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- NF-POGO Alumni Network for Oceans -

NF-POGO Alumni E-Newsletter – Volume 16, May 2019

Making lifelong connections at sea

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NF-POGO Alumni E-Newsletter – Volume 16, May 2019

This issue:

Cover photo by alumnus Lilian Krug
Portuguese Man-o-war at Calhau Beach, São Vicente Island - Cabo Verde.

From the Editorial Board

Welcome aboard the 16th NANO news!

This issue brings to you a broad array of interesting topics. As a start, the organisers Lilian Krug, Sophie Seeyave and Fiona Beckman keep us updated on the participation of NANO and POGO in the most recent conferences and meetings.

We are also going to meet the ten young marine scientists selected for the 2018/2019 NF-POGO Centre of Excellence at the Alfred Wegener Institute (the "POGOnians"), and some of the fellows who took part in the POGO shipboard training programme. These folks come from all over the world, and tell us about themselves, their great adventures and expectations for the future.

This issue also brings two research articles. One is a contribution of Noir P. Purba, a CofE scholar from Indonesia, on the development of a Lagrangian drifter with physicochemical sensors for real-time water quality monitoring. Dr. Lailah Akita, who has been a NANO member for more than ten years, leads the second contribution, which is on the macrobenthic fauna of sandy beaches in upwelling regions.

Further up in this issue, Meri Bilan gets us inspired with an interview full of kindness and wisdom of a pioneer marine researcher in the Azores, Dr. Helen Rost Martins.

We hope you enjoy the sailing!

Mariele Paiva

Editor-in-chief

NANO Participation at COP-24

Lilian Krug
Collaborator, NF-POGO Alumni for Oceans
Alumnus profile: https://nf-pogo-alumni.org/profile/Lica+Krug/

COP24·KATOWICE 2018
UNITED NATIONS CLIMATE CHANGE CONFERENCE

COP-24 is the informal name for the 24th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The Conference of the Parties (COP) is the main body of the UNFCCC, integrated by representatives of the Parties to the Convention. Currently, there are 197 Parties (196 States and 1 regional economic integration organization) composing the COP.

In 1992, after RIO1992, the COP acknowledged that '*change in the Earth's climate and its effects should be a collective concern of humankind*' and defined as the ultimate objective of the Convention '*to achieve, in accordance with the relevant provisions of the Convention, stabilization of the greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*'. Since 1995, the COP is held annually to take decisions in order to ensure the effective implementation of the provisions of the Convention and to review the implementation of these provisions.

Occurring alongside the COP, side events and exhibits allow observers to interact with Party delegates and other participants. For the second consecutive year, POGO, together with Plymouth Marine Laboratory (PML), BIOACID (A GEOMAR-led project), the UK Ocean Acidification Research Programme and the Global Ocean Acidification Observing Network (GOA-ON), hosted an exhibition stand entitle Oceans of Impact. The objective of the exhibit was to draw attention to the four major stressors on the world ocean – Acidification, Warming, Deoxygenation and Sea Level rise.

POGO invited members of NANO to join the exhibition stand and interact with the visitors explaining how scientists collect and analyze ocean data, providing evidence to drive stakeholders and policy makers to take action. NANO members Marwa Baloza, Babette Tchonang, Mohammad Uddin, Kirill Kivva, and myself, were able to network with delegates from all over the world including high-level delegates such as UK Parliamentary Under Secretary of State for the Environment Dr. Therese Coffey and the Secretary of the Ministry of Environment and Forests of Bangladesh, Mr Abdullah Al Mohsin Chowdhury.

POGO also co-hosted a Side Event on "Enhancing ocean and climate observing in developing nations using low-cost technologies and capacity building", in collaboration with an NGO in Bangladesh, "An Organisation for Socio-Economic Development (AOSED)", and participated in the Side Event "The challenge of a changing Pacific Ocean: understanding impacts, observing networks and building capacity to inform policy".

The general experience was very rewarding, as we could not only witness the discussions to fight climate change, and the incredible number of people who are working hard to transform the words into actions, but could actively participate in the conversation.

To learn more: https://cop24.gov.pl/; https://www.pml.ac.uk/News_and_media/Oceans_of_

Left to right: Mr Abdullah Al Mohsin Chowdhury (third from the right), Secretary of the Ministry of Environment and Forests of Bangladesh and the Bangladeshi delegation; UK Parliamentary Under Secretary of State for the Environment Dr Therese Coffey, NANO members, Ms Thecla Keizer (PML) and Dr Carol Turley (PML); The side event "Enhancing ocean and climate observing in developing nations using low-cost technologies and capacity building", chaired by POGO's CEO Dr Sophie Seeyave (left).; Ms Laura Ruffoni (POGO) and NANO members at the Oceans of Impact exhibit stand.

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20th POGO Annual Meeting

Sophie Seeyave[1], Fiona Beckman[2], Lilian Krug[3]
[1]Chief Executive Officer, POGO
[2]Communications Officer, POGO
[3]Collaborator, NANO

The 20th POGO Annual Meeting (POGO-20) was held from 21-25 January 2019, hosted by the Instituto Nacional de Desenvolvimento das Pescas (INDP) and the GEOMAR Helmholtz Centre for Ocean Research Kiel, at their newly inaugurated joint research venue, the Ocean Science Centre Mindelo (OSCM) on the island of São Vicente, Cabo Verde.

The meeting location was strategically chosen in line with POGO's current focus on bringing in African countries to contribute to the global ocean observing agenda, and to become members of POGO. Thus, representatives of institutions and universities in Benin, Côte d'Ivoire, Ghana, Nigeria, Senegal and Tunisia were present and provided valuable insights into the needs and priorities of northern and western African countries.

Topical sessions in POGO-20 included "Mineral-dust fertilization of the marine environment and its consequences for the carbon cycle", "Sustained observing in the South Atlantic Ocean and beyond", "Ocean observing technology and sensor development", a lunch Side Event on Capacity Development and a 2-day workshop for the "Open Access Marine Observation Devices" (OpenMODs) project. Other sessions included updates on POGO activities, and presentations by partner organizations and by new POGO members.

Four new members joined POGO in 2018: Instituto Nacional de Desenvolvimento das Pescas (INDP), Cabo Verde; Instituto de Investigaciones Marinas y Costeras (INVEMAR), Colombia; University of Algarve, Portugal; and Leibniz Centre for Tropical Marine Research (ZMT), Germany. During the meeting, an additional 3 members applied and were accepted as new members of POGO: a Consortium consisting of Institut de RecherchesHalieutiques et Océanologiques du Bénin and International Chair in Mathematical Physics and Applications (ICMPA-UNESCO Chair), Bénin, as well as two new members from Canada, Ocean Networks Canada (ONC) and the Ocean Frontier Institute (OFI). These recent additions represent a total addition of 5 new countries to POGO's membership, a testament to POGO's renewed efforts to increase its global outreach and inclusiveness, particularly of developing countries.

A very special moment during the 20th POGO meeting was the succession of the Chair. The outgoing Chair, Prof. Karen Wiltshire, Deputy Director of the Alfred Wegener Institute in Germany, handed over to Prof. Nick Owens, Director of the Scottish Association for Marine Science (SAMS). Prof. Owens thanked Prof. Wiltshire, on behalf of all POGO, for all her hard work, passion and dedication over her four-year term.

In total, the POGO-20 Meeting brought together 86 delegates from 25 countries. Among the participants, NANO alumni Dr. Houssem Smati and Dr. Kirill Kivva deliver presentations on NANO Global projects , Dr. Subrata Sarker presented two areas in Bangladesh as possible ocean observation sites for the OpenMODs project and NANO friend Dr. Eva Brodte, NF-POGO Centre of Excellence Scientific Coordinator, delivered a presentation on NF-POGO AWI Capacity development in ocean & climate science.

The next POGO Annual Meeting will be hosted by the First Institute of Oceanography (FIO) and the Qingdao National Laboratory for Marine Science and Technology (QNLM) in China, from 20 to 22 January 2020.

Participants of the 20th POGO Annual Meeting (A. Villwock, GEOMAR).

NANO members at POGO20 (F. Beckman, POGO).

Meet the new Pogonians

POGOnians year 10 (2018 - 2019)

Alumni profiles available at https://nf-pogo-alumni.org/programs/centre-of-excellence/cofe-1819/

Since 2008, each year ten young scientists are selected to take part in the 10-months NF-POGO Centre of Excellence in Observational Oceanography. The course includes one month of formal introductory training, followed by more detailed courses on core skills and specialized scientific topics such as modelling, remote sensing, ocean-atmosphere interactions, as well as training in instrumentation, sample collection and analytical protocols. Additionally, they conduct an independent research project during the programme. The ten dedicated young scientists from the 2018-2019 batch are introduced in this section.

Hind Azidane (Morroco)

Hind is the first POGOnian from Morocco. In 2009 she started her bachelor programme in Building Materials in Ibn Tofail University. Her bachelor thesis, completed in 2011, is entitled "Cement manufacturing going from the exploitation of the raw materials until its packing and its storage". She also studied the effects of admixtures on the quality of cement in laboratory. For her Master degree in exploitation and exploration techniques for Georesources (Ibn Tofail University of Morocco, 2011-2013), Hind studied the impact of quarries near national drinking water reservoirs. These are located in areas that are particularly vulnerable to pollution because of the high permeability and the shallow depth of the groundwater. She used ArcGIS to manage all data related to the study site.

As a graduate researcher who has previously been involved in diverse research areas, she proceeded to specialize in oceanography, which is usually a male dominated field in Morocco.

She was very eager to find her place in this field and as a result, she started her PhD in marine geosciences at Ibn Tofail University in Kenitra, Morocco. During her PhD, she conducted risk assessment analysis, erosion rate, beach profiling studies as well as shoreline change analysis along the Kenitra coastline. She also simulated the sediment transport processes and coupled tidal processes with wave-induced circulation. Moreover, she carried out coastal vulnerability and adaptation studies in order to understand the effects of climate change in terms of sea level rise and erosion impacts on coastal communities and to contribute to ongoing climate change studies.

