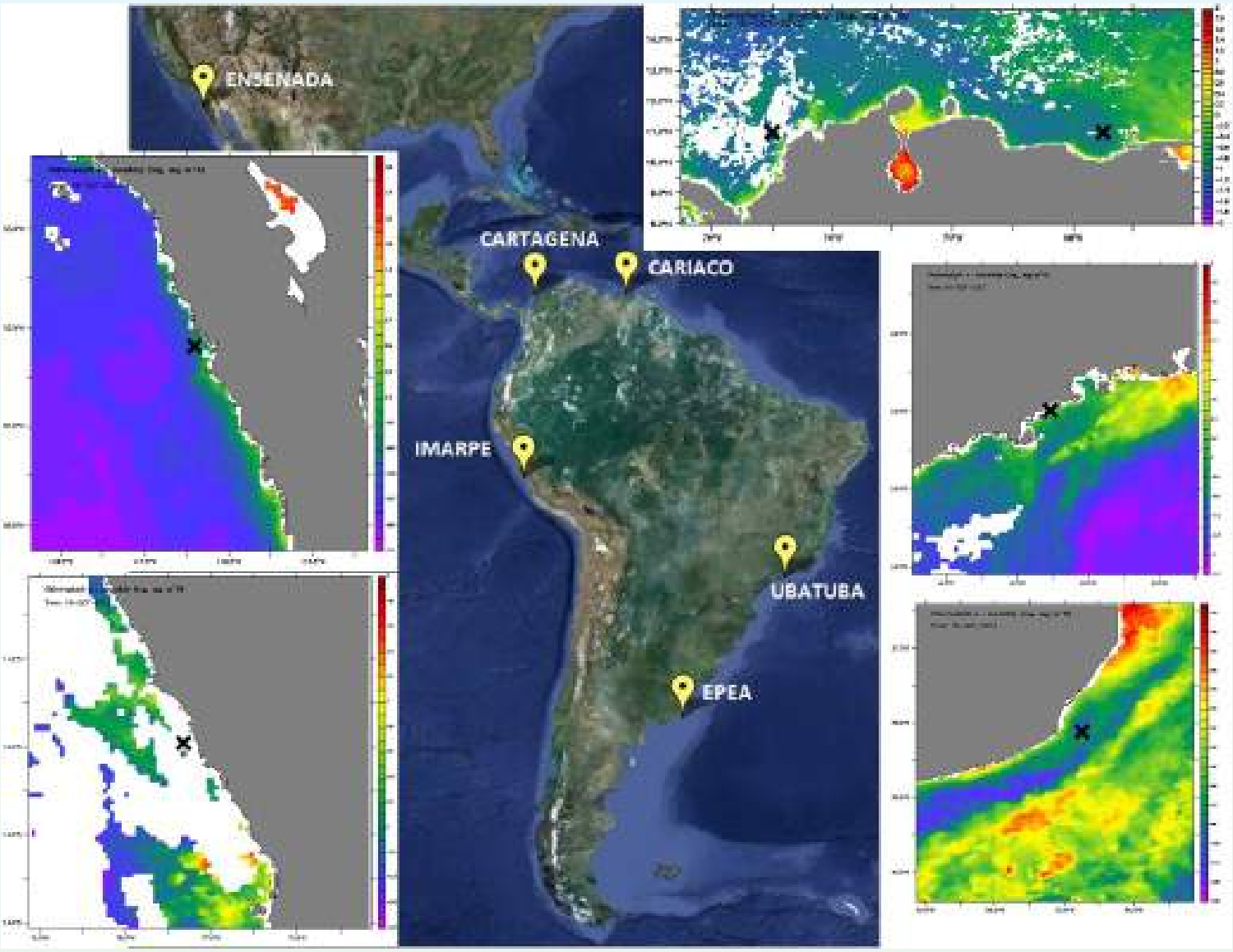

Preliminary view of monthly composite images of ocean surface chlorophyll-a distribution for October 2012 at the participant ANTARES-ChloroGIN time series stations (MODIS-Aqua, retrieved from Ocean Watch Website, NOAA

For updates and more details on the Regional Projects

India Sub-Continent: http://www.nf-pogo-alumni.org/Indian+Sub-Continent+Regional+Project

Latin America: http://www.nf-pogo-alumni.org/Latin+American+Regional+Project

North West Africa: http://www.nf-pogo-alumni.org/North-West+African+Regional+Project

South East Asia: http://www.nf-pogo-alumni.org/South-East+Asia+Regional+Project

The AMT experience

Priscila K. Lange
Wikipage : http://www.nf-pogo-alumni.org/~Priscila+Lange

Since 2009, the Partnership for Observations of the Global Oceans (POGO) has offered an opportunity for a student or early career scientist to participate in the Atlantic Meridional Transect (AMT), as part of the team of Plymouth Marine Laboratory (PML). The main goal of the POGO-Green Seas AMT Fellowship is to provide training in techniques novel for a student and important for his/her future scientific career. As a student awarded the fellowship for the AMT in 2012, I was supervised by Dr. Gavin Tilstone (PML), and we focused our project on the productivity (PI curves) of different size classes of phytoplankton cells through the Atlantic Ocean, a measurement that lacks data in the world ocean.

The program was divided into three major parts: I) three weeks of work at PML, preparing equipment and materials for the cruise; II) 7 weeks on the research cruise (AMT22); III) four weeks of work back at PML after the AMT, processing the acquired data. During the first period Dr. Tilstone showed me around PML and explained his past research involved in the AMT time-series; we also discussed the project for the following cruise. We spent most of the time preparing different materials for the cruise, which involved collecting and packing the equipment and consumables, training in PI curves and inherent optical properties (i.e. absorption coefficient & fluorescence of CDOM), the calibration of the spectrophotometer that was used during the AMT and tests of the performance of the in situ filtration rig. The AMT22 started in Southampton,UK and ended in Punta Arenas-Chile. Our activities were focused on measuring phytoplankton photosynthesis, primary production and coloured dissolved organic material (CDOM). Our main objective was to assess the latitudinal variations of phytoplankton production (Pz) and photosynthetic parameters along the Atlantic Ocean for three phytoplankton size classes (0.2-2µm, 2-10µm and >10µm), using methods synonymous to those used in previous AMT cruises in order to contribute to the existing AMT time-series dataset and validate satellite data.

Specifically, my responsibilities included measurements of phytoplankton photosynthetic parameters (PI curves) and filtering of phytoplankton of 3 different size classes in order to acquire data on the assimilation of carbon (under different light intensities). I also analyzed size-fractionated chlorophyll a (Chla) required to normalize carbon incorporation to chlorophyll and helped filtering for PABS. Incubations were performed at two

Priscila's activities onboard of AMT Cruise

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depths (surface and Deep Chlorophyl Maximum) during the "noon CTD" (around 13:00). Besides that, I helped Dr. Tilstone to process (filter) the simulated in situ primary production, which also considered these three phytoplankton size classes.

Simulated *in situ* primary production (Pz) was measured at 36 stations. Water samples were taken from pre-dawn (03:15-05:15 GMT) deployments of a CTD rosette sampler from 6 depths in the euphotic zone, and stored in polycarbonate bottles. The samples were inoculated with between 185 and 740 kBq (5 - 15 µCi) $NaH_{14}CO_3$ according to the biomass of phytoplankton. The polycarbonate bottles were transferred to the on-deck (simulated *in situ*) incubation system using neutral density and blue filters to simulate subsurface irradiance over depth to 97, 55, 33, 20, 14, 7, 3, 1 or 0.1% of the surface value and incubated from local dawn to dusk (10–16h). Suspended particulate organic matter was filtered sequentially through 0.2µm, 2µm and 10µm polycarbonate filters to measure the pico-, nano- and micro-phytoplankton production respectively.

Photosynthesis-Irradiance experiments (PI curves) were conducted at 37 stations (13:00-14:00 GMT) at two depths in the water column: surface and deep chlorophyll maximum (DCM). The experiments were run in photosynthetrons illuminated by 50 W, 12 V tungsten halogen lamps for the surface waters and LEDs for the Chl a maximum. The water samples were inoculated with between 185k Bq (5 µCi) and 370 kBq (15 µCi) of ^{14}C labelled bicarbonate. After 1 to 2 h of incubation, the suspended material was also filtered onto 0.2µm, 2µm and 10µm polycarbonate filters (cascade) to measure phytoplankton photosynthetic rates.

After the filtration, all filters were exposed to concentrated HCl fumes for 8-12 h immersed in scintillation cocktail and ^{14}C disintegration time per minute (DPM) was measured on board using a Packard, Tricarb 2900 liquid scintillation counter and the external standard and the channel ratio methods to correct for quenching. For the PI curves, the broadband light-saturated Chl a-specific rate of photosynthesis P^B_M [mg C (mg chl a)$^{-1}$ h^{-1}] and the light limited slope α^B [mg C (mg chl a)$^{-1}$ h^{-1} (µmol m^{-2} s^{-1})$^{-1}$] were estimated by fitting the data to the model of Platt et al. (1980). Preliminary results show that the subtropical oligotrophic gyres are well delimited by the latitudes where the thickness of the surface layer with high water temperature (Fig. 2a) and salinity (Fig. 2b) deepens drastically, with a deep chlorophyll maximum (DCM) reaching depths from 80 to 130 meters (Fig. 2c). In general, higher Pz values (Fig. 2d) are associated with both micro- and pico- production in the Bay of Biscay (~400 mg C m^{-2} d^{-1}), the equatorial upwelling (500-650 mg C m^{-2} d^{-1}) and the Patagonia shelf region (900-1600 mg C m^{-2} d^{-1}), whereas lower values predominantly from pico-production occur in the North Atlantic (100-300 mg C m^{-2} d^{-1}) and South Atlantic Gyres (150-250 mg C m^{-2} d^{-1}).

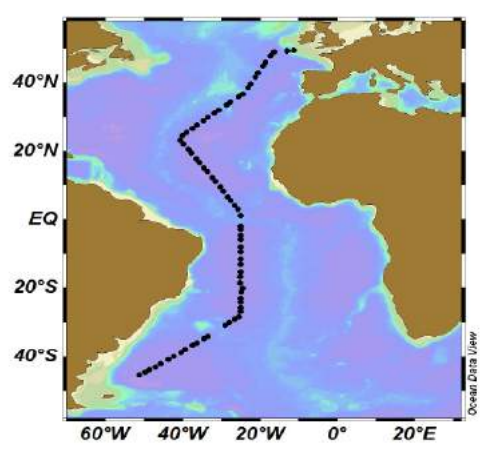

Fig 1 - Track of the Atlantic Meridional Transect (AMT22) in Oct-Nov/2012

It is also clear that the contribution of microphytoplankton to the total Pz (Fig. 2e) is higher in the surface waters, especially in the North Atlantic gyre, whereas picoplanktonic species are the most important primary producers in the DCM (Fig. 2f).

