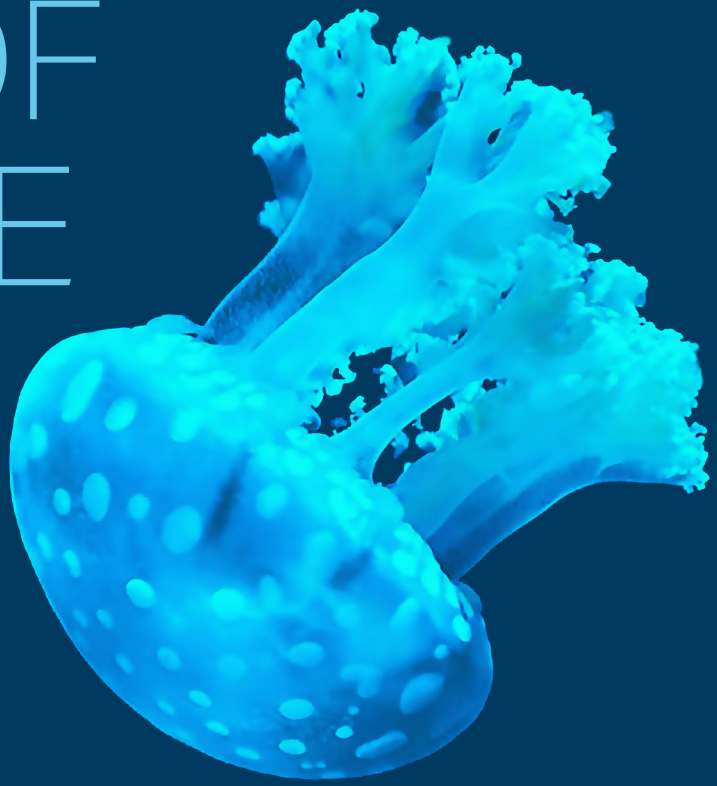
17 November 2016
Porto, Portugal

Centro de Congressos
da Alfândega do Porto

STRONG
MAR

2016 STRONGMAR CONFERENCE

A SEA OF SCIENCE



ORGANIZER

INESCTEC
TECNOLOGIA E CIÊNCIA
LABORATÓRIO ASSOCIADO

PARTNER

FÓRUM OCEANO
Associação da Economia do Mar

www.strongmar.eu

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HORIZON 2020

VENUE

The 2016 STRONGMAR conference will take place at the Centro de Congressos da Alfândega do Porto (floor 2, D. Luís Hall).

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Directions
http://tinyurl.com/gsqutm4

D. Luís Hall
(image credits: Centro de Congressos da Alfândega do Porto)

BUSINESS2SEA

The 2016 STRONGMAR conference takes place within BUSINESS2SEA (former Fórum do Mar), which is organized by the Fórum Oceano association. You are invited to also attend the exhibition, conferences and business meetings.

The 6th edition of former Fórum do Mar that has now a new designation, BUSINESS2SEA (B2S), is an international event dedicated to stakeholders from the different activity sectors that comprise the maritime economy and will encompass international conferences, seminars and workshops and an exhibition space for sea products, services and technologies.

The event is organized by Fórum Oceano and will take place at Alfândega Porto Congress Centre (Porto, Portugal) between the 16th and 18th of November and will hold the Celebration of the National Maritime Day, at 16th, with a special programme.

The central theme of B2S "Grow and Internationalise the Maritime Economy" was chosen by the need to give visibility to a set of dynamics and initiatives in several maritime areas that have made the maritime agenda in the last years. The purpose is to present the results of the main maritime activity sectors in Portugal, with the focus in the North region, and facilitate networking, projects and business developments among the participants through their participation at workshops and business meetings.

The celebration of the National Maritime Day will have a special programme dedicated to students, with nautical activity experiences, organised by the National School Sport Co-ordination, from the Directorate General of Education.

B2S is open to all participations, but with mandatory registration in each activity.

FÓRUM OCEANO

Fórum Oceano – Associação da Economia do Mar (Association of Maritime Economy) is a private non-profit association created in 2009 and since then formally recognized by the Portuguese Government as the entity responsible to implement collective efficiency strategies in the maritime economy sector. At present, the association gathers 130 members from the whole country, covering all sectors of the blue economy, from traditional to emerging activities, among them companies and business associations, R&D centres, higher education institutions, local authorities and other associative organizations. The Association main priority is to promote the sea as a valuable source for the economy, promoting cooperation between stakeholders through the intersection of knowledge and support for innovation, internationalization and entrepreneurship contributing, in sustainability conditions, for the country's competitiveness.

www.forumoceano.pt

FÓRUM OCEANO
Associação da Economia do Mar

WELCOME

The STRONGMAR project would like to wish you all a warm welcome to the one-day 2016 STRONGMAR conference.