During her bachelor's, Master's and PhD programmes, Hind has developed various skills and techniques such as interpolation of elevation data by Triangular Irregular Network (TIN), treatment of aerial photographs and statistical analysis to determine beach sediment properties (e.g., mean grain size, sorting coefficient, skewness and kurtosis).

She has presented her research in different conferences and training programmes, increasing her knowledge in a wide range of skills and concepts. For her experience at the CofE, Hind expects to increase her knowledge on oceanographic research and develop her English skills. Thus, this training represents a valuable opportunity for her to be a first female with this specialty in Morocco.

Ivan Ryzhov (Russia)

Ivan is a research assistant in the Department of Oceanography at the AARI (Federal State Budgetary Institution "Arctic and Antarctic Research Institute") in Russia. He is also involved in the Nansen Fellowship Program at the Nansen Center in St. Petersburg. Ivan holds a Bachelor degree in Geology from the St. Petersburg State University (Russia) and a M.Sc. degree in Marine Geoscience from the University of Bremen (Germany). Between 2017 and 2018, he attended the NF-GEBCO Postgraduate Certificate in Ocean Bathymetry (PCOB) training, which was hosted by the University of New Hampshire, USA.

Ivan believes the more you know, the better specialist you are. He says the CofE training programme attracted his attention because it offers an opportunity to participate in interdisciplinary research that performs investigations in different fields and gives a broad view to the ocean science, delivered by researchers who are pushing this science further. He hopes that the NF-POGO CofE programme will help him build a strong scientific base in Oceanography. Another expectation Ivan has for the training is related to networking. People with whom you spend a year in a very intensive and taught condition, helping and supporting each other, usually become friends, he says. Moreover, teachers, graduate students and other people associated with the programme are an invaluable source of knowledge and help for the scholars. Ivan believes he will be able to accomplish all goals set in the NF-POGO programme and handle all responsibilities associated with it.

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Estela Monteiro (Brazil)

Estela holds a first degree in Oceanography from the Oceanographic Institute of the University of São Paulo, Brazil (2013-2018). During these years, she worked in three main projects: i) morphometry and small cetacean's bycatch in fishing gear (e.g. *Sotalia guianensis*, *Pontoporia blainvillei*, *Stenella frontalis*) in the coast of São Paulo; ii) ecological and biological aspects of the lifecycle of the nudibranch *Berghia stephanieae*, including its relationships with Symbiodinium and aquacultural procedures to optimize its commercial culture; and iii) genetic characterization of the polychaete family Paraonidae in pockmarks of the continental shelf off the coast of São Paulo. During her bachelor, she also worked as Teaching Assistant for Marine Vertebrates courses, participating in theoretical classes and elaborating laboratory activities. She has earned experience in environmental education projects, where she had direct contact with several audiences (children and adults), and learned how to articulate science in a broader manner to the general public.

Her expectations for the NF-POGO CofE program include improving her knowledge on data analysis and modelling, which would help her plan and execute her master's degree, for which she is currently preparing herself, and building her network.

Anthony Ndah (Cameroon)

Anthony identifies himself as an interdisciplinary scientist from southwest Cameroon. He has a BSc in Geography from the University of Buea (Cameroon), an MSc in Marine Affairs from the Xiamen University (China), and a PhD in Environmental Studies from the University of Brunei Darussalam (Brunei). Currently, he is a research assistant at the Institute of Asian Studies, and an assistant lecturer of Integrated Coastal Management and Environmental Systems Dynamics. His research interests consist of ocean-atmosphere interactions, marine bio-geochemistry, and carbon dynamics. In 2018, Anthony attended the International Summer School on the Polar Climate System in Hohai University (China), where he learned more about cryosphere research and the effects of contemporary changes at the poles.

Anthony is excited to enhance his knowledge through hands-on experiences and skills in observational oceanography, instrumentation, laboratory methods and GIS tools.

Charaf M'Rabet (Tunisia)

Charaf is from Bizerte (Tunisia), the northernmost city on the African continent. Her studies are focused on environmental impacts over the marine ecosystem (climate change, eutrophication, pollution, and contamination). She holds a baccalaureate degree in Nature Sciences and Applications and an engineering degree in Halieutics Engineering and Marine Environment by the National Agronomic Institute of Tunisia (INAT). At INAT, Charaf worked on the impact of mauve stinger jellyfish *Pelagia noctiluca* proliferation on farmed fish (gilthead seabream *Sparus aurata*), under the European project "MED-JELLYRISK" (ENPI CBCMED Project; Ref: I-A/1.3/098).

These first years of experience broadened her horizons and motivated her to pursue a research career. In 2015, she joined a PhD programme at INAT in collaboration with the French Institute for Research and Development. In her PhD project, Charaf is interested in the ecotoxicological answer of phytoplankton exposed to plastic-derived chemicals. She aims to be a competent and reliable researcher in her field of study and believes the CofE programme will help her to achieve her goals, by making her a qualified researcher with a consistent profile that can generate in-depth research. A qualified multidisciplinary profile in the scientific field is in high demand in research centres, national and international organisations. Charaf believes that undergoing extensive multidisciplinary training in oceanography will greatly assist her proficiency and complete her knowledge.

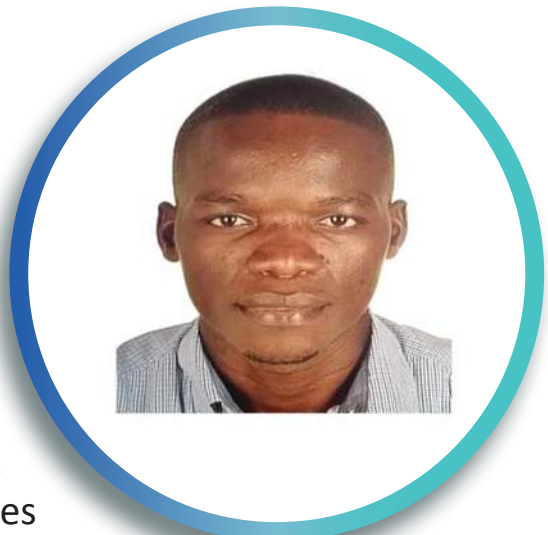
Noir Purba (Indonesia)

"*Cogito, ergo sum*" means "I think; therefore I am" (Descartes). Noir holds a BSc from the University state of Riau in Physico-chemical Oceanography and a MSc from the Bandung Institute Technology. His research concerned the impacts of sea level rise and temperature anomalies on coral reefs in Bali. After he graduated, Noir became a junior lecturer and a researcher at Department of Marine Science, Universitas Padjadjaran, Indonesia, where he was involved with several projects with the Ministry of Marine and Fisheries Affairs, and the Ministry of Maritime Affairs, and conducted research in Indonesian Seas onboard the R/V Marion Dufresne. His research and projects focus on Applied Physical Oceanography (e.g., temperature, salinity and ocean currents) and Physical Oceanography of the inner sea of Indonesia. Currently, he is involved in the de-

velopment of a Lagrangian instrument to measure and track ocean currents and marine debris, and is a founder member of the KOMITMEN Research Group, which focuses on physical oceanography, instrumentation, and marine debris outreach.

Noir's research for the future will be focused on deep ocean warming and on the development of ocean observation instruments. He strongly believes that the NF-POGO CofE programme is a great opportunity to enhance his knowledge in ocean science with an unique perspective. He is now planning to continue his study further to graduate school.

Victor Otieno (Kenya)



Victor is a proud member of the Luo tribe from Lake Victoria region in Kenya. He holds a Bachelor degree in Environmental Science at Kenyatta University, where he learned the scientific principles, concepts and methodologies required to understand the interrelationships in nature. He did his undergraduate research on the assessment of heavy metals (lead and cadmium) in water and edible fish species in Makupa Creek, Mombasa Kenya. After graduation, Victor worked with Wildlife Clubs of Kenya as Environmental Education trainee. From 2014 to 2016, he enrolled in the Master of Environmental Science programme at Pwani University with modules on ecosystem dynamics and biodiversity, environment and urbanization, climate change and education for sustainable development. For his master thesis (Carbon sequestration in the seagrass meadows of Malindi Marine Park and Reserve, Kenya), Victor analysed the spatial and temporal dynamics of organic carbon assimilated in seagrass tissues and stored in sediments. Since he graduated, Victor has been teaching in the School of Environment and Earth Scences at Pwani University and working as a consultant for the Pure Earth's Programme "Toxic Site Identification in Kenya". In 2015, he participated in a mesocosm experiment with temperate seagrasses *Zostera noltii* and *Zostera marina* on carbon sequestration and the ecosystem responses to elevated pH and temperature at Alfred Wegener Institute (AWI) for Polar and Marine Research in Sylt, Germany.

For his training at CofE, Victor expects to enhance his knowledge in Marine Ecology, as well as to improve his skills in experimental and instrumentation techniques, data analysis, and scientific writing and presentation. He also wishes to improve his knowledge on ocean data management, climate systems and ocean observation. After graduation, he intends to join a PhD programme in Marine Sciences.

Yvette Nerquaye-Tetteh (Ghana)

Yvette holds a Bachelor of Science degree in Marine Science from the University of Ghana (2013 – 2017). Her research project culminated in a dissertation entitled Granulometry, mineralogy and provenance analysis of sediments from Kpone and Prampram beaches in Ghana, where she worked under the supervision of Dr. Edem Mahu, a NANO alumnus. After attaining her degree, she worked as a teaching assistant in the Department of Marine and Fisheries Sciences during her national service year (2017 – 2018). During this time, she was involved in a research project ("Ghana-Netherlands Universities Volta Delta Design Project") where she worked on the topic "The Keta Lagoon of the Volta Delta- A review of changes in some water quality parameters in the last 20 years", under the supervision of Prof. Kwasi Appeaning Addo. She reviewed and analysed water quality data from literature survey and field sampling on the Keta lagoon for two time periods (1996/1997 and 2018) to investigate changes in the lagoon's water quality for management purposes, which she presented at a conference held in Delft, Netherlands.