For the latitudinal variation of the photosynthetic parameters of different phytoplankton size classes, high values of P^B_M and α^B of microphytoplankton in the surface waters of the subtropical gyres (Fig. 3a,b) suggests that, despite their low biomass, their capacity for growing is high in these areas, implying that large cells would have an event of nutrient input (by dust deposition, upwelling by mixing, etc.). Conversely, at the DCM of the subtropical gyres, P^B_M values were low to all size classes (Fig. 3c), but α^B was higher in the North Atlantic gyre (Fig. 3d), especially for picoplanktonic cells, maybe due to the shallower DCM compared to the South Atlantic gyre. The last four weeks of the fellowship were dedicated to acquiring and processing data from the previous AMTs (provided by the British Oceanographic Data Centre: BODC) in order to create a dataset with information on temperature, salinity, phytoplankton microscopy and flow cytometry counts and primary production and productivity. The main outcome from this project was the manuscript "Contribution of micro-phytoplankton to total primary production in the sub-tropical Atlantic Gyres", to be presented in the 45th International Liege Colloquium on Primary production in the ocean: from the synoptic to the global scale.

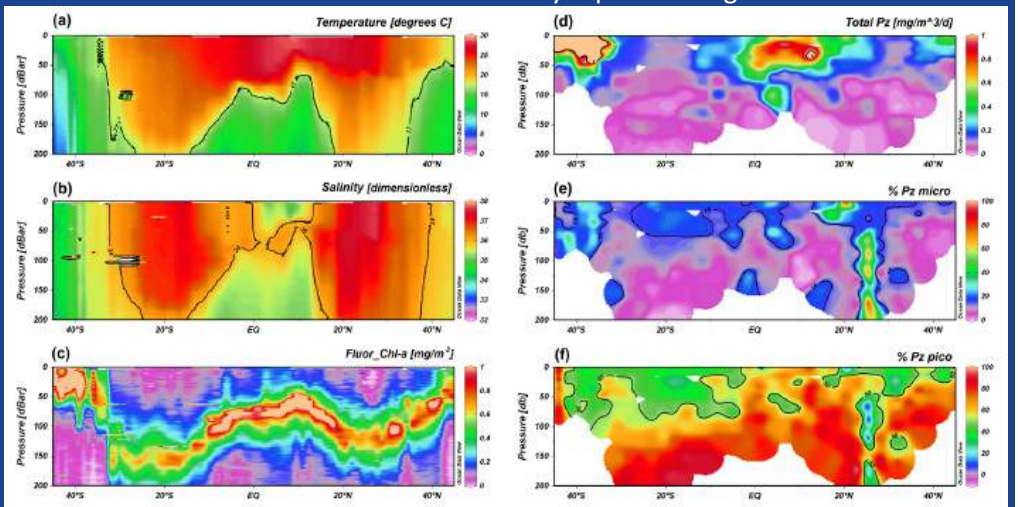

Fig 2 - Vertical profiles of temperature (a), salinity (b), chlorophyll (c), total primary production (Pz) (d), and the contribution of micro- (Pz >10µm) (e) and pico- (Pz 0.2-2µm) (f) size fractions to the total Pz across the Atlantic Ocean in October/November of 2012

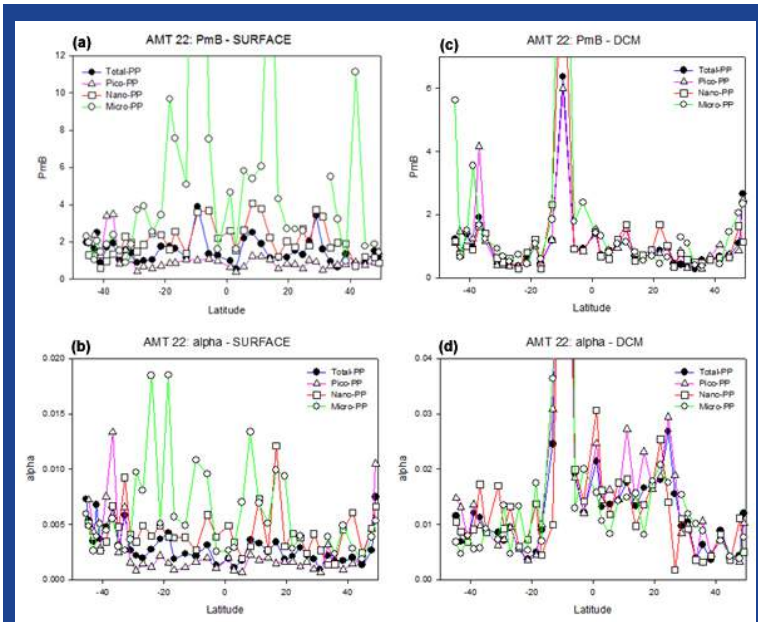

Fig 3 - Phytoplankton photosynthetic parameters for total (Total), micro- (>10µm), nano- (2-10µm), pico- (0.2-2µm) size fractions, across the Atlantic Ocean in October/November of 2012: surface P^B_M (a) and α^B b) at the surface; and P^B_M (c) and α^B (d) at the DCM.

The AMT was the longest scientific cruise I have ever participated in and the R/V James Cook was also the most comfortable I have ever sailed on. Working with Dr. Gavin Tilstone was very good. He is patient, creative, very experienced and enjoys teaching. It was a mind-blowing and constructive experience for me as a student to work under his supervision. His enthusiasm is really contagious and makes the hard work become something fun and pleasant. The relationship between the scientists and the crew was fantastic. We worked hard during the cruise and had a chance to rest only three times (one morning, one afternoon and one evening in separated days) in 7 weeks. Co-existing with all people on board was fantastic as well. It was great to share moments of joy and support each other in stress situations, and in both, everybody was very cooperative and kind. It was an amazing experience! The long time on board, routine and hard work made me not only learn how to deal with other people under stress, but also to face my own defects, and motivated to improve myself as a person and as a scientist.

NANO ALUMNI IN THE FIELD

Antarctic expedition - February 2013. Brazilian Antarctic Program (PROANTAR XXXI) Project "PRO-OASIS"

Maria Fernanda Colo Giannini

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"NPo. Almirante Maximiano" in the Admiralty Bay, Antarctic Peninsula

In February 2013 I joined a large group of researchers from Brazil to participate in a Brazilian research expedition to Antarctica, which took place as part of the Brazilian Antarctic Program XXXI (PROANTAR XXXI). The project is called PRO-OASIS, which could be translated into English as "Enrichment of Southern Ocean surface waters and influences on marine ecosystem: primary producers to top predators". The main researchers and the project coordinators are from FURG (Universidade Federal de Rio Grande) and USP (Universidade de São Paulo), others areUFRJ (Universidade Federal do Rio de Janeiro) and UFJF (Universidade Federal de Juíz de Fora).

The scientific cruise was carried out onboard the polar ship from the Brazilian Navy, the "NPo Almirante Maximiano" (kindly called "Tio Max", which means "Uncle Max"). The ship left from Punta Arenas, Chile, on February 5th heading down to the Antarctic continent. Coincidentally, at the day we were initiating our trip, "Tio Max" was celebrating its 4th anniversary. The ceremony was attended by several authorities from Brazilian and Chilean governments. We spent the first two days of our trip crossing the wonderful Chilean channels towards the Drake Passage. Good sea conditions at the time facilitated the opportunity for scientists to start preparing the laboratories and equipment and the incubation set up for the iron enrichment experiment on deck.

Argentine research base "Esperanza" at Hope Bay, Antarctic Peninsula

Fortunately, we had everything set up in the labs by the time we started crossing the Drake Passage, when the sea conditions changed for the worse. However, the sea was relatively peaceful and the scientific team was ready to start working on the oceanographic stations soon. After two days, the physical oceanography team, involved in the project called POLARCANION, initiated the work in the Bransfield Strait. They deployed the first of the two moorings that were meant to collect physical data of the water column for a year. The second mooring was deployed near the Joinville Island. Besides the mooring sites, we worked

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along with the POLARCANION project during the oceanographic stations to obtain physical oceanographic data.

Research team on board of the "Almirante Maximiano" ship (photo: Camila Signori)

The first region to be sampled was the Gerlache Strait, where we could closely follow the work of the project "Baleias" or "Whales". The researchers involved in this project, coordinated by Dr. Eduardo Secchi, also worked hard to get their observations and especially their sampling for biopsy of the animals during the cruise. They got good results and several samples, including an unprecedented sampling of a Fin Whale. The first site for the iron experiment was also in the Gerlache Strait, where the samples where incubated on deck for biological and chemical analysis, such as chlorophyll, nutrients, physiological rates and primary production. The experiment aimed to verify the possible effects of iron limitation on the phytoplankton community efficiency in photosynthesis in different regions over the Antarctic Peninsula.

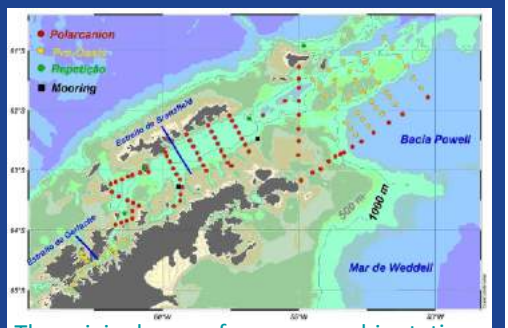
The second sampled location was the Bransfield Strait waters. This region was the focus of the POLARCANION project, although the PROOASIS team also sampled this region and collected water for another iron enrichment experiment. One of the goals of PRO-OASIS was to verify the influence of the sea ice coverage on the phytoplankton community. For that, oceanographic stations were sampled in the eastern basin of the Bransfield Strait and at the edge of a large sea ice field in the Powell Basin. The latter showed an anomalous sea ice concentration in the northern Weddell Sea. The activities of the phytoplankton team involved filtration of samples for determination of chlorophyll a and accessory pigments concentrations, Colored Dissolved Organic Matter (CDOM) analysis, and other samples for bio-optical measurements that were performed later in the laboratory; samples were collected also for taxonomic analysis, fluorescence analysis, phytoplankton physiology, and incubations for primary production.

We spent about 30 days at sea. POLARCANION and PRO-OASIS research teams completed 97 oceanographic

Argentine research base "Esperanza" at Hope Bay

stations including the Bransfield and Gerlache Straits and the edge of the sea ice field north of Powell Basin. The project Baleias was also successful in collecting 29 samples for whales' biopsies and lots of data of their distribution in that region.