The STRONGMAR project (Strengthening Maritime Technology Research Center) is an EU H2020 project, worth around 1 M€, aiming at creating solid and productive links in the global field of marine science and technology between INESC TEC and established leading research European institutions, capable of enhancing the scientific and technological capacity of INESC TEC and linked institutions. It also seeks to help raise its staff's research profile and its recognition as a European maritime research center of excellence.

STRONGMAR is coordinated by INESC TEC (Portugal) and is partnered with CINTAL (Portugal), Heriot-Watt University (United Kingdom), NATO Science & Technology Organization (Belgium), Universitat de Girona (Spain) and the University of Aberdeen (United Kingdom).

The project will perform a series of activities from summer schools, winter schools, short-term scientific meetings, long-term staff visits, networking meetings, workshops, conferences, technology transfer workshops with stakeholders, and other dissemination activities.

This year's conference is mainly devoted to sea science, and brings together a series of 10 talks from a variety of different areas of scientific research: from remote sensing of the sea-surface to the deepest ocean trench, from commercial fisheries to the geology of the seafloor, from benthic and chemosynthetic habitats to chemical and biological sensors. The variety and depth of discussion in today's meeting will undoubtedly spark a series of healthy discussions that will hopefully forge new networks and serve as a foundation for new scientific collaboration between European nations.

On behalf of myself, the project partners, the organising committee and the invited speakers, we welcome you again to Porto, Portugal and to the 2016 STRONGMAR conference – *A sea of science*, and wish you all a fascinating, constructive and enjoyable meeting.

Alan J. Jamieson
CHAIR OF THE 2016 STRONGMAR CONFERENCE

The investment of INESC TEC in the technical-scientific development in robotics and autonomous systems, and related fields like sensors, energy or telecommunications, aims at solving new problems and at bringing new solutions to existing problems of the society on a World, national and regional scale, thus contributing to the promotion of a regional and national development perspective of reference in sustainable ocean management, exploration and exploitation (related with areas like safety and security, energy, raw materials and environment

It is universally accepted that humanity has made significant improvements in its condition and quality of life. However, despite these achievements, humanity has not yet been able to manage this progress in a 'healthy', respectful and harmonious relationship with planet Earth and all species that inhabit it.

The economic growth will be feasible and compatible with a robust public health, leisure activities evenly spread through the population, reduction of the impact of climate change adaptation and other large-scale accidents, and, balanced management of natural resources in a non-depleting mode.

Oceans cover more than 70% of the surface of the globe, consist of over 90% of the living space, and are at the core momentum of our planet's physical, chemical and biological cycles. However, the seas and oceans that dominate the surface of our planet remain relatively unexplored and poorly understood.

In this context, it is crucial to have a profound and solid knowledge about the oceans and the relations established between the oceans, the shoreline, the air and the forests. Understanding and reacting accordingly with these interactions will have a strong impact on growth and sustainability of the current and future population.

The 2016 STRONGMAR conference is a small contribution for the oceans-related R&D performed at INESC TEC, so that it is established in deep knowledge and consistent with sustainable growth.

Eduardo Silva
PRINCIPAL INVESTIGATOR OF THE STRONGMAR PROJECT

PROGRAMME

SCHEDULE

START	END	SESSION		SPEAKER	TITLE
08:30	09:15		REGISTRATION AND WELCOME COFFEE		
09:15	09:30	WS	Welcome Session	Alan J. Jamieson Newcastle University England, UK	NA
09:30	10:30	PS1	Plenary Session 1	Francis Neat Marine Scotland Science Scotland, UK	*A towed camera system to provide representative sampling of deep-sea habitats and fish behaviour*
10:30	11:00	S1	Session 1	Bhavani E. Narayanaswamy Scottish Marine Institute Scotland, UK	*Does deep-sea benthic ecosystem research need new technological developments?*
11:00	11:30		COFFE BREAK		
11:30	12:00	S2	Session 2	William Reid Newcastle University England, UK	*"End-to-end" trophodynamic understanding of deep-sea hydrothermal vents*
12:00	12:30	S3	Session 3	Antonina dos Santos IPMA Portugal	*MarinEye – Building a multitrophic sensor for oceanic monitoring*
12:30	13:00	S4	Session 4	Pedro Jorge INESC TEC Portugal	*Blue photonics: optics and sensors to sense the ocean*
13:00	15:00		LUNCH		
15:00	16:00	PS2	Plenary Session 2	Alan J. Jamieson Newcastle University England, UK	*Life and Light in the Deep Ocean*
16:00	16:30		COFFE BREAK		
16:30	17:00	S5	Session 5	Heather Stewart British Geological Survey Scotland, UK	*Marine geological data: from shallow seas to deep oceans*
17:00	17:30	S6	Session 6	David McKee Strathclyde University Scotland, UK	*Ocean Colour Remote Sensing: Technology Requirements for a Radiative Transfer Approach*
17:30	18:00	S7	Session 7	Filipe Castro CIIMAR Portugal	*CORAL: a joint effort for the Sustainability of Ocean Exploitation*
18:00	18:30	S8	Session 8	Thomas D. Linley Newcastle University England, UK	*Abyssal and hadal fishes of the Pacific Ocean: baited lander studies from three hadal trench systems*
18:30	18:45	CS	Closing Session	Eduardo Silva INESC TEC and ISEP Portugal	NA