She believes the NF-POGO training programme has been particularly fascinating so far and she has acquired a wealth of knowledge and developed the requisite skills, which will enable her to become a better scientist.

POGOnians visiting Düne in Helgoland, with Dr. Bärbel Wichmann, assistant coordinator of CofE in AWI.

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Aditi Pophale (India)

Aditi completed her undergraduate studies in Neuroscience from Johns Hopkins University, where she worked on a project at the Laboratory for Neurocognitive and Imaging Research, Kennedy Krieger Institute. The project investigated the white matter architecture in the frontal lobe of children with ADHD and autism using Diffusion Tensor Imaging. After graduating, Aditi found that she was more interested in studying animal behaviour in the wild. Then, she began diving and exploring the tropical marine world of India and East Timor and worked as a Research Assistant on a Chimpanzee Habituation project on Rubondo Island National Park, Tanzania. She returned to India to pursue a MSc. in Wildlife Biology and Conservation at the National Center of Biological Sciences, Bangalore. During this time, she had the opportunity to conduct her thesis project examining the influence of multifocal pink-spot disease on the competitive interactions between Porites, a dominant, stress-tolerant coral genus, in the Lakshadweep Archipelago.

After her masters, she conducted a project examining the behavioural ecology of *Octopus cyanea* in the Andaman Islands as a Research Associate at the National Institute for Advanced Studies, Bangalore. Although the project is in its preliminary stage, she hopes to expand on this topic for her PhD. Currently, she has two specific research interests: coral reef ecology and the behavioural ecology of octopuses. There is an implicit assumption in these studies that the subject exists in a vacuum, rather than embedded in a complex ecosystem that influences its every aspect. She hopes to understand the "umwelt", that is, how these animals experience the world and in turn, how the world impacts them.

Darryl Valino (Philippines)

Darryl is from the southern Tagalog region of the Philippines. Currently, he is taking his Masters in Marine Science major in Marine Biology in the Marine Science Institute, University of the Philippines – Diliman under the Community Ecology Laboratory. His specialization is coral biology and his main interest is the coupled effects of climate change and local anthropogenic stress on Philippine reefs. His main research work involves the bleaching recovery of an in-shore turbid reef exhibiting high coral cover. Together with his masters course, he was part of several Philippine-Government-funded research projects, such as: "Molecular Genetics and Genomic Studies of Coral Resilience in Support of Coral Restoration and Rehabilitation Efforts: Identifying Resilient Coral Species (2014 – 2017)"; and "Coastal Assessment for Rehabilitation Enhancement - Capability Development and Resiliency of Ecosystems (CARE – CADRES): Updating Coral Reef Baseline Data of the Western Philippine Seas (2017 – 2018)". He is also currently involved with a non-profit organization, the "Philippine Coral Bleaching Watch", which aims to map the coral bleaching events in the country through the reports of citizen scientists.

He is expecting that the NF-POGO Programme will provide several first-hand experiences in data collection and advance data analysis that will immensely increase his competency as a marine scientist. It will equip him with proficiency to provide holistic approach towards succeeding research opportunities and possible collaborations.

The group and Prof Dr Peter Lemke in Sylt, Germany.

POGO Visiting Fellowship for Shipboard Training

A number of shipboard training programmes have been supported by NF-POGO since 2015. These have included cruises to the Porcupine Abyssal Plain (PAP) Sustained Observatory, across the Mediterranean Sea and in the Atlantic Ocean.

Here, some of the participants introduce themselves and share their experiences.

AMT27 cruise, Southampton (UK) to Falkland Islands (UK)

RRS James Clark Ross

NF-POGO-PML Atlantic Meridional Transect Shipboard training fellowship onboard the RRS James Clark Ross (21 Sep to 5 Nov 2017)

Kokuhennadige Hashan Niroshana (Sri Lanka)

Alumnus profile: https://nf-pogo-alumni.org/profile/Hashanniro/

Hashan is a PhD student at School of Ocean and Earth Science at the National Oceanography Centre Southampton, United Kingdom. His research focuses on understanding the oceanic carbon fluxes and processes along GEOTRACES sections in the Southeast Atlantic Ocean, Northwest Atlantic Ocean and Pacific Ocean by using an isotopic approach.

Hashan holds a Bachelor degree in Fisheries and Marine Sciences (2011) from the University of Ruhuna, Sri Lanka and a Master's degree in Marine and Lacustrine Science and Management (2015) from the Vrije Universiteit Brussel, Ghent University and University of Antwerp, Belgium. For his master thesis, he studied dissolved Barium in the Northeast Atlantic Ocean and its potential as a tracer to track the Mediterranean Outflow Water.

Between 2011 and 2013, Hashan worked an assistant lecturer at the Department of Oceanography and Marine Geology of University of Ruhuna, Sri Lanka, where, since 2016, he has been a lecturer. He teaches biological, chemical and physical oceanography for undergraduate students and is interested in studying carbon and nutrient cycling in oceans, trace metal biogeochemistry in oceans, ocean acidification and marine pollution.

The NF-POGO experience and the shipboard training on the 27th AMT research cruise was a great opportunity for Hashan to acquire immense knowledge and skills on pre-cruise preparation, conducting scientific experiments on board, post-cruise data analysis and interpretation, which gave him an overall coverage in oceanographic research. During the cruise, he was involved in incubation experiments to determine carbon and nitrogen fixation rates through the measurements of ^{13}C and ^{15}N signatures with the Stable Isotope Ratio Mass Spectrometer, collection and preservation of zooplankton samples, collection and preservation of samples for later DNA analysis, and deployment of radio-sonde weather balloons to acquire information on the lower atmosphere composition. Hashan affirms this programme provided him an opportunity to interact with other experienced scientists who are experts in the area of oceanography and marine biogeochemistry. Learning from these scientists and their guidance is an inspiration for Hashan to enhance the quality of his future research activities.

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M148 cruise, Belem (BR) to Walvis Bay (NA)

RV Meteor

NF-POGO Shipboard training fellowship onboard RV Meteor, from Belem, Brazil to Walvis Bay Namibia (24 May to 29 June 2018).

Felipe Branco (Brazil)

Alumnus profile: https://nf-pogo-alumni.org/profile/felipebranco_/

Felipe holds a a bachelor degree in Oceanography (2018) from the Federal University of Pará (UFPA), Brazil. During his undergraduate years, he has worked with Chemical Oceanography and Environmental Chemistry from the Amazon River, estuaries, and the northeast coast of Pará, where the freshwater turns into saltwater. He worked with groundwater and superficial water and investigated how the coastal aquifers are impacted by human use and marine intrusion, mostly focusing on nutrients' concentration and environmental management. Currently, he is a postgraduate student in Geology and Geochemistry at the same university, focusing his Master's research on the environmental geochemistry of an estuarine system in the Amazon coastal zone. During the M148 Cruise on board the R/V Meteor, Felipe´s training concentrated on water sampling, chemical analysis and sensor calibration techniques. He was able to improve his abilities in Chemical Oceanography and to learn more about physical processes on a large scale and how to study them. On his working watch, he was responsible for sampling and measurement of dissolved oxygen, and helped to run nutrients analyses whenever needed. When he was off duty, he was responsible for processing and interpretation of dissolved oxygen data, as well as the calibration of the instrument. During the cruise, there were lectures and seminars about physical oceanography and the studied processes, and on how to process data acquired during the cruise with Matlab. Aside from the professional experience, he keeps in his mind the amazing scientific and ship crews, and the friendships that they have made. Felipe is pretty sure that each one of them is going to remember this experience for life, and will keep in touch with each other.

Ramilla de Assunção (Brazil)

Alumnus profile: https://nf-pogo-alumni.org/profile/Ramilla/

Ramilla is a PhD student in the Oceanography program of the Federal University of Pernambuco, Brazil. The general objective of her research is to understand the response of multifrequency acoustic overvariation on the thermohaline structure. The specific objective is to detect physical structures (thermocline, pycnocline, internal waves, etc.) through a combination of four different frequencies over western tropical South Atlantic.

Currently, she is studying the thermohaline variability along that region, analysing data from CTD and ADCP. Ramilla says that participating in the METEOR cruise enabled her to work directly with these data acquisitions. According to her, Dr. Dengler and the scientific crew contributed a lot for her research. Despite the absence of a multi-frequency ecosounder on the ship, she could learn how to make the ADCP data acquisition and processing during the cruise from Brazil to Namibia. During the cruise, she could also see the environmental systems interactions and changes, such as the different dynamics of the western and eastern boundaries of the South Atlantic.

On the personal side, Ramilla says that the 36-days cruise also gave her the opportunity to interact with other researches and exchange knowledge in different areas of oceanography. She thanks both scientific and ship crew for the knowledge acquired, and she hopes to be able to continue to collaborate in the future.

Porcupine Abyssal Plain sustained Observatory

RRS James Cook

NF-POGO Shipboard training fellowship onboard the RRS James Cook to the Porcupine Abyssal Plain Sustained Observatory (19 May to 12 June 2018).

Carolina Camargo (Brazil)

Alumnus profile: https://nf-pogo-alumni.org/profile/Carolina+Camargo/

Carolina holds a bachelor degree in Oceanology from the Federal University of Rio Grande (FURG) in Brazil, and a master degree in Marine and Lacustrine Science and Management, a Belgian inter-university programme organized by the Vrije Universiteit Brussel (VUB), Universiteit Antwerpen (UAntwerpen) and Universiteit Gent (UGent). Currently, she is a PhD student at T.U. Delft and a member of the Sea Level Centre of the Royal Netherlands Institute for Sea Research (NIOZ).