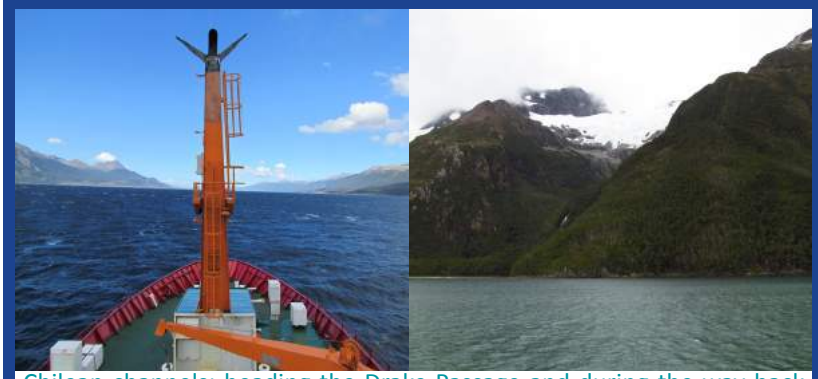
This was my second experience in the Antarctic continent: I also participated in a cruise from PROANTAR XXVII in February 2009. However, each experience is unique and the lessons learnt are always of a great importance for



The original map of oceanographic stations for physical, chemical and biological sampling. The stations has eventually changed during the cruise due to the sea ice coverage and the weather conditions

my scientific carrier and personal development. Antarctica has incomparable beauty, but I also truly hope this wonderful and special place will continue to be cared about and preserved for peoples of the world due to its great importance for many oceanographic processes and for the ecosystem as a whole.

I would like to take the opportunity to congratulate all the research teams who participated in the trip and especially to thank the entire crew of the NPo. Almirante Maximiano. Their assistance and willingness to help the researchers was essential for the success of the cruise.



Chilean channels: heading the Drake Passage and during the way back to Chile

Whales Team sampling for biopsy in the Gerlache Strait and the NPo. Almirante Maximiano around Clarence Island (Photo by Camila Signori)

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Phytoclima Project and the Algarve experience

Warm summer wind and sun grazed our faces as our small boat weaved its way through a labyrinth of lagoons and small sand islands in the Ria Formosa, a coastal lagoon in the Algarve, the southernmost region of Portugal. All around were flocks of birds perched or flying overhead to the next sand island, one of the reasons why the Ria is designated a Nature Reserve in this part of Portugal. Our heading: the barra, a small inlet opening between small barrier islands at the outer edge of the Ria, and an access point to the open ocean to our first sampling station. Our mission: to conduct our first field sampling campaign for the Phytoclima Project, to collect phytoplankton and oceanographic data within the time of overflight pass of MODIS-Aqua satellite sensor, to calibrate/validate MODIS-Aqua images.

The Algarve and SW Iberia

The Algarve is the southernmost region of Portugal. It is a popular summer destination in Europe because of its generally mild climate, sunny weather throughout the year… and the beaches! My first beach experience though was met by waters relatively cold for someone coming from a tropical country (this however would be explained scientifically as you read on). Portugal in turn is part of the Iberian Peninsula, which is the southwesternmost region of Europe. Our current location therefore is the South Western Iberian Peninsula. I found the region a very interesting melting pot of influences from its marginal zones, both from a cultural and scientific point of view. Culturally, the region exhibits a mixture of Moorish and North European influences. Scientifically, its immediate waters are governed by the combination of oceanographic and climate regimes of the Atlantic and Mediterranean, one dominating the other at specific times of the year. This oceanographic and climatologic setting made the basis for the conceptualization of the Phytoclima Project.

Figure 1 - The Ria Formosa Nature Reserve, Algarve, Portugal (*Left*) and the Southwest Iberia and its immediate coast (*Right*).

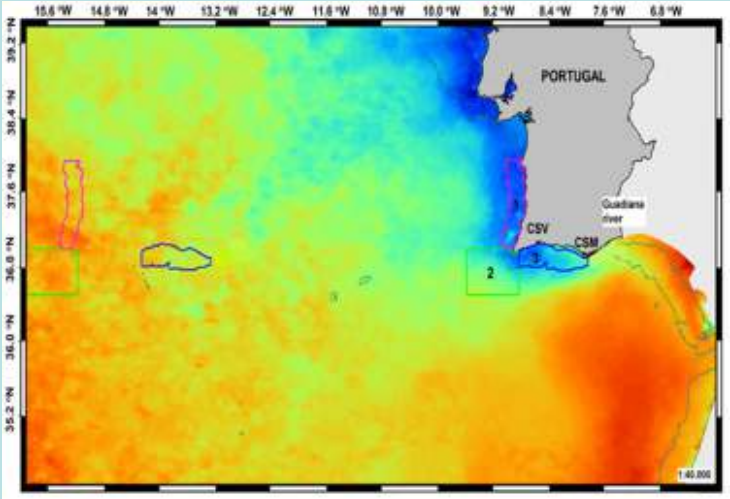

Figure 2 - Subregion polygons representative of different coastal regimes used to evaluate phytoplankton variability (solid lines): (1) West Coast – WC; (2) Cape São Vicente – CSV; (3) South Coast –SC. Offshore duplicate subregions (dashed lines) used for calculating temperature-based upwelling index

With the recently observed changes in climate patterns and the mixture of climatic/oceanographic influences in SW Iberia, a group of oceanographers became interested in investigating the effects of these climate drivers on the coastal region off South Western Iberia, leading to the conceptualization of the Phytoclima Project. The team is headed by Prof. Dr. Ana Barbosa, and composed of oceanographers from the Universidade do Algarve, two NANO Alumni (Lilian Krug and myself), and Dr. Trevor Platt and Dr. Shubha Sathyendranath as project advisers. The project aims to determine whether phytoplankton can be a sentinel or indicator of climate change in South Western Iberia. This would be carried out using satellite remote sensing data, in situ data from ocean databases, and localized field campaigns to validate the satellite images. Satellite data provided us with a synoptic temporal and spatial coverage of 15 years (1998 – 2012), to analyze trends in climate drivers such as temperature, wind, PAR, rainfall, etc., and corresponding consequences to trends in variability of chlorophyll and primary production. My task in the project is to analyze time series data of these climate drivers, over the

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15-year time period, for trends, patterns and deviations, and subsequently identify 'hotspots' or areas where phytoplankton is most vulnerable to changes , therefore making them good indicators for climate change.

The main study area of Phytoclima is the South Western (SW) Iberian coast, covering portions of the western and southern coasts of Portugal. The site coverage itself is very interesting in that it is governed by two dominant oceanographic regimes – the western coast more influenced by Atlantic processes, and the southern coast by Mediterranean processes, through the Gulf of Cadiz. Making it more interesting is the inflection point in Cape San Vicente where these two perpendicularly-oriented coastlines meet to a point, exhibiting a balance of influences of the Atlantic and the Mediterranean (Figure 2).

The SW Iberian coast also experiences regular phytoplankton blooms and upwelling events, being part of the Canary Current Upwelling System, one of the four Eastern Boundary Upwelling Systems of the world ocean. Cool, nutrient-rich waters from upwelling events promote primary production, thus high phytoplankton abundance. This regularity and recurrence in the SW Iberian coast makes phytoplankton the perfect candidate for an indicator of climate change and the key player in the Phytoclima study.

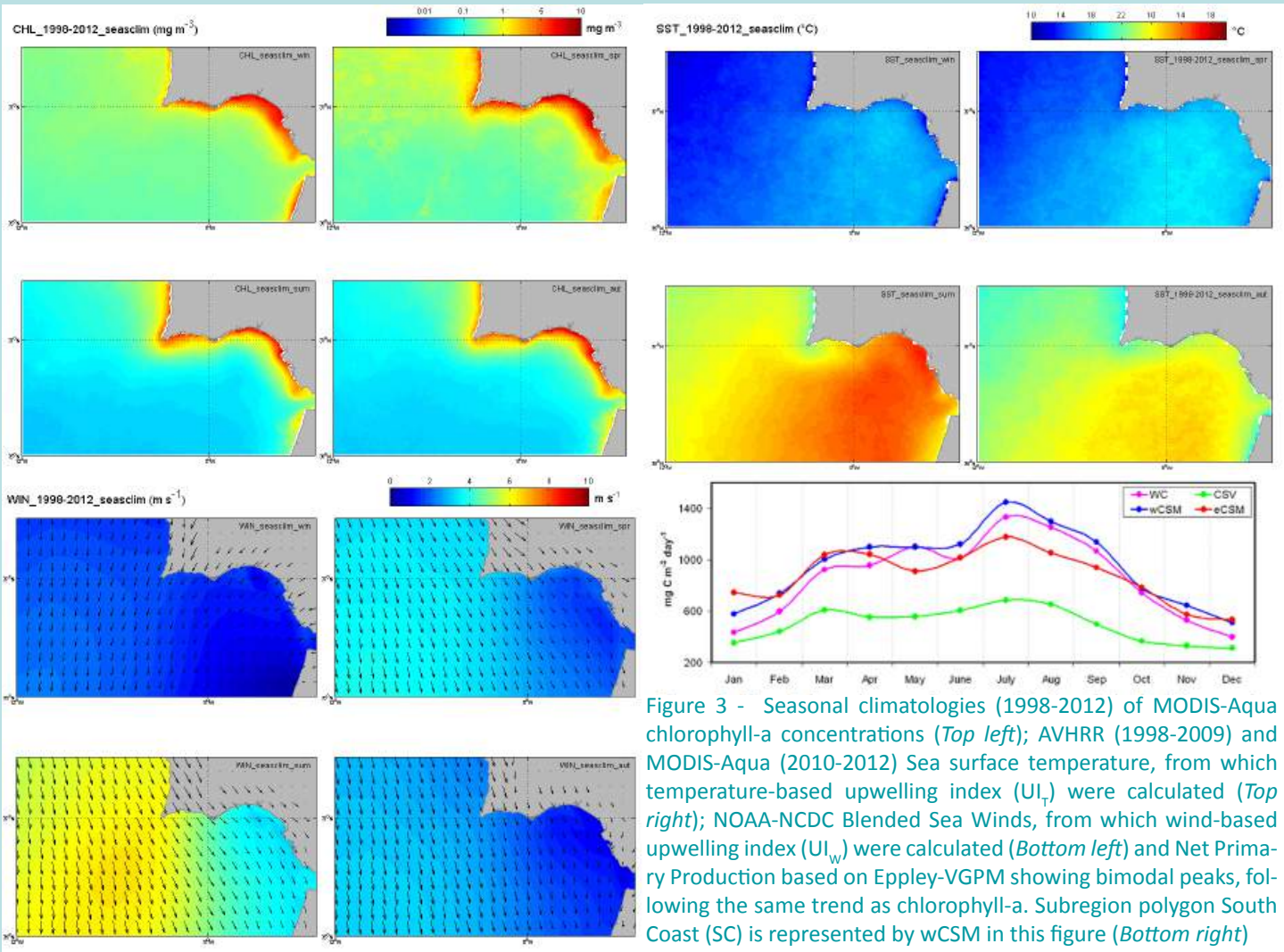

Figure 3 - Seasonal climatologies (1998-2012) of MODIS-Aqua chlorophyll-a concentrations (*Top left*); AVHRR (1998-2009) and MODIS-Aqua (2010-2012) Sea surface temperature, from which temperature-based upwelling index (UI_T) were calculated (*Top right*); NOAA-NCDC Blended Sea Winds, from which wind-based upwelling index (UI_W) were calculated (*Bottom left*) and Net Primary Production based on Eppley-VGPM showing bimodal peaks, following the same trend as chlorophyll-a. Subregion polygon South Coast (SC) is represented by wCSM in this figure (*Bottom right*)

First cuts on SW Iberia Upwelling Events

Here is a peek on some of the preliminary results on the analysis of upwelling patterns that we got during the first few months in the Phytoclima project.