Carolina´s research interests are related to sea level variability patterns. During her undergraduate years, she used geophysics (sub-bottom profiler of 3.5 kHz) to investigate evidences of past coastlines in the continental shelf, when sealevel was lower than today. For her masters thesis, she worked with quality control of *in situ* sea level measurements from tide gauges, under the supervision of Dr. Francisco Hernandez (VLIZ) and Dr. Karline Soetaert (NIOZ). For her PhD studies, she is interested in the regional sealevel budget in the satellite era (1993-present). Sea level has been rising in the last century; however there is still a difference between the total observed sea-level rise and the sum of the different contributions. Uncertainties in the reconstruction of past sea-level change may be the reason why we are not able to explain the regional sea-level variations. For her research, she is using satellite data to understand sea-level change and its contributing processes.

Before this fellowship, Carolina has participated in other training experiences, including internships at Rockland Scientific (RSI) and at the Oceanic Observatory of Madeira (OOM), where she had the opportunity to work with ocean turbulence, and participation in field campaigns onboard the B/O SOCIB, the NRP Gago Coutinho, the N.Oc. Atlantico Sul.

This time, she took part on a shipboard training aboard the RRS James Cook to the Porcupine Abyssal Plain (PAP) Sustained Observatory, hosted by the National Oceanographic Centre (NOC), UK, from May to June 2018. During the cruise she was part of the benthic team, working mainly with Megacore sediment samples for deep sea mega- and meiofauna studies. She was also involved with the processing of amphipod traps and bottom trawls.

The PAP site is one of the longest time series oceanic observatories in the world, with almost 30 years of data sampling. In her opinion, having the chance to join this environmental study was a very valuable experience. She learned about the importance and challenges of sampling the deep sea, and how a time series station is maintained through the years. As her studies are more directed towards physical oceanography, she felt that this experience with biological studies has expanded her knowledge in general oceanography. According to her, this training was a wonderful opportunity, where she could learn from researchers with high relevance in the deep-sea research.

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MSM72 cruise, Mediterranean Short Cruise

RV Maria S Merian

NF-POGO Shipboard training fellowship onboard the RV Maria S. Merian to reoccupy the transect MED-01 (2 Mar to 3 Apr 2018).

Abed El Rahman Hassoun (Lebanon)

Alumnus profile: https://nf-pogo-alumni.org/profile/abedhassoun/

Abed is a researcher in the National Centre for Marine Sciences, affiliated to the CNRS-L, which is a governmental research institution (http://www.cnrs.edu.lb) since April, 2015. He is passionate about everything related to the environment, particularly marine ecosystems. He also loves photography and discovering new cultures and places.

Hassoun has held a PhD in Oceanology since 2014, from the National Council for Scientific Research in Lebanon (CNRS-L), National Centre for Marine Sciences (NCMS) in cotutelle with the Université de Perpignan Via Domitia, France .

His PhD thesis is entitled "Analysis and Modelling of the Acidification in the Mediterranean Sea", and it is available online at https://tel.archives-ouvertes.fr/tel-01083406v1.

His main scientific interests are i) quantification of the carbonate system and of anthropogenic CO_2 (CANT) sequestered in the Levantine Sea, ii) acidification trends in the Mediterranean Sea, iii) potential effects of CANT sequestration and acidification on phytoplankton and iv) monitoring of coastal environmental conditions in the context of both climate change and ocean acidification. Moreover, he is also interested in studying the effects of global and local stressors on coastal ecosystems, particularly in the Eastern Mediterranean Sea. Hassoun's training was composed of three phases. First, in A Coruña (Spain), he has trained the necessary skills to analyse the carbonate system parameters. Then, during the cruise, he participated in the sampling and measurements onboard, followed by a period in Kiel (Germany), where he learned how to process the acquired data.

Although he has being measuring carbonate system parameters in the NCMS-Lebanon, the new methodologies he has learnt were very interesting. It allowed him to compare the quality of analysis obtained by the different techniques, and also to have a thorough idea on how other laboratories are analysing these critical parameters, besides improving the quality of their analysis back home. Also, the quality control check of big dataset will be very useful to apply for the time-series data in Lebanon.Moreover, the training has allowed him to promote his work in the Oceanographic Community, which has helped him to establish future collaborations, and to meet renowned experts in his field with whom he exchanged ideas and built a professional network.

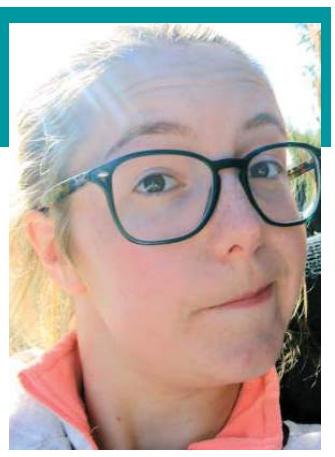
The results of the MSM 72 are expected to help them to evaluate the recent biogeochemical changes in the Mediterranean Sea and will be published in peer-reviewed journals. Otherwise, Hassoun feels that this experience wasn't only rich at the professional level, but also on a personal level. During the training, he had the pleasure to meet friends from different countries, to discuss with them local, regional and global issues we see in this World, and to close the gaps of knowledge about our cultures and countries. These friendships will definitely last forever.

Dr. Helen Rost Martins, a pioneer of marine research in the Azores

Meri Bilan

University of Açores, DOP/IMAR, Portugal

Alumnus profile: http://nf-pogo-alumni.org/profile/mbilan/



Dr Helen Martins in her office at Horta, Faial island, holding the new issue of Arquipelago-Life and Marine Sciences journal (photo: Aurora Ribeiro, 2019)

One of the most memorable feelings connected to POGO is getting inspired by great scientists and great people. Following that stream of thought, I decided to write about a woman who recently inspired me. Her name is Helen Rost Martins and she works at the same institute as me, on the island of Faial, Azores, Portugal. Born in Tromsø, Norway in 1932, she was the first Marine Biologist who came to work on the island and the pioneer of many research topics that continue today. Our institute is small, and I noticed her when I first came, but only recently discovered who she actually is.

"My husband and I arrived to the island in 1976 on the invitation of the University. He was a geologist and I was the only Marine Biologist on the island. Very soon, he was transferred to São Miguel, another island in the Azores, to the geological department, and I stayed on Faial with two 4-year old children. The first years here were very difficult. We didn't know anything about the sea, we didn't have any books and no internet, of course. One of my first jobs was going to the fish market and measuring the blue jack mackerel (*Trachurus picturatus*). I was also chasing fishermen and asking them to tell me local names of the fish so that I could link it with the species names. I wasn't very good in Portuguese then, so it was sometimes quite funny."

"Things changed in 1979. It was an exceptional year because, during the summer, the fishermen caught a lot of squid *Loligo forbesi*. This caught the interest of the regional government and we got some money to study *lula* (Portuguese for squid). That was my first real paper: Biological studies of the exploited stock of *Loligo forbesi* (Mollusca: Cephalopoda) in the Azores (Martins, 1982). Back then, there were not many co-authors. You would write what you did."

"In 1981, Malcolm Clarke, a renowned specialist in cephalopod research, got a project to work on the diet of sperm whales and I got to work with him on this. It was wonderful. Almost every time they would catch a whale, I would go to Pico (another island, about 30 min by boat from Faial) to sample the stomachs. There was a young boy, Norberto Serpa, that would help me."

Back then, whaling was still going on in the Azores. It was a very artisanal and difficult job that men would do on the side, to earn some extra money. They had lookouts on land that would watch where the whales were and notify the villagers. Men and sometimes small boys would go on a bote baleeiro (a small whaling boat) and go hunting for the sperm whales with harpoons. When the sperm whale died, they would drag it to whaling factories where oil was produced. Everything was used, even the bones and teeth which were scrimshawed. This was a very difficult and dangerous job, which included only men. But after 1981, around the factory, there would be one woman among them with a big knife cutting the stomachs of the sperm whales and sampling the squid that would be there.

"Working with lulas was wonderful because I made a lot of great friends. We worked hard together and it brought more young people to work here. Another great project where I made great friendships was the loggerhead turtles project in collaboration with the University of Florida. We are still very good friends and the cooperation between the two Universities continues today. That is beautiful and important."

The turtle story begins in 1984 when Helen sent Archie Carr (turtle ecology specialist from the University of Florida) 40 carapace lengths of loggerhead turtles, which helped solve "the mystery of the lost year" (Carr, 1986). The mystery was that hatchlings (5 cm carapace length) would leave the east coast of US, disappear into the open ocean and reappear in the West Atlantic with 50 cm of carapace length. The "missing" sizes were found in the Azores. After that discovery, the Azores became an important spot in turtle research and Alan Bolten, a

(Top) Helen measuring squid and (Bottom) sampling sperm whale stomach contents with Norberto Serpa (credits: Tron Soot-Ryen, 1982).

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Helen and a juvenile loggerhead turtle found in Porto Pim Bay, Faial island (photo by Alan Bolten, 1989; adapted from Martins et al. 2018).

marine turtle specialist, helped built the strategy with the team in the Azores. New programs were established with local fisheries like local pole and line tuna fleets and longline fisheries targeting swordfish (Martins et al., 2018).

"I never did a PhD, but in 1991 I was awarded with an equivalent Doctor's degree because I had a lot papers and a degree from Norway. This degree was candidatus realium, which doesn't exist anymore. It usually took 7 years to finish, but I finished in 12 years – said Helen smiling. But it was because I went for study visits to America (Harvard University, Smithsonian Institution, Woods Hole), India (University of Kerala), Curaçao (Marine Biological Station Piscadera Bay) and I had a child. My thesis was on bivalves from the Silurian of Gotland. Since then, I did not work a lot on bivalves. There was a cruise in 1997 where we went with R/V Atlantis to the hydrothermal vents in the Atlantic and we worked on the Bathymodiolus.

Back then, we didn't know much about it. In 1991, I did three dives with the submersible Johnson Sealink I on board R/V "Seward Johnson" in Madeira. On one dive, the manipulator didn't work so we went "sightseeing" and we passed beautiful forests of black corals, it was a cnidarian heaven."

Helen retired in 2002, when she was 70, but continues to work as an editor of Arquipelago-Life and Marine Sciences journal. "I love being the editor of a journal because I know a bit about everything. My first interest were birds when I was 15 years old. Then I made collections of insects, I especially liked Odonata (dragonflies). Some of my collections are in a museum in Norway. Then I worked on bivalves, crustaceans, mollusks... I took what came to me."

When I met Helen, I was amazed like many of my colleagues that she is still working with passion. She loves the sea and the Azores very much – in her words – "everything that is mine is here". Besides work, she has a "socks club" where she and her friends knit socks with five needles. She continues to travel every year, and especially enjoys going on cruises along rivers in Europe.

Helen is a continuous inspiration and her stories are full of wisdom from which we can learn or be reminded of important values. "There were situations where I or my colleagues worked a lot, and after we didn't even get a thank you in the acknowledgments. But you forget about it. There is no place for that when you can have wonderful memories and stories with people that became your friends and with whom you shared many nice moments. This is what is important in the end."

Helen sampling *Bathymodiolus* from the hydrothermal vents in 1997.

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Felipe and Ramilla during their shipboard training. Read more about NF-POGO Shipboard Trainings at pages 8-11

A Progress Report of New Observational Instrument: RHEA (DrifteR GPS oceanograpHy covErage Area)

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Overview

Ocean circulation and water mass characteristics in Indonesia constitute a highly complex system. Shallow waters are predominant over Eastern Indonesia, while western Indonesia presents mostly deep water areas, and water mass transfer can occur from one to the other sectors. Concurrently, circulation in inner Indonesia is affected by the monsoonal situation and others water mass sources (e.g., South China Seas and the Pacific). The understanding of Indonesian Seas ocean system circulation is extremely important, however, there is a lack of *in situ* observation data due to the high cost of field sampling and instrument limitation.

This research communication presents a brief description of a RHEA drifter. RHEA is a drifter sensor (lagrangian concept) with data transmission system. Drifters have been widely used for scientific purposes, such as mapping large-scale ocean currents, supporting search and rescue operations (Ullman et al., 2006), tracking oil spills (Abascal et al., 2009), marine debris (Maximenko et al., 2012;), coastal mixing and larvae spreading (Edwards et al., 2006).

The RHEA lagrangian drifter is being developed within a project granted from Hibah Internal UNPAD (HIU) for the period 2016 to 2020, in a joint-partnership between Marine Research Laboratory (MEAL) Padjadjaran University and Robomarine Indonesia (http://www.robomarine.com).

Method

The drifter GPS (GERNED) and existing design were firstly evaluated during the RHEA Phase 1. Next, the design, comprises system and sensors characteristics were improved as result of testing several physical-chemical instruments combinations and the cage material. Likewise, several tests were conducted in different waters conditions (e.g., freshwater, seawater and shallow areas).

The instrument (Figure 1) has a total (dry) weight circa of 10 kg. The cage, made from metal with injected moulding, consists in three sections (air sensor, housing for battery and microcontroller, and water sensor). Sensors for oceanographic and atmospheric measurements, located under and above the container, respectively, are connected to the battery and data storage (micro SD). Data is transmitted from the storage to the database (http://podc.fpik.unpad.ac.id/; Figure 2) via satellite, using a communication system (Rock-

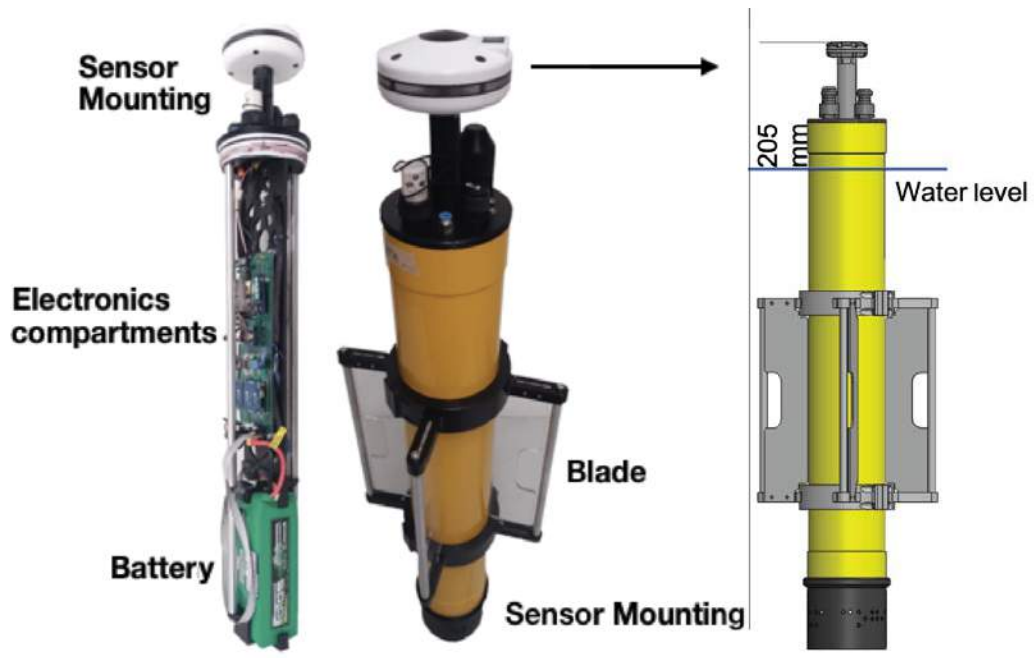

Figure 1 - Structure and design of RHEA.

BLOCK Iridium 9062) with GPS geolocation accuracy provided by ARGOS (±5 km) or GPS (<1km) satellites. The drifter's battery life rate is approximately three months, but highly depends on characteristics of data transmission.

Initial results

Basic tests for buoyancy and for each sensor were carried out (Figure 3). The pH sensor was tested in two buffer solutions (4.01 and 6.86), for 300 minutes. The sensor showed values ranging between 4.03 and 4.76 and 6.30 and 6.93, respectively. The water temperature sensor was tested by comparison with digital temperature devices. Values indicated by RHEA sensor and digital temperature were 25.31 °C and 26 °C, respectively. In general. The results indicated that all sensors have precision within expected range.

In order to assess RHEA's suitability for field studies, a test was conducted in Seribu Island, Jakarta (Figure 4). The instrument headed northeast, roughly the orientation of the two islands and the direction of the circulation at the time.

Future steps of the project include the addition of a depth sensor and a module for deep waters, which will be very useful for monitoring Indonesian waters or other areas with different characteristics.

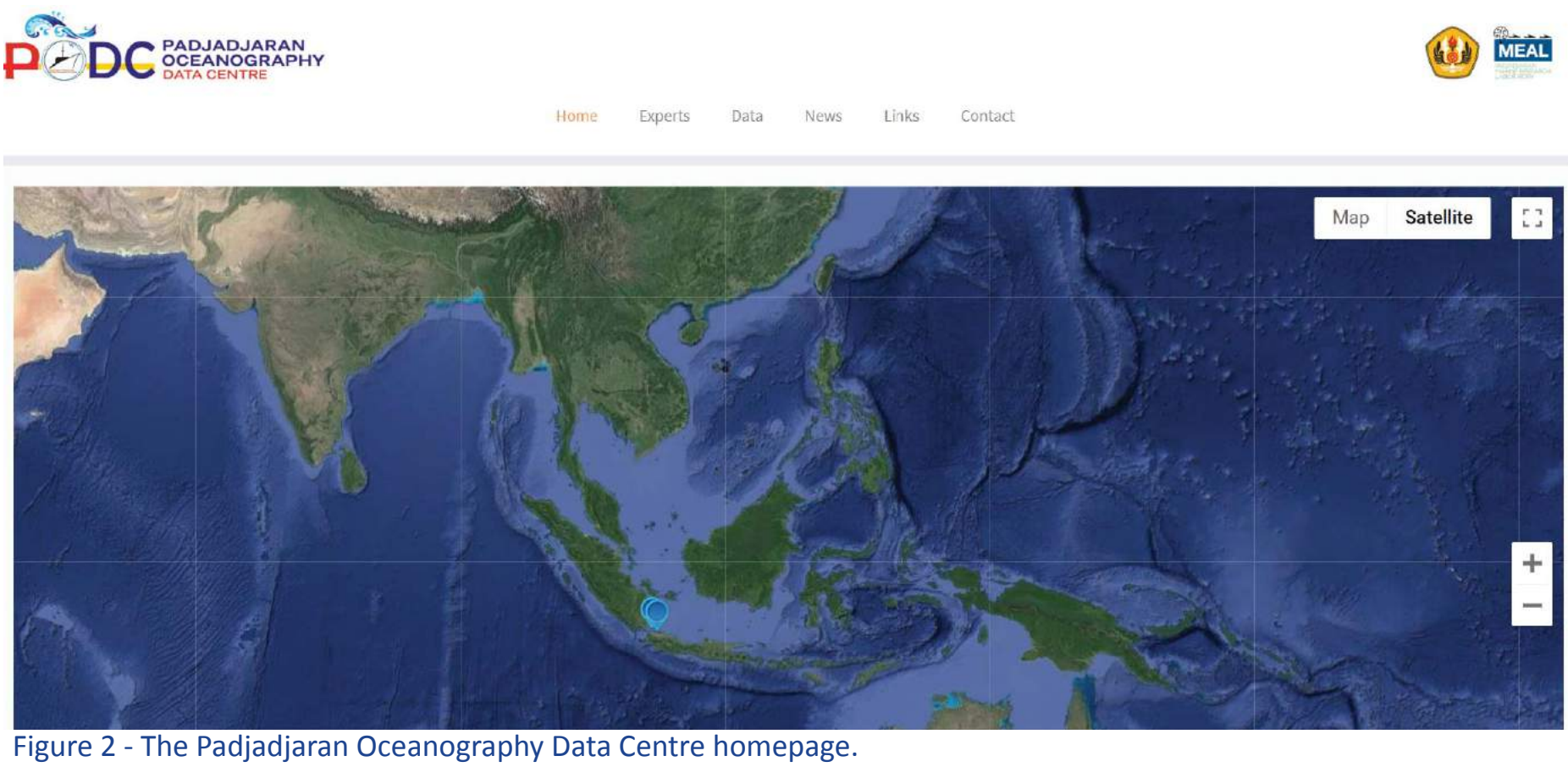

Figure 2 - The Padjadjaran Oceanography Data Centre homepage.