At this stage of the project we have arbitrarily defined polygons within the site to represent outstanding physico-chemical regimes, based on physical conditions variables (e.g., Atlantic, Mediterranean or riverine influences). The polygon subregions represent the West Coast (WC) facing the Atlantic, the South Coast (SC) facing the Gulf of Cadiz, and Cape Sao Vicente (CSV) at the inflection point of the two coasts. These polygons will later be refined to establish biogeochemical subregions within the SW Iberian region (Figure 2). The polygons were assigned to facilitate preliminary time series analysis on patterns and trends on upwelling and phytoplankton variability.

To show the overall annual pattern in SW Iberia below are 15-year seasonal climatology images of chlorophyll, temperature, and wind (Figure 3) as a summary of the data that were used in this project Upwelling indices in the subregion polygons

were calculated from temperature differences between offshore and coast (UI_T), and wind-driven Ekman transport (UI_W) to reinforce preliminary assumptions of upwelling events from the chlorophyll images. Primary production estimates based on Eppley-VGPM, from satellite data were also used to support incidences of upwelling events.

The upwelling indices indicated favorable upwelling conditions extending from May to December, for most of the years, depicting an annual cycle with its peak in summer. Incidences of upwelling were higher in WC and CSV, and generally less intense in SC. Bimodal peaks of chlorophyll-a were observed in WC and CSV during late spring (April-May) and early summer (July-August), with a decline in June. SC on the other hand exhibited its chlorophyll-a peak slightly earlier (March) than the two other subregions. Primary production estimates matched the trend observed in chlorophyll-a and upwelling indices, with maximum values in summer and minimum in winter. Both chlorophyll-a and primary production correlated significantly with the upwelling indices, although more strongly with UI_W, across the time series. Our results clearly show that phytoplankton variability is season-dependent and site-specific, reflecting the diverse physical regimes that drive phytoplankton dynamics in SW Iberia. This will serve as an initial step towards establishing biogeochemical subregions in SW Iberia and further trend analyses of climate drivers leading to identification of vulnerability 'hotspots' for phytoplankton.

To close with a side note, my first Algarve beach experience with relatively cold waters turned out to be a first-hand encounter with summer upwelling waters on the coast, which I found out from the analysis that we ran later. For the remaining time that I have in the Phytoclima project, I have set it as my mission to discover more of this interesting region, both in the cultural and scientific aspects.

Research communications - NF-POGO Alumni

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Phytoplankton variability and its environmental drivers off South-Western Iberia Peninsula

The region off southwestern Iberia (Figure 1) encompasses a wide variety of oceanographic regimes, including coastal areas impacted by upwelling, riverine inputs and submarine groundwater discharge, submarine canyons and sea mounts, and open ocean waters. These different regimes most likely affect phytoplankton in different ways and, ultimately, the entire food chain.

In a world potentially prone to climate change, how do phytoplankton and its environmental drivers behave? Can we use phytoplankton variability to estimate patterns and trends on the environmental variables in our area of interest? The PhytoClima project (Remote sensing of phytoplankton variability off South-Western Iberia: a sentinel for climate change?) aims to: (a) identify relevant drivers underlying phytoplankton variability off SW Iberia, over a 15-year period, and (b) explore linkages between meteorological forcing and phytoplankton dynamics.

An international team of experts in biological oceanography, regulation of phytoplankton (Dr. Ana Barbosa – Principal Investigator, Dr. Helena Galvão, Dr. Rita Domingues and MSc. Cátia Luís), physical oceanography, marine geophysics, statistical analyzes (Dr. Paulo Relvas and Dr. Joaquim Luis), marine optical properties and ocean colour (Dr. Shubha Sathyendranath and Dr. Trevor Platt) work on PhytoClima. This multidisciplinary group is affiliated to four research centres: Centre for Marine and Environmental Research and Centre for Marine Sciences of University of Algarve (Portugal), Dom Luiz Institute from University of Lisbon (Portugal) and the Plymouth Marine Laboratory (United Kingdom).

Remote sensing, modelled and in situ databases are being utilized to investigate trends in phytoplankton, and local and remote meteorological and oceanographic variables in different temporal and spatial scales. Next, we present some of the first results of PhytoClima.

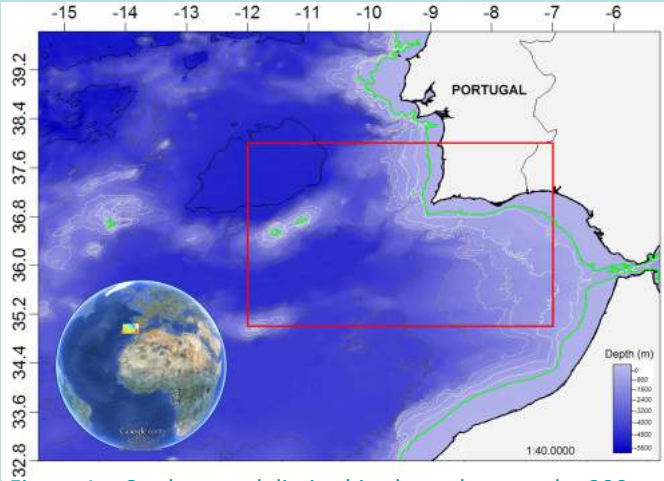

Figure 1 – Study area delimited in the red rectangle. 200 m isobaths in green

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Oceanographic databases

World Ocean Database (WOD - Boyer et al., 2009) is the largest global oceanographic dataset available. WOD contains information collected with different instruments like Niskin casts, Argo profilers, gliders, among others (http://www.nodc.noaa.gov/OC5/WOD09/pr_wod09.html). For our area of interest there are more than 40000 samples collected between 1864 and 2012 by different institutions.

The WOD collection provides us information on several different physical, chemical and biological variables. On Figure 2 we plot surface data on salinity, temperature and chlorophyll-a. It is possible to see the influence of freshwater discharge (riverine and submarine groundwater) at the southeastern coast (~37ºN; 7-8ºW) and the strong upwelling at the western coast of Portugal (~9ºW). Unfortunately, biological data availability is much lower, but is still possible to note the impacts of these features on coastal chlorophyll.

Looking specifically on the western section during summer months (July – September) it clearly shows the influence of the colder, nutrient-rich upwelled water on the phytoplankton (Figure 3).

Ideally, WOD data would be used on validation of satellite chlorophyll-a however, when the collection is constrained to the period of study (1998-2011) the samples are reduced to about 7000 and not a single sample of chlorophyll.

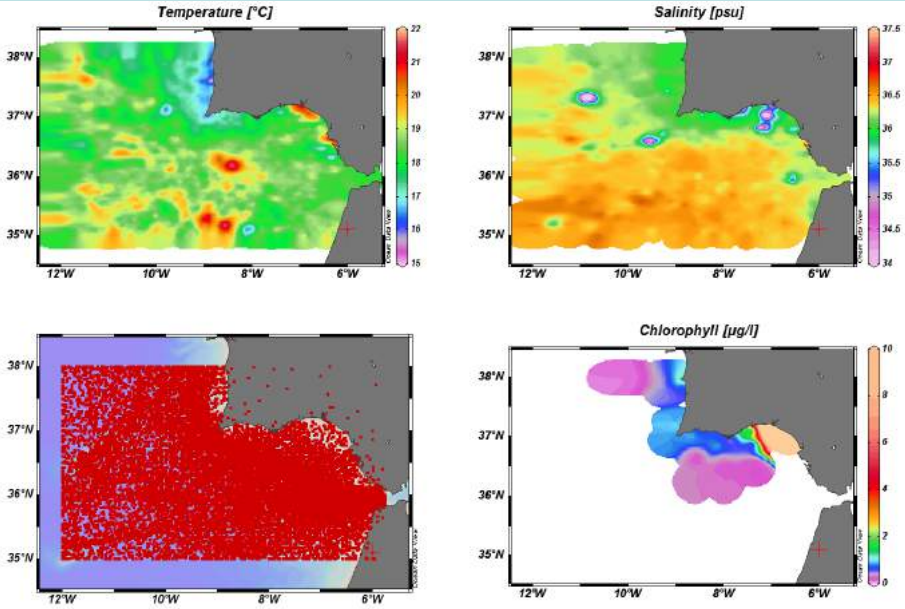

Figure 2 – World Ocean Database collection for Southwest Iberia. Maps depict sample locations (*Top left*) and surface salinity (*Top right*), temperature (*Bottom left*) and chlorophyll (*Bottom right*). Samples were collected by different instruments and institutions between 1864 and 2012

We have looked into other databases like NOMAD/SEABASS version 2a2008 (http://seabass.gsfc.nasa.gov/, accessed in May 2012) and BCO-DMO (http://bcodmo.org/data, accessed in May 2012) without success on getting data within the study area limits. We have had two field samplings and more to come in order to acquire few in situ data for the calibration/validation of ocean colour images.

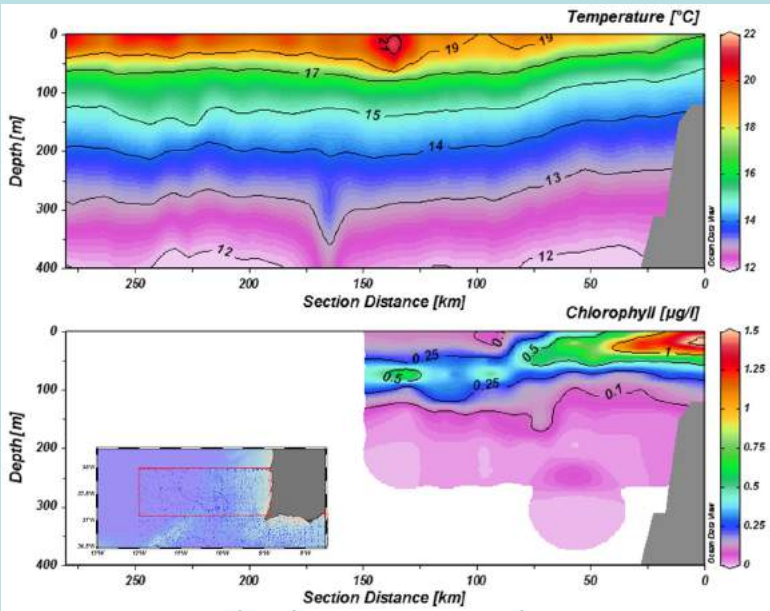

Figure 3 – Sector profile of the western coast of study area illustrating the upwelling of cold waters (*Top*) during summer months (July to September) and its effects on chlorophyll (*Bottom*)

Ocean colour data

Surface Chlorophyll-a concentration (Chl-a) was acquired from the merged product of SeaWiFS, MeRIS and MODIS-Aqua provided by the GlobColour Project. Climatological Chl-a at off-shelf locations was significantly lower than coastal areas, and exhibited a fairly stable unimodal annual cycle, with maximum during March while coastal locations displayed more variable annual cycle, probably impacted by upwelling dynamics and riverine influences (Figure 4).