Conclusion

This research showed that RHEA's design, data transfer, and data reliability can be used to monitor water quality with real time and delayed data in both sea water or freshwater environments.


Figure 3 - Tests of buoyancy.

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Figure 4 - The location for field tests for RHEA was Seribuisland, Jakarta.

Macrobenthic Fauna of Coastal Upwelling Sandy Beach

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Coastal zone

The coastal zone is an exceptionally dynamic environment, where there is a continuous interface between sand, water and air. This interface is composed of specific gradients or boundaries, whose dimensions range from a few nanometres to kilometers. The coastal zone is characterized by: (i) maritime zone, (ii) "sea" zone and (iii) intertidal zone (the sea-land interface), and each contains specialized fauna and flora.

Coastal upwelling sandy beaches

The most prominent upwelling areas of the world are located at the western coasts of continents (Figure 1) where equatorward winds, due to the Subtropical High, forces an offshore Ekman drift of the surface water. The majority of the coastal upwelling areas are characterized by strong currents directed to the equator (i.e. the Humboldt and California Current in the Pacific Ocean, and the Canary, Benguela and Guinea Currents in the Atlantic (Laudien, 2002).

Coastal upwelling is a dramatic event, during which warm nearshore water is replaced from below by cold nutrient-rich water. Surface waters are usually depleted of nutrients such as phosphates and nitrates, which are critical for plant growth, while deep waters normally have higher nutrient concentrations. Upwelling of cold and nutrient rich water towards the ocean surface replenishes the surface layer with nutritional components necessary for the biological productivity. Thus, during upwelling, the biological production is very high (FAO, 1997; Mensah and Anang, 1998), and this process also fuels a high productivity in adjacent sandy beaches (Laudien, 2002). Consequently, upwelling regions are among the richest coastal marine areas of the world.

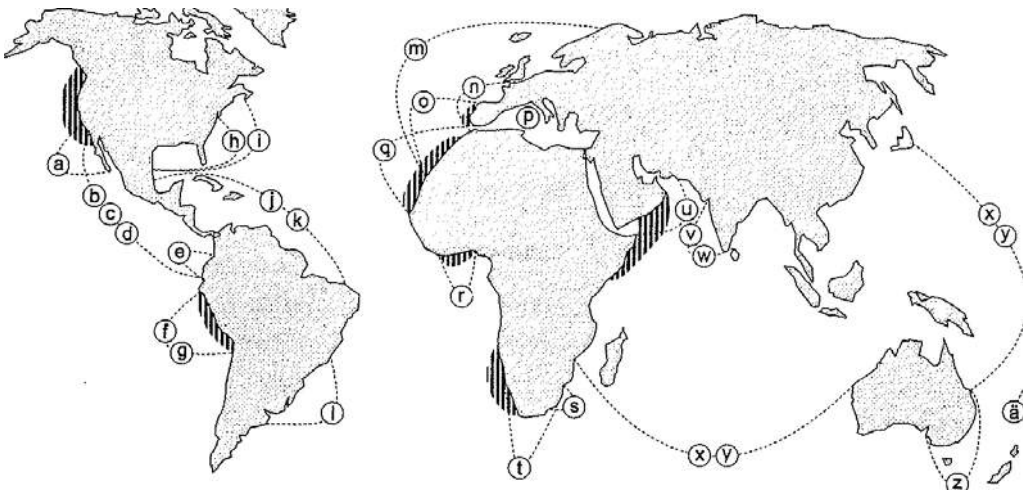

Figure 1 - Coastal upwelling areas of the world. Letters indicate geographical distribution of selected donacids. The reader is refered to the original (in Laudien, 2002) for the complete list.

Off the Ivoiro-Ghanaian coast, intense upwelling events significantly influence the fish distribution (Ibe, 1998). Analysis of models considering the period and the intensity of upwelling events shows that years of higher upwelling indices coincide with larger catches of Sardinella in Ghana (Koranteng, 1991). Upwelling is seasonal for Ghanaian coastal waters, dominated by two upwelling peaks per year (Quaatey, 1996). During either January, February or March weaker upwelling events occur (being stronger off Côte d' Ivoire), whereas intense upwelling fuels the system off Ghana between late June to early October. The two seasons are characterized by higher salinity as well as lower sea surface temperature (SST; typically <25 °C) and dissolved oxygen. Seasonal coastal upwelling periodically modifies the physicochemical parameters of the region and controls the biology of the sub-system (Minta, 2003).

Most of the year, coastal waters are stratified with a shallow (30 to 40 m) well-mixed layer of warm (25 °C - 36 °C), low salinity water (33.67 - 34.22 psu). This layer is followed by a sharp thermocline (between 60 and 80 m), after which the salinity reaches its maximum, between 35.05 - 35.38 (Mensah and Anang, 1998). During upwelling, the thermocline weakens and rises to the surface, resulting in a vertically homogeneous salinity profile above the shelf (Mensah and Anang, 1998).

Sandy beaches are the most extensive intertidal systems worldwide, dominating temperate and tropical coastlines (Short, 1999). Most sandy beaches originate from glacial erosion (Figure 2). In this environment, small particles of rocks (generically called sand), resultant of the action of water, chemicals, and extreme temperatures on the rocks, are constantly transported by wind, water and ice to the coast. Quartz sand is the most common on the east coast, a result of the breakdown of granite and sandstone (Figure 2).

Shallow marine sands, that appear to consist of clean mineral grains only, actually harbour a community of microorganisms (bacteria, fungi, protozoa), meio- and macrofauna organisms that in its diversity rivals that of terrestrial ecosystems. Sandy beaches are one of the most highly productive systems (McLachlan, 1983) and are inhabited by a diverse macrobenthic fauna, some with high commercial value.

Donax species are often the primary consumer in sand beach-communities of upwelling systems. They filter feed on phytoplankton, small particles (e.g., unicellular algae, de-

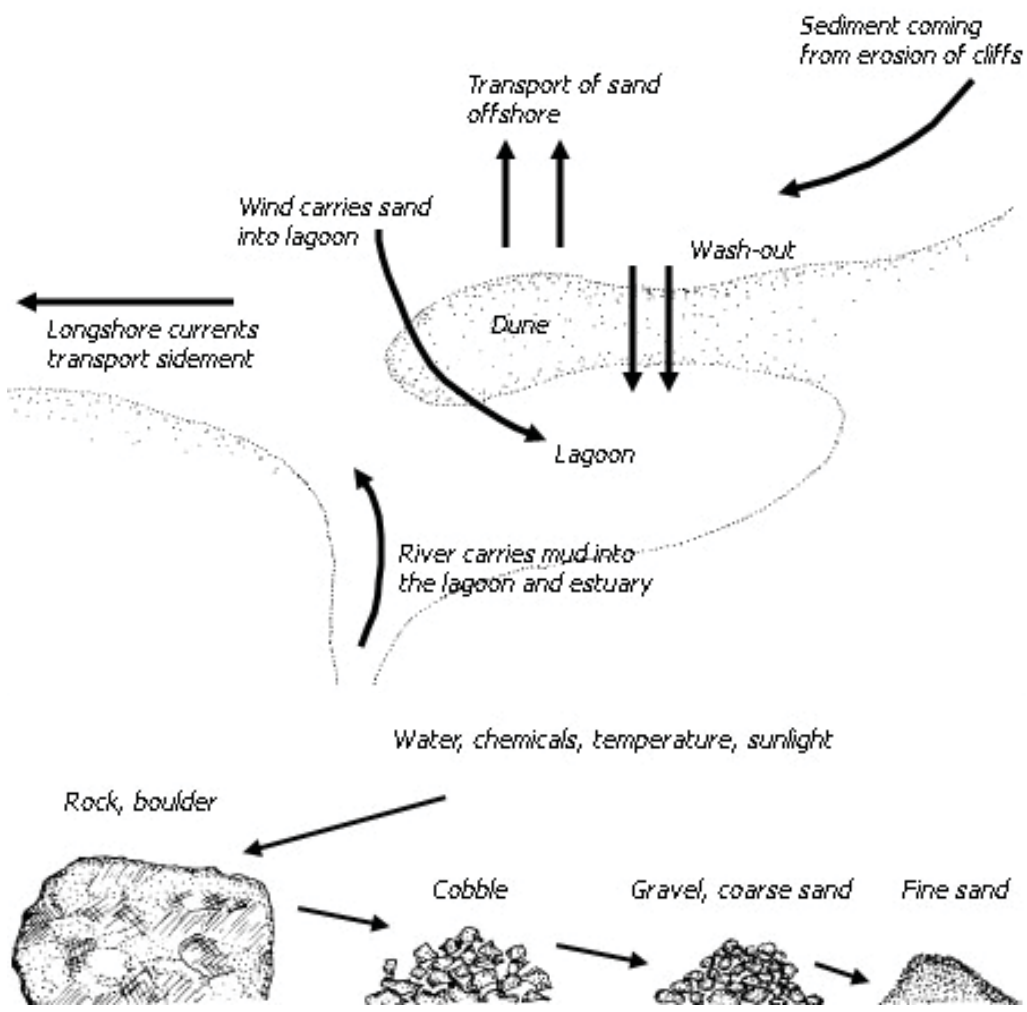

Figure 2 - (Top) Processes on sandy beaches and (Bottom) of sand particles.

tritus) and are, in turn, consumed by fish and shore birds as well as by human beings (Salas et al., 2001). Therefore, Donax species provide an important trophic link in surf food webs. Additionally, when shelled organisms such as Donax die, the remaining skeleton (mainly composed of calcium carbonate) is broken up, and these parts may dominate sands (Brown and McLachlan, 2006).

Beaches also have an important link with the adjacent ecosystem and commonly have large socio-economic values. They serve as buffer zones against the sea and as recreational areas (Davies, 1972). Nonetheless, human activities (e.g., tourism, fishing, sewage disposal, plastic disposal, etc.) threaten living organisms (e.g., molluscs, crustaceans, polychaetes) in sandy beach environments.

Types of beach

The interaction of waves and tides with the sediment results in a series of morphological beach types (Short, 1996). The dissipative and reflective beaches are the most common beach types, although there are intermediate beaches. Dissipative beaches (or wave dominated beaches), are characterized by a smooth beach slope and non-turbulent swash, once the wave energy is largely dissipated in a broad surf zone before reaching the intertidal sand. For reflective beaches, there is no true surf zone, so the waves break at the beachfront and much of the wave energy is reflected back, towards the sea (Defeo and McLachlan, 2005).

Table 1 - Types of sandy beaches in Ghana.

	Type 1	Type 2
Location	La Beach	Chorkor Beach
Latitude	5°33'30.88'' N	5°31'3.99'' N
Longitude	0°9'34.74'' W	0°14'38.16'' W
Beach type	Dissipative	Reflective
Slope	1:6.28	1:11.23
Grain size (Φ)	Fine (2.37 ± 0.18)	Coarse (0.99 ± 0.66)
Sorting (Φ)	Moderately sorted (0.72 ± 0.11)	Sorting coefficient (0.79 ± 0.18)
Skeweness (Φ)	Near symmetrical (0.02 ± 0.14)	Moderately well sorted (0.27 ± 0.46)
Kurtosis (Φ)	Mesokurtic (1.09 ± 0.17)	Leptokurtic (1.07 ± 0.15)
Donax species	*Donax pulchellus*	*Donax rugosus*

Examples of dissipative and reflective beaches in Ghana are the La beach and Chorkor beaches, respectively (Table 1). Beach morphological dynamics together with the local hydrological conditions determine the kind of fauna and flora within its system.

Biodiversity of sandy beaches

Macrofauna are the most abundant fauna in sandy beach systems (Short, 1999), and vary from a few mm to 20 cm in length. Physical factors on the sediment and water (e.g., wave action and particle size) determine the distribution and diversity of these organisms (Brown and McLachlan, 1990), while food input and surf-zone productivity may determine the population abundance.

Some of the macrofauna are typical of intertidal and surf zones, while others inhabit the freshwater-saltwater transition zone, such as sheltered sandbanks, sandy mud and estuaries (Short, 1999). Molluscs, crustaceans and polychaetes are the most important sandy beach macrofauna (Figure 3). Usually, crustaceans are more abundant on tropical exposed sandy beaches, while molluscs are the most abundant organisms on temperate, less exposed beaches. Exceptionally, polychaetes can be more abundant than either these two taxa. Crustaceans dominate the sands towards the upper tidal level and molluscs the lower level (Brown and McLachlan, 1990).

The upper sandy beach, like the upper rocky shore, marks the transition from land to sea. Ghost crabs and sand fleas, organisms characterized by being more terrestrial than marine, occupy this zone. True marine life appears at the intertidal zone. Two common inhabitants, active at high tide, are: i) the lugworm, which burrows through the sand and feeds on organic matter; and ii) the surf clam Donax, which advances up the beach and retreats with the tides. Among the sand grains live small copepods (minute crustaceans) and nematodes (worms) that feed on microscopic algae, bacteria, and organic matter. On the lower beach, where sediment remains exposed for only a short period, live clams, crabs, starfish, and sand dollars, whose calcareous skeletons lie partially buried in the sand.

Donax species in coastal upwelling sandy beaches

The most frequent molluscs in sandy beach are Donax species (including surf clams, beach clams and Wedge clams; Figure 4). Donax (Bivalvia: *Donacidae*) inhabits the intertidal zone of coastal upwelling sandy beaches in most parts of the world (Laudien, 2002). Donax are major primary

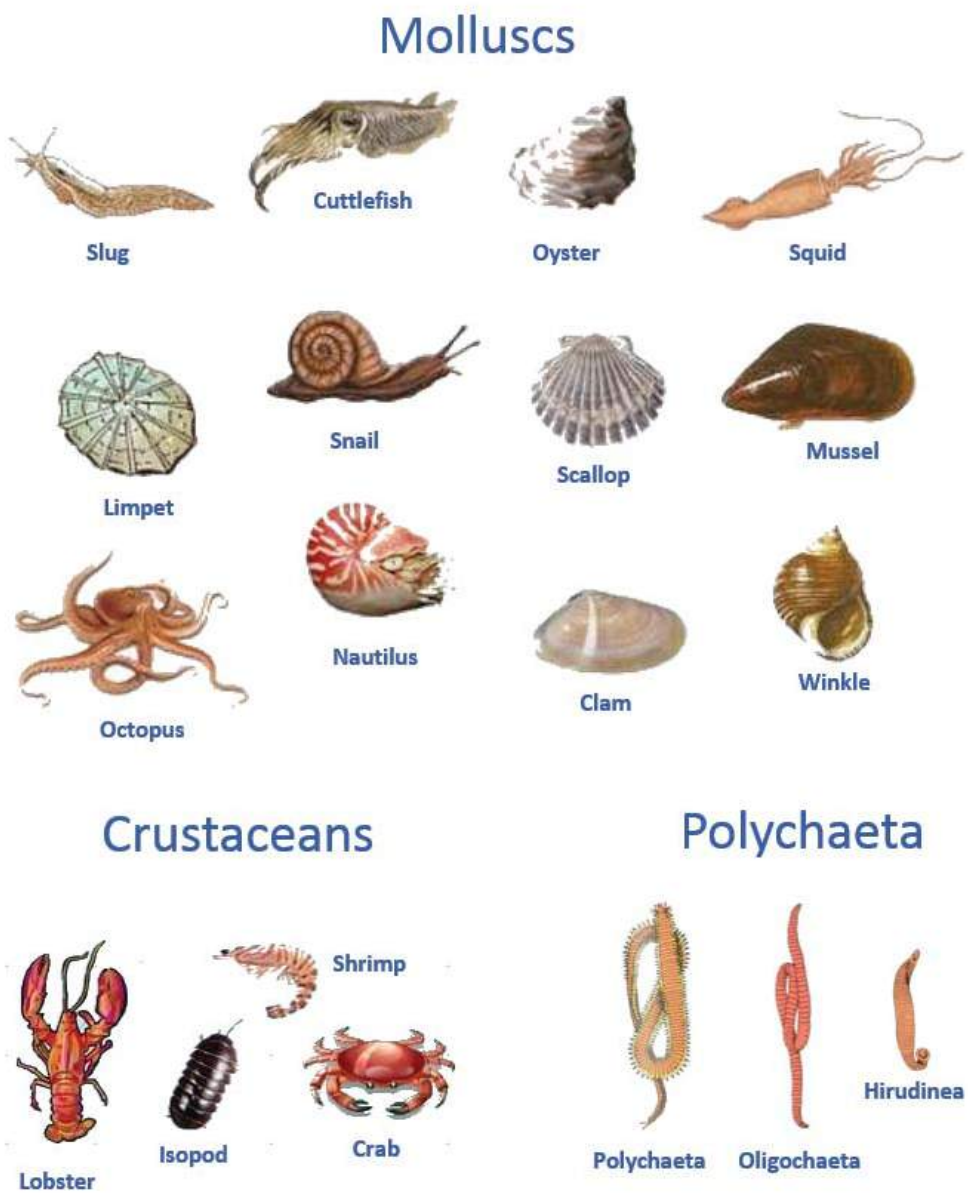

Figure 3 - Sandy beach macrofauna include molluscs, crustaceans and polychaetes.

consumers in sandy beach communities, supported by the high levels of phytoplankton production (Laudien, 2002). The clam buries itself by extending its foot in a tapered point into the sand. The foot then expands and becomes an anchor, and the clam pulls the rest of the body downward. Donax are edible food resources for consumption, especially by the local coastal communities, and are often used as bait for fishing.

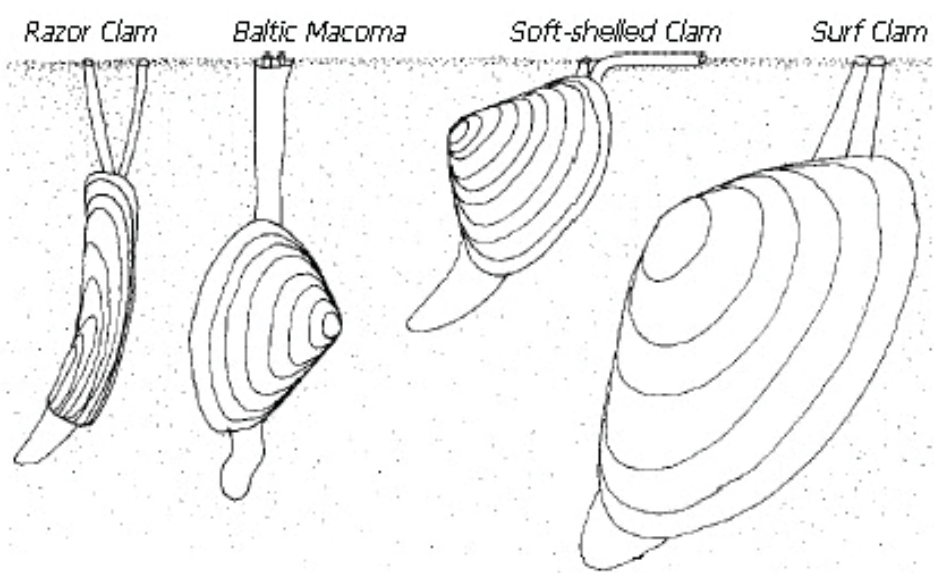

Figure 4 - Different Donax species feeding by protruding their siphon to sand surface.