Please, refer to the research communication (Phytoclima Project and the Algarve experience) in this issue to see more on upwelling effects on Chl-a by the PhytoClima project.

Besides local effects, phytoplankton can be subjected to large-scale/regional forcings as well. The time series of coastal Chl-a anomalies showed a high interannual variability and it is negatively related to NCAR/Hurrell's North Atlantic Oscillation index (R: -0.48; Figure 5).

Currently, the PhytoClima team is analyzing other variables (e.g., wind, river flow, sea surface temperature, mixed layer depth, nutrients, among others) and performing field work whenever weather conditions allows. A PhD study under the project will do a comparative analysis across different sub-regions allowing an increased perception of how ecosystem-specific attributes may modulate phytoplankton responses to climate changes scenarios.

The offshore of SW Iberia is a heterogeneous region and it was classified as being very sensitive to climate change by the IPCC (2007). Climate-driven alterations like changes in upwelling patterns and intensity have been previously reported for the area (Relvas et al., 2009). PhytoClima will provide an increased understanding of the dynamics and forcing mechanisms underlying phytoplankton variability in coastal and oceanic regions off NE Atlantic. Ultimately, predicting how phytoplankton respond to recent climate-driven changes may be used to hindcast past phytoplankton variability, and to improve our ability to forecast phytoplankton biomass and production under projected climate change scenarios.

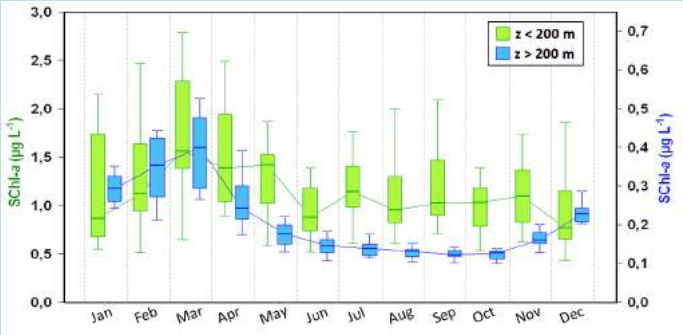

Figure 4 - Chlorophyll–a climatology based on 1998-2011 time series. Coastal zone is depicted in green (*Left axis*) while offshore averages are depicted in blue (*Right axis*)

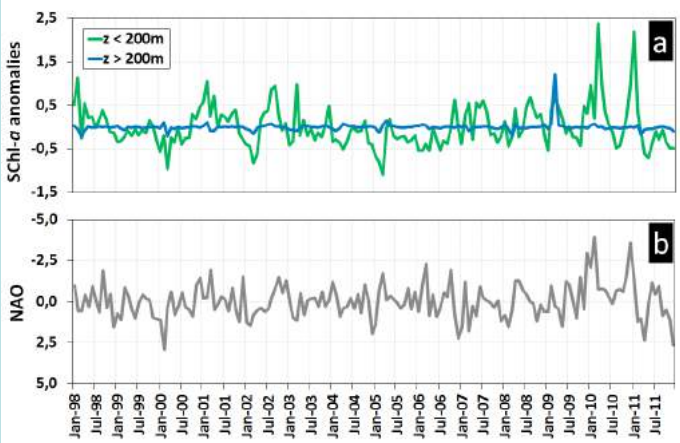

Figure 5 - (a) Chlorophyll-a anomalies for offshore (blue line) and coastal (green line) areas; (b) North Atlantic Oscillation index

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Research communications - NF-POGO Alumni

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Background

I did a Master in Physics of Atmosphere in my University and then got involved in Ocean Sciences through a regional program (PROPAO) devoted to Physical Oceanography in West Africa. As a PhD student I spent 10 Months at the Bermuda Institute of Ocean Sciences (BIOS) participating in the Centre of Excellence NF-POGO training in Observational Oceanography. From this program, I learned more about Ocean Sciences, for example, about other components of Oceanography, such as Biology and Chemistry and got valuable research cruise experiences. I fell in love with phytoplankton and learnt to appreciate what they are doing for our life. I also learned how to conduct scientific research and how to communicate the results to the public. I would like to thank our "super" teachers during this training. I will always remember this training as the beginning of Ocean Sciences in my life. I defended my thesis in January 2013 shortly after the training.

Research interests

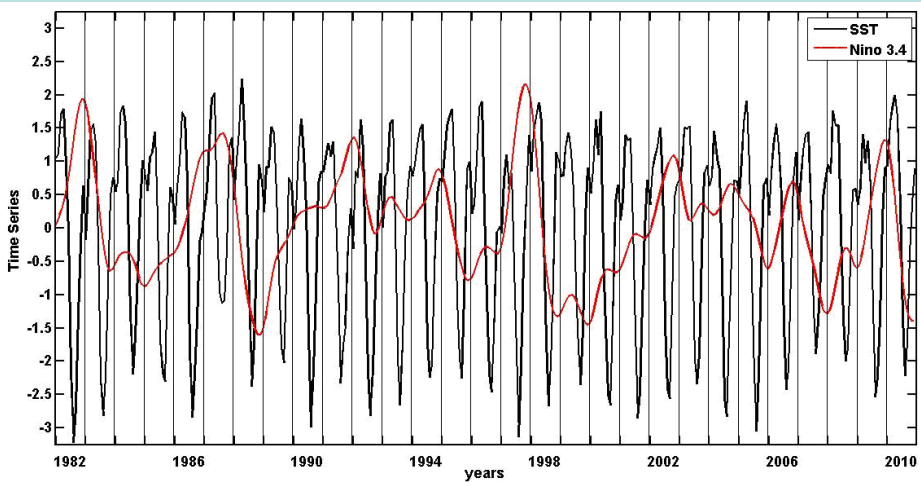
My research work is devoted to the Gulf of Guinea in the North Atlantic. I study the physical mechanisms of the seasonal coastal upwelling occurring in that region. Thanks to my NF-POGO formation, I now also look at how the physics of this upwelling can control phytoplankton blooms in that area and I share this experience with another NF-POGO scholar Anna Rumantseva, who is now involved in a PhD program in UK. As the first oceanographer in my lab of Physics of Atmosphere, I

have to work with atmospheric scientists studying the Ocean-Atmosphere interaction.

Summary of scientific work

Here is an example of my recent study about Variability of Sea Surface Temperature in the Northern Coast of Gulf of Guinea published in the Asian Journal of Applied Sciences (a full reference: E. Toualy, G. Stanojevic, K.Y. Kouadio and A. Aman, 2012. Multi-decadal Variability of Sea Surface Temperature in the Northern Coast of Gulf of Guinea., Asian Journal of Applied Sciences, 5: 552-562)

El Niño influences the climate over a broad region in the world and could shift the oceanic upwelling. The intensity of the upwelling at the northern coast of Gulf of Guinea (GG) is characterized by strong year-to-year variability with anomalous warming events that reach 1°C or 2°C some years, but how this event responds to natural climate-driven change in the physical environment still remains not well understood. The sea surface temperature (SST) from the Reynolds datasets of the last 3 decades (1982-2010) was analyzed to evaluate the long term variability of the coastal upwelling in July-September of the northern Gulf of Guinea and the influence of El Niño-Southern Oscillation (ENSO) on this phenomenon. This major coastal upwelling of GG is important for the marine ecosystem and the fisheries. It also influences the precipitation of the bordering countries. Lag relationship of 7-8 and 18 months was observed between the peaks of the strong El Niño (La Niña) events in the Pacific Ocean and the strongest warming (cooling) during summer at the northern coast of GG. Particularly, the strong cooling in July-September at the northern coast of GG occurred one year after the strong La Niña events in the Pacific Ocean. These results suggest that El Niño or La Niña events lead the SST variability at the northern coat of GG.

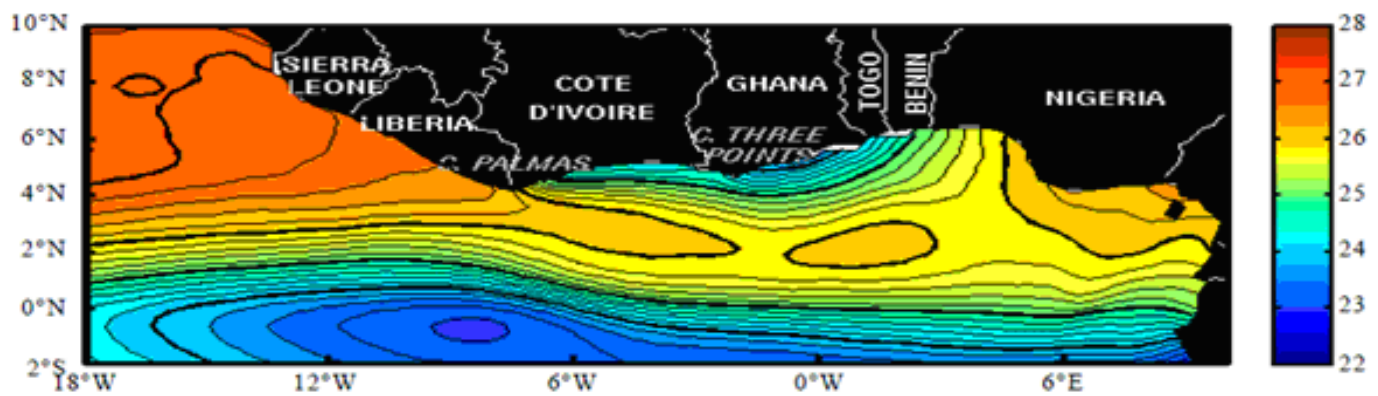


Monthly evolution of the detrended SSTs from the monthly time series of SSTs in the northern coast of GG (black curve) and the Nino 3.4 index (red curve). The best-fit line in the least-squares sense was removed from the time series data to compute the detrended SSTs. A 5-month running mean was applied to the Nino 3.4 time series

Collaborations

I have also participated in the study that used a regional atmospheric model to determine the main patterns of the climate of West Africa.

Yoroba F., Diawara A., Kouadio K.Y., Schayes G., Assamoi A.P., Kouassi K.B., Kouassi A., Toualy E., 2011. Analysis of the West African rainfall using regional climate model (MAR). International Journal of Environmental Sciences, 1: 1339-1349.



Horizontal distribution of the mean July-August of SST calculated over 29 years (1982-2011) from weekly SST (C) of Reynolds et al. (2002) datasets. Intervals between contours are 0.25C and the bold lines represent integer values

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Research Work

The Guanabara Bay System covers most of the metropolitan area of Rio de Janeiro, which has almost 12 million inhabitants and is the second largest city in Brazil. Recent developments such as the Metropolitan Arc (a highway ring surrounding Guanabara and Sepetiba Bays, deviating traffic from the urban areas) and the Petrochemical Complex of the State of Rio de Janeiro, as well as the increase of activities related to the oil and gas sector, are causing synergic increase in environmental impacts on the Guanabara Bay.

In partnership with the Geographic Institute (UERJ), we are carrying a project to study the Guanabara Bay and its watershed (http://www.comitebaiadeguanabara.org.br/). The main objective is the development of a geographic information system based on the Internet (GIS-Web). Environmental and social aspects will be clumped together in the database and will have broad social visibility. The main fronts are: research, education and social extension. Faculty and students of the university are working together to understand the main processes that are impacting the Guanabara Bay System with a multidisciplinary point of view. The GIS, being a communication tool, can carry information in both directions: from the Watershed Committee to the society and from the society to the Committee. The funding for this R&D project is provided by the Guanabara Bay Watershed Committee, which is a public and non-profit foundation, whose legal mission is to improve water resources management.

To optimize the water quality monitoring, radiometric measurements are being collected monthly (as well as water quality parameters). The strategy is the creation of regional bio-optical algorithms for monitoring the waters of the Guanabara Bay (and its plume) through satellite images. In the first step, we are collecting data to understand the main processes that changes the optical characteristics of the bay.

Research communications - NF-POGO Alumni

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Studying the effects of climate change on *Trichodesmium* in the Arabian Sea using mesocosms

Climate change is expected to affect marine ecosystems and biogeochemical cycles in several ways. Global average Sea Surface Temperature (SST) has increased by 0.6 °C over the last 150 years (Solomon et al., 2007). Recent climate projections suggested up to 6.4 °C increase in the global atmospheric temperature by the end of this century, thereby leading to a further warming of the surface ocean (Greene and Pershing, 2007). This will affect marine ecosystems profoundly, as stratification of the water column becomes stronger, leading to changes in the availability of nutrients (e.g., nitrogen and phosphorus) and light. It is also likely that sea surface warming will have pronounced direct effects on pelagic ecosystems and marine carbon and nitrogen cycles, as temperature is a major factor controlling the rates of biological processes (Brown et al., 2004). A clear relationship between temperature and phytoplankton growth is evident from several laboratory experiments (e.g., Eppley, 1972). Recent studies have suggested that anticipated increased temperature scenarios will have effects on the timing of the blooms, coupling of phytoplankton and bacterial processes as well as changes in food web dynamics (Sommer et al., 2008). However, most of these studies have not explicitly monitored biogeochemical dynamics.

Phytoplankton form the base of the marine food chain and are responsible for approximately half of the global photosynthetic carbon fixation (Falkowski et al., 1992). The community structure has profound effects on higher trophic levels and on ocean chemistry and productivity, thus playing an integral part in global biogeochemical feedback mechanisms (Selander et al., 2007). No community pattern in a given region is predictably constant over multiple years and shifts in oceanographic

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settings will imply effects on ecosystem level (Ptacnik et al., 2008). *Trichodesmium* is a cyanobacterial diazotroph, which is an important nitrogen fixer and their bloom occurs regularly in the Arabian Sea during spring intermonsoon. Nitrogen is a limiting nutrient for primary production in the surface ocean and most part of the reactive nitrogen is fixed in the ocean by *Trichodesmium*. Climate change scenarios as predicted by IPCC has the potential to impact the marine nitrogen fixation. Therefore, it is important to address the questions about how climate change effects (such as rise in temperature, decline in salinity) will impact on nitrogen fixation. In order to understand this, presently (during 16 March-5 April 2013) we are performing a mesocosm experiment in Mangalore (a coastal region surrounded by eastern Arabian Sea), India (Fig. 1). The major objectives of this project are to:

1. Experimentally test how *Trichodesmium* will respond to anticipated climatic changes.

2. Investigate the effect of temperature and salinity on marine carbon and nitrogen cycling in a natural plankton community. Estimates of N2 fixation by *Trichodesmium* and other microorganisms that have potential to fix N2.

Study Area

The Arabian Sea, western part of the northern Indian Ocean, provides an opportunity to carry out the objectives of the proposed project. Its present pelagic microbial communities, and the fate of them, are influenced by the regional and seasonal hydrographic settings , as well as by distant global oceanographic cycles. Hydrographic conditions are characterized by distinct seasonal variations controlled by the monsoon winds. The strong southwest summer monsoon induces coastal upwelling and supply nutrient-rich waters which promotes diatoms blooms (Luis and Kawamura, 2004). During the northeast winter monsoon the winds and surface currents change direction (Schott and McCreary, 2001), which induces convective mixing and triggers dinoflagellate blooms (Madhupratap et al., 1996). During the following months the sea is calm, and the concentration of nutrients is low in the surface water. Nitrogen-fixing cyanobacteria thrive under these conditions, and bloom formation is frequently observed (Gandhi et al., 2011). The Pacific El Niño Southern Oscillation (ENSO) affects regional SST (Ramesh et al., 2010). Seasonal variation in SSS is due to the inflow of low salinity waters from the Bay of Bengal during the winter monsoon, and copious precipitation during the summer monsoon (Singh et al., 2010). Invariably all marine zones are affected by climate change. However, the Arabian Sea is more exposed because climate projections suggest that precipitation generally increases in the areas of regional tropical precipitation maxima–such as the monsoon regimes of the SW coast of India (Bates et al., 2008; Singh et al., 2012). Several researchers from India and Sweden, including my Postdoctoral adviser Dr. Anna Godhe, who is also the project head of this mesocosm, are participating in this activity at Mangalore to understand several other aspects of the pelagic community structure in the climate change scenario in tropical oceans.

Figure 1 - Mesocosm experiment at Mangalore, India

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Research communications - NF-POGO Alumni

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I remember the day like it was yesterday. I was just back after a field trip when I received a call from Dr. Shubha Sathyendranath inviting me to visit PML as an academic visitor to work under her and Professor Trevor Platt on the validation and application of Indian Ocean colour sensor OCM-2 from 10th October, 2012 to 29th March, 2013. For me it was the most longed for phone call, after I wrote a

request letter asking if she could provide any opportunity to work under their supervision. Since attending their NF-POGO training programme in Hyderabad (February, 2012) it was my long cherished dream! Thanks to my parent institute NIO (National Institute of Oceanography) for coming forward and sanctioning deputation for the visit which helped to fulfill the dream.

Being majorly trained in observational and experimental oceanography the project on ocean colour that traversed OCM-2 on the sensor launched in September, 2009 was highly challenging for me, and I was ready to accept that. One of the major objectives in this project was the global validation of OCM-2 and to statistically compare its performance with other sensors such MODISA, MERIS and SeaWiFS. As a first step it required me to compile a comprehensive long-term database (1997 to 2012 December) synthesising global in-situ observations of radiometry and phytoplankton pigments. While doing that it became apparent that I needed to add Python in my programming repertoire to make the data compilation process more robust and efficient. The learning curve was not very steep thanks to some of the python wizards at PML who were always ready to help out. My acquaintance in spread-sheet programming language such as VBA (Visual Basic Application) came very handy towards this as well.

Next step was to process the level-1b data of OCM-2 global area coverage (GAC) products [freely available to be downloaded from NRSC (National Remote Sensing Centre, India) website (http://218.248.0.134:8080/OCMWebSCAT/html/controller.jsp)]. Once this was completed appropriate satellite L2 files were programmatically fetched which met date, time and coordinate criteria of in situ data points.

Pixel by pixel match ups were extracted by the ship-track option of SeaDas 6.4 and later independently by an Octave code specifically written for this purpose. Both these approaches agreed pretty well and a total of 89 matchup points were found out with the available satellite data as mentioned before. Statistical analyses and inter-comparison exercise are under process. Dr. P.V. Nagamani, scientist at NRSC and Dr. Shovonlal Roy, scientist at PML actively contributed in the global validation project of OCM-2. Not to mention my supervisors Dr. Sathyendranath and Prof. Platt who overall fostered and coordinated the project with their timely suggestions and strategic advice so that I could never be off the track.

I also worked on a prospective application area of OCM-2 majorly based on regional algorithm development, diatom contribution, phytoplankton phenology and its impact on higher trophic level with respect to the river discharge in the Godavari river plume in Bay of Bengal (writing of a research proposal under progress). PML remote sensing colleagues gave great feedback while I presented the initial results in a group meeting.

The entire tenure was so much engrossing that I barely understood how I could have spent six months in PML. It was so much fun being surrounded with the fantastic and always helpful colleagues such as MarieFanny Racault, Stephane Saux-Picart, Mike Grant, Bob Brewin, Peter Miller, Steve Groom. So also I can't forget motherly affection of my house owner Jan Kirsop Taylor at Rusty Anchor guest house who made me feel at home from the day one with her love and affection. Thanks also to Laura, Vikki and Sophie for their friendly approach. Miss those days when I had the opportunity to celebrate with all of them during Christmas and New Year party, group lunch, dinner invitations, coffee breaks, charity walk and the list may go on and on.

Prof. Trevor Platt, Tamoghna and Dr. Shubha Sathyendranath at Plymouth Marine Laboratory

When I retrospect I find that I gained so much from the academic perspective as I got the opportunity to witness a different work culture and environment, could attend highly stimulating MMC lectures by the prominent scientists and was able to interact with other researchers during poster and brain storming sessions for exchanging and generating ideas. This visit also helped me to grow as a better human being since I had the chance to exchange and share our cultures and coming up with this feeling that at the end of the day we are ultimately a part of a very big family. This visit will be memorable forever!!

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Background

I am working as a Research Officer at the Oceanography Division of National Aquatic Resources Research and Development Agency since 1993. In 2009, I was awarded a scholarship by the Sri Lanka Council of Agricultural research Policy (SLCARP) to carry out my Ph.D. at Central Institute of Fisheries Education (CIFE), Mumbai, India. The research on the assessment of persistent organic pollutants (POPs) in the marine environment was carried out at the Aquatic Environment and Health Management Division (AEHMD) of CIFE under the supervision of Dr. C. S. Purushothaman (Principal Scientist and Head/AEHMD). I completed my PhD studies in March 2013. My research interest is the management of the coastal marine environment focusing on plankton dynamics, physical oceanographic processes and water quality in relation to fisheries and pollution.

Organic micro-pollutants in the coastal area of Mumbai, India

Organic micro-pollutants are a set of chemical substances that persist in the environment, they undergo long-range transport, bioaccumulate through the food chain, and pose a risk of causing adverse effects to human, wildlife and the environment. The beached plastic pellets were used as passive samplers to evaluate the organic micro-pollutants in coastal area of Mumbai, India including accumulation of these substances in inter-tidal sediment of the coast during May 2011 to March 2012. Sediment and plastic pellet samples were collected and analysed for seven polychlorinated biphenyls (PCBs), 16 organochlorine pesticides (OCPs) and 16 polycyclic aromatic hydrocarbons (PAHs) by gas chromatography. The study confirmed that organic pollutants are higher in plastic pellets than in sediment. The importance of plastics as a sorbent material to sorb hydrophobic contaminants has been demonstrated.