The species probably originated in the tropics, and migrated to cooler climates (Ansell, 1983). Donax species distribution are mostly concentrated in tropical (77% of Donax species), followed by warm (22% of Donax species) and cold temperate coasts (5% of Donax species; Ansell, 1983). The lowest diversity of Donax species is found on coastal upwelling sandy beaches of West Africa (Ansell; 1983; FAO, 1990). Nonetheless, coastal upwelling sandy systems may stimulate large populations of Donax (Figure 1). Sixty four (64) species of Donax exist worldwide (Ansell, 1983), two of which are found in Ghana (*D. pulchellus* and *D. rugosus*) (Akita et al., 2014). These two beach surf clams (Figure 5) belong to super family Tellinacea of family Donacidae and class Bivalvia of the Mollusc Phylum (Akita et al., 2014).

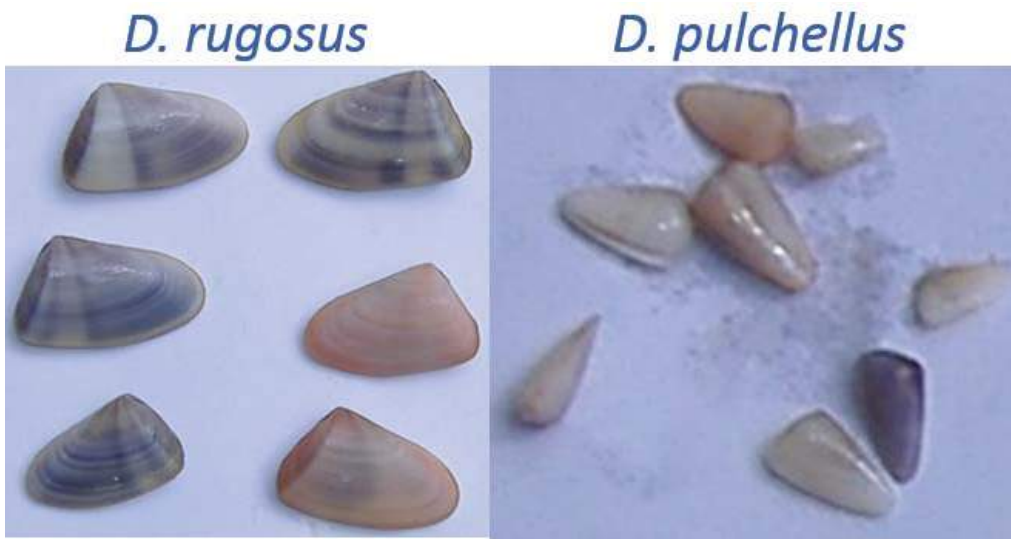

Figure 5 - "Osege" (*Donax rugosus*) and "Adjamo" (*Donax pulchellus*) sampled in Ghanaian Chorkor beach and La Beach, respectively.

Conclusion

Coastal upwelling sandy beaches are one of the most productive marine systems in the world. The biodiversity (e.g., crabs, clams and polychaetes) in these beaches helps to regulate the nutrient cycle of coastal ocean front water and maintain the nutrition of trophic food chains. Surf beach clams from the Donax species are organisms commonly found in coastal upwelling sandy beaches macrofauna. *Donax pulchellus* and *Donax rugosus* are the two common tropical beach clams found in the western coast of the Gulf of Guinea, in Ghana. *Donax pulchellus* prefers fine sandy dissipative of La beach, while *D. rugosus* dwells in coarse sandy reflective beach of Chorkor.

Human pressure (e.g., population increase, urbanisation and industrialization) on coastal environments (e.g., sandy beach ocean fronts, estuaries and lagoons), demands integrated approach to assess the state of coastal water quality, coastal resources and coastal diversity. As permanent members of coastal upwelling sandy beaches, Donax species can be explored as biological indicators to be integrated in physicochemical environmental monitoring of coastal waters in Ghana. Integrated assessment of ecosystems offers a broader view of the state of coastal water quality.

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Lailah during fieldwork at La Beach, Ghana

Chasing phytoplankton from space!

by Maria Fernanda Coló Giannini

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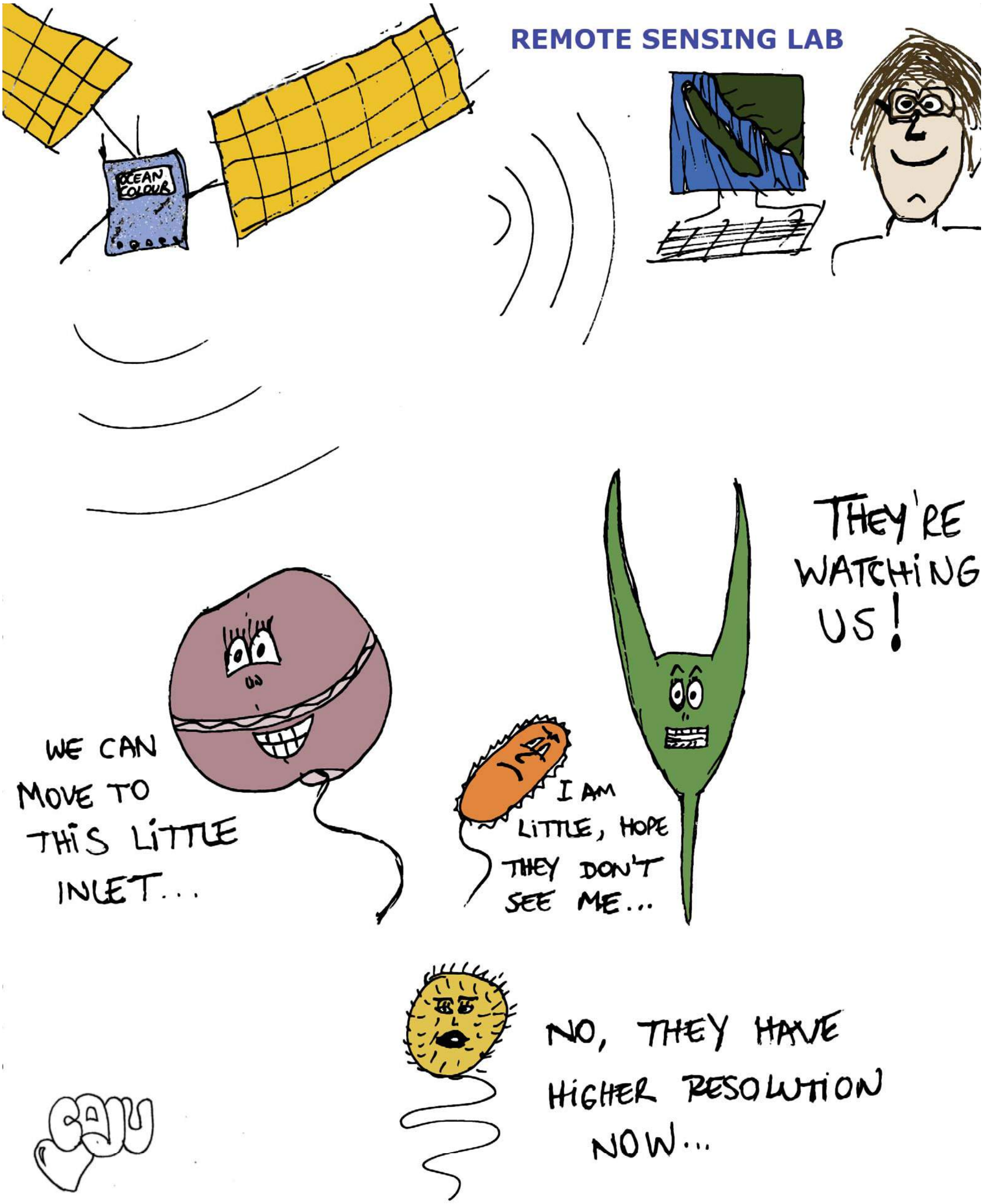

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Scientific events announcements

Ocean Obs'19
Honolulu, USA
16 - 20 September 2019

OceanObs'19 will continue to develop strategies for a sustained, multidisciplinary and integrated ocean observing system, and better connect user communities and observers. Input (in the form of Community White Papers), will help shape strategy development throughout the conference and for the upcoming decade.

Deadline
27 June 2019

Contact: mmccamb@ucar.edu
http://www.oceanobs19.net/

2nd GEOTRACES Summer School
Cadiz, Spain
23-28 September 2019

GEOTRACES summer schools aim at teaching the skills and knowledge necessary for a good understanding of the biogeochemical cycles of trace metals. General lectures will be given by 10 world-leading international scientists and practical sessions including field sampling workshops will be ran throughout the week. The summer school is open to 36 students. The maintenance and lodging on board of the Intermares school vessel during the course will be covered for all students.

Deadline
15 May 2019

Contact: geotraces@campusdelmar.com
https://geotraces.uca.es/

Congress of Young Marine Scientists
Malaga, Spain
1-4 October 2019

The 2nd International Congress of Young Marine Researchers, organised by and for young marine researchers, seeks to promote and bolster the research from young scientists into the marine field in order to generate a meeting space among different marine related disciplines, building novel synergy and cooperation among participants. Fellowships available for selected participants.

Deadline
10 May 2019

Contact: jisdelmar@uma.es
http://jisdelmar.uma.es

PICES-2019 Annual Meeting
Victoria, Canada
16 - 27 October 2019

The North Pacific Ocean is rapidly changing due to an increasing number of stressors. This presents challenges for understanding, collaboration, and communication. PICES provides a unique forum for collaboration among North Pacific member nations and other science organizations to address these challenges.

Deadline
30 June 2019

Contact: secretariat@pices.int
https://meetings.pices.int/meetings/annual/2019/pices/scope

CHEERS Conference 2019
Bordeaux, France
4-8 November 2019

Contributions covering different types of coastal systems, a wide range of geographical areas and a large diversity of methods are expected. The integration of available knowledge to improve management tools and plans, as well as rehabilitate coastal habitats will be explored.

Deadline
27 June 2019

Contact: cheers2019@sciencesconf.org
https://cheers2019.sciencesconf.org/

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