The significantly higher concentration of PCBs in plastic pellets and sediment was reported in November during the post-monsoon. However, the spatial variation was not significant for PCBs in pellets among the study sites due to the mobility of floating resin pellets in a relatively small study area. Further, the mixing process also might have affected the spatiality of PCBs. However, spatial variation was significant for PCBs in sediment showing significantly high concentrations in sediments from the Versova and Dadar beaches. The lower chlorinated compounds (PCB-28 and PCB-52) were detected at the highest concentrations in pellets and sediment.

Figure 1 - Plastic pellets collected for analysis of organic pollutants

Among the 16 OCPs studied, γ-HCH (lindane) was present at the highest concentration in pellets followed by heptachlor. α-HCH was recorded at the highest concentrations followed by γ-HCH in sediments. These compounds might be extensively used for vector control in India. Moreover, total HCH concentration was higher than that of the total DDTs in pellets and sediment. Though ΣOCPs and ΣHCHs did not vary significantly among the months and sites, ΣDDT varied significantly in space and time in pellets. However, significant temporal variation was found for ΣOCP, ΣHCH and ΣDDT in sediment. Significantly high concentration in November and increasing trend of ΣOCP concentration from May to November can be attributed to the monsoonal impact.

Significantly high concentration of DDT in pellets in January could be correlated with the high usage of DDT for post-monsoonal mosquito control. Significantly high levels of DDT in the pellets at Dadar indicate the high concentration of DDT in Mahim Bay which receives large quantities of industrial and domestic waste water via the Mithi River and the Mahim Creek, particularly during monsoon. The predominance of DDT in sediment over its metabolites indicated the recent application of parent DDT.

The 16 PAHs of the priority list of the USEPA showed substantially higher mean ΣPAH concentrations in the pellets at Mumbai beaches compared to the sediment. The PAH contamination is comparatively low in the intertidal beach sediment due to its sandy texture and low total organic carbon (TOC).

However, significant correlation was observed between TOC and ΣPAH. The concentration of fluorene was found to be the highest in pellets and sediment. However, phenanthrene and anthracene were found as the most dominant PAHs with more than 95% of detection in pellets. In sediment, naphthalene was found to be the most dominant PAH with 100% frequency of detection followed by anthracene, acenaphthene and fluorene. The temporal variation was significant for ΣPAHs

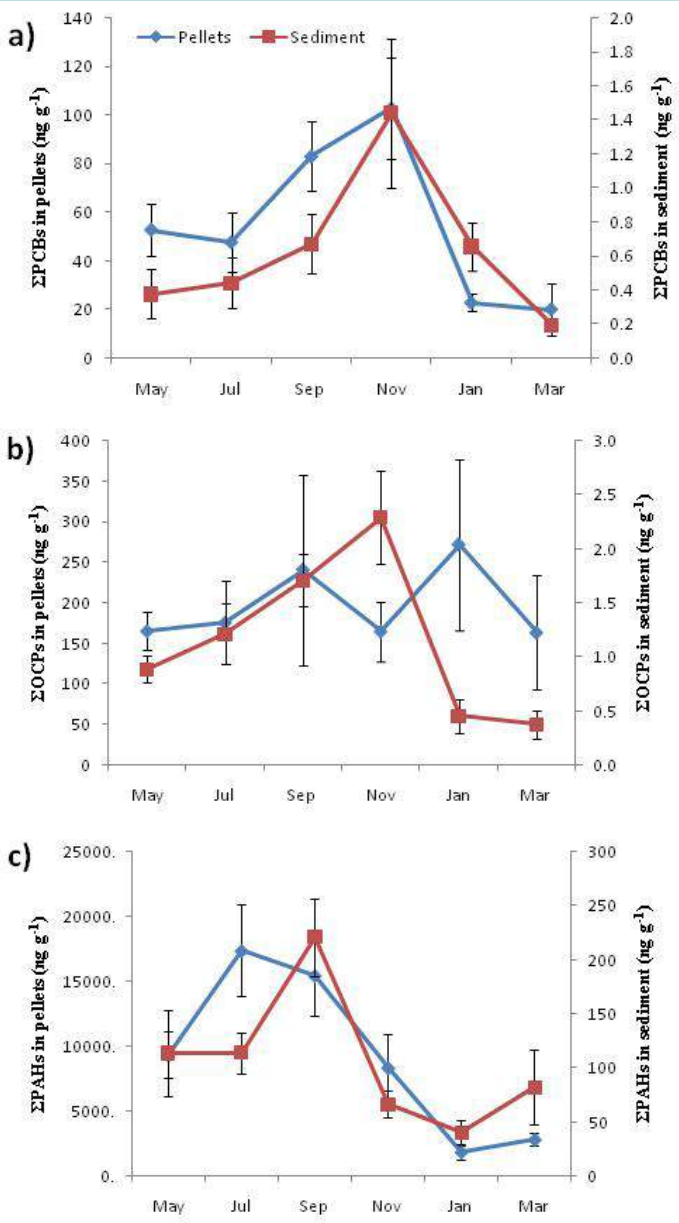

Figure 2 - Bimonthly variability of organic micro-pollutants in marine plastic pellets and sediment from Mumbai coastal area from May 2011 to March 2012 a) ΣPCBs b) ΣPAHs c) ΣPAHs

over pyrogenic ones in the area. HCH, DDT, PCB and PAH concentrations were generally low in comparison with the other coastal environments of Asian and other countries indicating that beaches were not grossly polluted by organic contaminants. However, ecotoxicological impact by some OCPs was revealed in the intertidal area of Mumbai. Further, it can be inferred that there is no toxic effect of PCBs and PAHs in the beach sediments of Mumbai.

Significant correlations were found between PCB and PAH in sediment and plastic pellets. In general, identical temporal and spatial trends were observed for organic micro-pollutants in plastic pellets and sediments due to similar sources and factors which govern the organic pollutants contamination. Further, the contamination by organic pollutants is comparatively high in Versova and Dadar beaches.

and ΣLPAHs (low molecular weight PAHs) in pellets and sediment while spatial variation was significant for ΣHPAHs (high molecular weight PAHs) in pellets. The significantly high concentration of ΣPAHs in July followed by September can be correlated with the two oil spills that occurred in July and August near the Juhu beach.

Significantly high ΣLPAHs in July and September confirmed the impact of oil spills on the accumulation of PAHs in pellets. However, significantly high levels of ΣHPAHs in pellets were observed in Versova due to its semi-enclosed nature with restricted water exchange. Further, Malad Creek which enters into the coastal area of Versova might have brought in land based PAHs. In sediment, significantly high concentrations of ΣPAHs and ΣLPAHs were found in Versova and Dadar beaches. The PAH distribution index of ΣHPAHs to ΣLPAHs revealed that those of petrogenic origin PAHs predominated

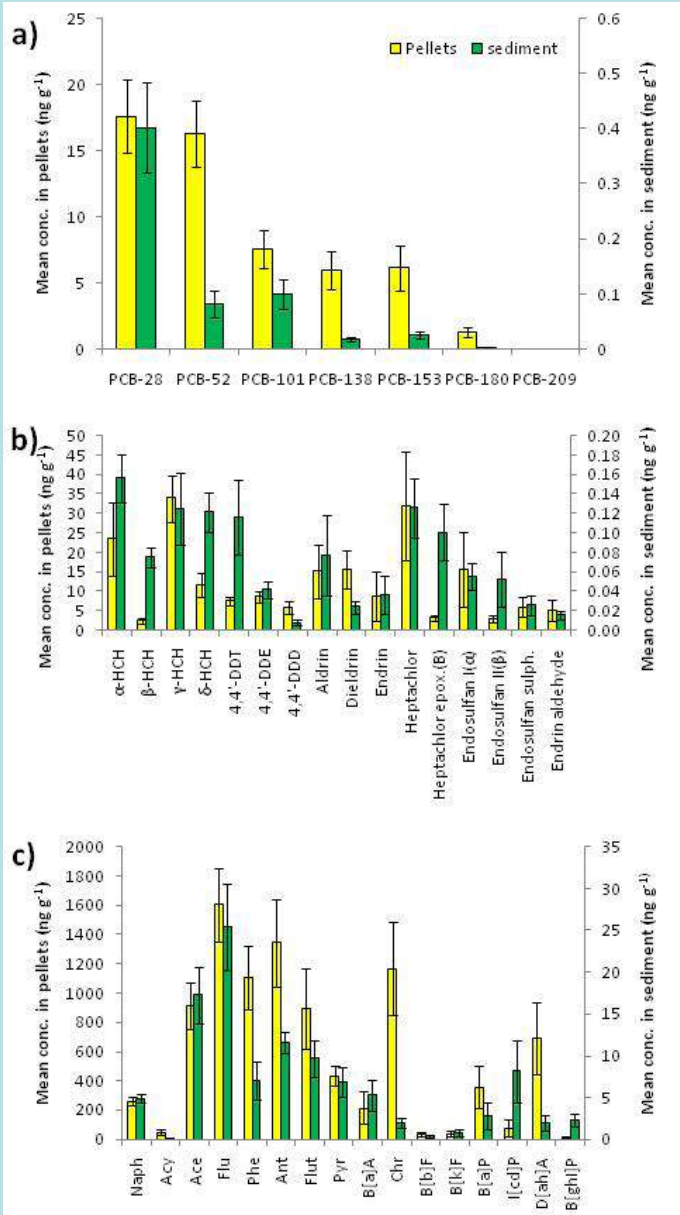

Figure 3 - Concentration (mean±SE) of organic compounds in plastic pellets and sediment (n=72) a) PCBs b) OCPs c) PAHs

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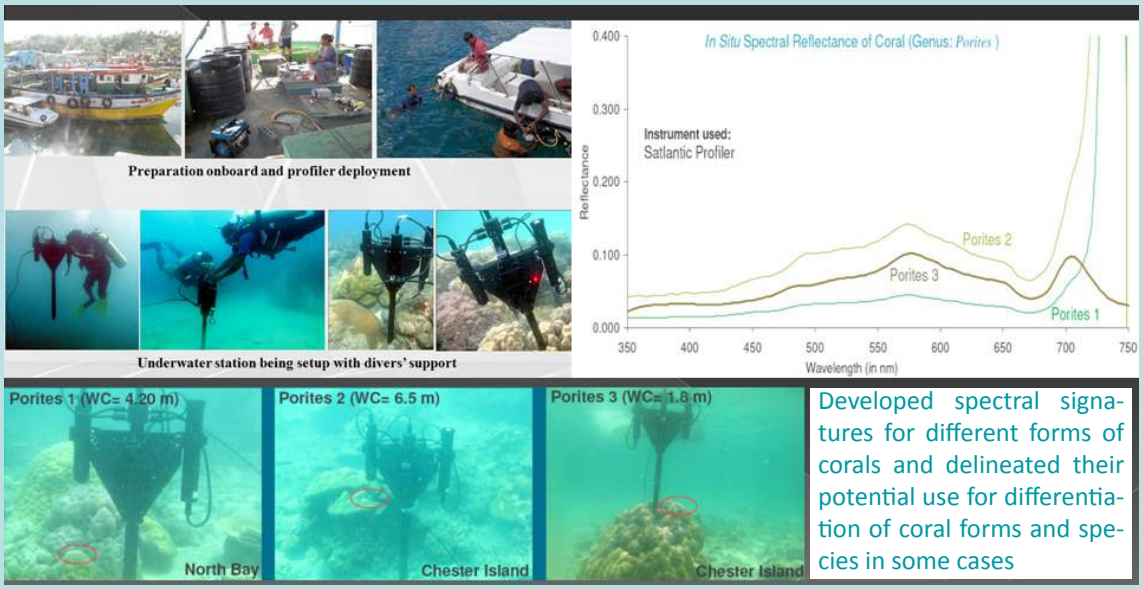
Research and career after attending NF-POGO visiting Professorship at Kochi – pleasant memories to retrospect

Being a Junior Research Fellow in Life science at National Institute of Oceanography (NIO), Goa; I was still at awe with respect to the numerical modeling works which Dr. Vethamony, my guide at NIO suggested for fish larval transport studies for my doctoral research. It was during this initial phase of my doctoral research that I could participate in the NF-POGO training during December 2004 to March 2005 at NIO, RC, Kochi. My NF-POGO training during the visiting professorship of Dr. Trevor Platt and Dr. Shubha Sathyendranath was indeed a pleasant experience and helped me in my research career. On the very next month of completion of training, I was selected as a Scientist and started working at Fisheries Science Division of Central Agricultural Research Institute located at Port Blair, in the beautiful archipelago of Andaman and Nicobar group of Islands.

The training received during the NF-POGO visiting professorship also earned me a few grants to start up a career in the field of fisheries oceanography utilizing satellite retrieved data, modeled and in situ ocean data and its link to fisheries. Over a span of 7 years in the islands I will be associating projects relating to these study areas. During this period, our research could publish a concept of algal biorefinery-based industry as an approach to address fuel and food security for a carbon-smart world (Subhadra and Grinson, 2011). Satellite retrieved parameters were effectively utilized for identifying organic carbon biomass in dynamic ocean fields for assessing fishery resources. Chlorophyll data from SeaWiFS could establish the putative trophic link of oil sardine (Grinson, 2012), IRS – ocean colour data and NOAA SST data integrated potential fishing zone forecasts were proven to be guiding fishermen to the right zones without scouting efforts (Grinson, 2012) and we could establish a relationship between mesoscale oceanographic features and pelagic fisheries of Andaman and Nicobar Islands (SARAL- ALTIKA programme). Coral reef resources which are areas of high productivity have been challenged by climate change and their role as oceanic carbon sinks prompted for few studies on reef health assessment supported by transect surveys and satellite retrieved data (Krishnan, 2010, 2012). Spectral signatures for a few coral species could be worked out using radiometric measurements in collaboration with Space Applications Centre, Ahmedabad. Vulnerability status of Nicobar group of islands has been worked out which formed part of National Action Plan for Climate change. In the meantime, I could complete my Doctoral research at NIO, Goa. Numerical modeling has been utilized effectively in this study to establish the larval transport of fishes along gulf of Kachchh and Mangalore coastal waters (Grinson, 2011). This model was utilized for assessing barnacle larval movement and settlement along the coastal and estuarine waters of Goa (Chetan 2012). Presently I am working as Senior Scientist at Central Marine Fisheries Research Institute at Kochi.

Ongoing research programme

Assessment of marine resource potential off Indian EEZ has been a vital task to be carried out before crucial planning interventions of the government. The marine domain is peppered with biota having a direct and indirect role in deciding the potential of the EEZ. The resource domain and its extent of spread is an unknown entity, predictions based on indices obtained on shore have played a major role in assessing the marine resource potential. The advent of technologies like remote surveillance of marine areas is more approachable on a synoptic scale. Established models link resource dynamics and habitat dynamics vis-à-vis fin



Developed spectral signatures for different forms of corals and delineated their potential use for differentiation of coral forms and species in some cases

fishes. But comprehensive models covering the entire gamut of physiological, habitation and climatic factors leading to a forecasting paradigm is a new avenue to be tried especially under the tropical conditions in which Indian EEZ falls. Chlo-RIFFS (Chlorophyll based remotes sensing assisted Indian Fisheries Forecasting System) is the flag-ship programme for CMFRI during 2012-17 plan period. Primary production modeling will be one mechanism to assess the organic carbon production in the sea. The Institute has a long history of focusing on the "Eltonian Pyramid" and the conversion of primary productivity wealth as an estimator of resource abundance. CMFRI has been collating information on the three major fronts: (a) resource abundance (its alibi- catch and effort) (b) Primary productivity data and (c) climatic parameters. These coupled with the secondary data from internationally renowned databases could serve in translating into a workable model of resource forecasting.

Research communications - NF-POGO Alumni

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Fading taxonomy: cause for concern

Biological organisms are defined on the basis of shared morphological characteristics. The discipline of giving names to organisms on this basis is called taxonomy. The word 'taxonomy' originated from the Greek word 'taxis' (meaning 'order' or 'arrangement') and 'nomos' ('law' or 'science'). In simple terms, taxonomy is a practice of arranging or ordering organisms following scientific laws.

"Without taxonomy to give shape to the bricks, and systematics to tell us how to put them together, the house of biological science is a meaningless jumble" (R.M. May, 1990, Nature).

In the contemporary ocean, the importance of taxonomy has moved beyond the context of diversity, tracking of extinct species and endangered organisms, to aspects like invasive species, community response to climatic changes, species-specific adaptation potentials and their role in ecosystem functioning, biomedical research, bio-fuel industry to food industry. All these aspects cannot be understood completely without the light of taxonomic knowledge. In fact, failure in taxonomic detection in fields relating to the last 3 aspects cause serious damage to the health of ecosystems as well as economic losses.

In recent years, the taxonomy field is fading. It is losing its luster for the present generation of young researchers. Opinions vary as to the possible reasons for this trend. Firstly, it is a time-consuming job involving laborious work. Secondly, it translates into slow publications having low impact factor. Thirdly, it is difficult to get funding for taxonomy-based projects. Fourthly, the fascination for molecular biology may also be a factor. The fact remains that taxonomy is no more a hot topic among new researchers.

In the present context, I would like to discuss the status of phytoplankton taxonomy in Indian waters. The period between 1940 -1990 was a golden era in the Indian phytoplankton taxonomy field and it was brought about largely by Profs. R. Subrahmanyan, T. Desikachari and C.P.Gopinathan. The work carried out by them has been referred to worldwide. Unfortunately, the subsequent period could not sustain the same interest and, thereafter, less work has been published based on systematic taxonomy of phytoplankton. India has approximately 7,500 km of coastline which berths several institutes and universities, which carry out ocean-related studies; few of these organizations are involved in phytoplankton taxonomy studies. Most of the taxonomists involved in these studies are young and new to this field. They have difficulties in learning/applying the systematic approaches of taxonomy. A few within this group have been lucky to get global exposure to upgrade their knowledge. This happened through visits to the world's leading laboratories with the support of different funding programmes. I am one among them that got the chance to upgrade my knowledge in phytoplankton taxonomy under the POGO-SCOR fellowship.

Right now is not the time to measure who is lucky and who is not, but now is the time to share that upgraded taxonomic knowledge among all other taxonomists (via online forums and/or email) and build a solid network of taxonomists so that even in the absence of one or two, there will not be a vacuum of taxonomy expertise in future generations.

Taxonomists are getting extinct and before they fall under the 'endangered' category, I strongly propose the establishment of the Indian Taxonomist Network (ITN) not only for phytoplankton taxonomists but for all other subjects.

Meeting announcements

Croucher Summer Course - Climate Change and Marine Ecosystems
Hong Kong University of Science and Technology
17-21 June 2013

Oceans play a vital role in the global carbon cycle by acting as a sink for the atmospheric CO2. On the other hand, global warming and ocean acidication has a profound effect on marine organisms and the integrity and function of marine ecosystems. In this rst summer course of this series, we will focus on the microbial food web dynamics under changing climates. Both experimental and modeling approaches will be covered.

Deadline
31 May 2013

Contact: marinesc@ust.hk
www.marinesummercourse.ust.hk

Operational Oceanography: Synoptic Views of the Sea
Ocean Teacher Academy Training course, Oostende, Belgium
9-13 September 2013

This course will demonstrate the data resources available from operational programs, which can be assembled, synthesized and displayed in public-domain software platforms. The data for the course will be taken from the most recently available date (usually within the past 0-3 days) to demonstrate the enhanced value of multiple, overlapping observing systems. The parameters to be synthesized include winds, waves, currents (Eulerian and Lagrangian), surface/at-depth temperature, surface/at-depth salinity, surface height, pigments, primary productivity, coastal visual imagery, major storm track predictions (when present), and ice. Satellite-sensed, in-situ measured and modeled parameters are included, as appropriate.

Deadline
8 June 2013

Contact: claudia.delgado@iode.org
http://classroom.oceanteacher.org/

21st International Symposium on Environmental Biogeochemistry
Wuhan, China
13-18 October 2013

The conference was sponsored by the "International Society for Environmental Biogeochemistry (ISEB)" a newly established society. ISEB is mainly devoted to the development of scientific knowledge, application and training in the fields of interdisciplinary approaches to better know the terrestrial and aquatic environments. The conference will provide a forum for researchers, professors and engineers working in the fields of environmental sciences, microbiology, chemistry, soil science, geoscience, limnology, ecology, marine and atmospheric sciences both from fundamental and applied perspectives.

Deadline
30 June 2013

Contact: qyhuang@mail.hzau.edu.cn; tanwf@mail.hzau.edu.cn
http://iseb21.hzau.edu.cn/

34rd Asian Conference on Remote Sensing (ACRS 2013)
Bali
20-24 October 2013

The Conference is organized by Indonesian Society for Remote Sensing (ISRS/MAPIN) and Asian Association on Remote Sensing (AARS). Holding the theme "BRIDGING SUSTAINABLE ASIA", we offer you the festive of science, education, nature and culture in our togetherness.

Deadline
31 May 2013

Contact: secretariat@acrs2013.com
http://www.acrs2013.com/

15th POGO Annual Meeting
CSIRO and IMAS, Hobart, Australia
22-24 January 2014

The next annual POGO Meeting will take place in Hobart, Australia between 22-24 January 2014. The meeting will be jointly hosted by CSIRO and IMAS.

We will be adding information to the POGO website so please check this periodically for updates:
http://ocean-partners.org/meetings-and-workshops/meetings-and-workshops/pogo-15

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