SESSIONS

PS1
A towed camera system to provide representative sampling of deep-sea habitats and fish behaviour

The deep-sea is the largest and least known ecosystem on the planet. Exploring and sampling the deep sea in a representative way is thus a major challenge. ROVs, submersibles, drop-frame cameras and landers provide highly focussed observation and often spectacular imagery, but cannot be expected to give more than the smallest fleeting glimpse of what is really down there. The chances of discovering previously unsuspected habitats with what are essentially targeted point-observations tools are minimal and may lead to a biased perception of the deep sea. Large bottom trawls towed across wide areas of the seabed are perhaps the most likely way of discovering new habitats, but they often fall foul of seabed obstacles and have an undesirable destructive impact on the sea bed fauna. Towed camera systems capable of covering many square kilometres per transect, provide an alternative, relatively cheap and representative method that is benign to the seafloor. Over the past decade the Marine Laboratory has developed such as system. Initially it was developed to assess fish numbers in areas closed to trawling, but it quickly became apparent it could be used to map seafloor habitats. Over the years this system was deployed deeper and deeper, allowing assessment of numbers of deep-sea fish and to map coral habitats. In 2014 the acquisition of high definition cameras was a breakthrough and the system has been used to map out previously unknown deep-sea sponge grounds on seamounts at depths of 1500 m. In 2015 the towed camera was deployed to find a suspected cold seep ecosystem in the north Atlantic; within an hour of searching it provided the first conclusive evidence for what is one of the most significant recent deep-sea discoveries in the north-east Atlantic. It has also yielded novel insights into fish behaviour and community diversity. With further technical development this system will have great potential for discovering and understanding deep sea habitats.

S1
Does deep-sea benthic ecosystem research need new technological developments?

The deep sea is a term used for any environments found below a water depth of 200m and off the continental shelf edge. However, the name does not describe the numerous different habitats that are known to exist (>25). These habitats cover everything from e.g. the wide expanse of the abyssal plains, to chemosynthetic habitats, mid-ocean ridges, seamounts etc. The complex nature of these habitats, the depth at which they are found and the range of sediment types observed, sometimes almost adjacent to one another, pose many challenges to researchers wishing to study deep-sea benthic ecosystems. Equipment to sample the deep-sea benthic communities has remained virtually the same for the past few decades. Most fauna are either physically collected using a variety of trawls or corers either suspended from the ship or collected using an ROV, whilst a variety of camera systems have been used to collect images of the fauna in-situ. However, the challenging nature of the environment means that the same piece of equipment may not be suitable to be used in the different habitats. This can, and often does, result in difficulties when interpreting and comparing the results with other studies. Once the biological samples have been collected a huge investment in time is required to initially process the material before the long task of identifying the fauna is undertaken. At present there is no other viable mechanism for undertaking this work other than the researcher themselves doing the work. The technology for identifying fauna from stills images or video is being developed but can be specific to certain systems and still requires researcher input. In all, sampling deep-sea benthic ecosystems is complex, time consuming and what works well for one deep-sea habitat is not good for another. New technological developments are needed in order for researchers, policy makers and other stake holders to get a better understanding of deep sea habitats and in a shorter time frame.

S2
"End-to-end" trophodynamic understanding of deep-sea hydrothermal vents

Hydrothermal vents are ephemeral deep-sea habitats that occur along seafloor spreading centres and subduction zones as well as in association with volcanic seamounts. Diverse microbial communities utilise abundant reduced chemical species in venting fluids and a variety of carbon sources for chemosynthetic primary production which ultimately supports localised, high metazoan biomass in relation to the surrounding deep sea. These systems have been investigated for over 40 years yet we still have not integrated all the geochemical and biological processes to develop an "end-to-end" understanding of ecosystem function. Here we review the current stable isotope derived knowledge of geochemistry and trophodynamics at sediment- and basalt-hosted hydrothermal vents. Stable isotopes are routinely used to identify and examine a variety of processes within the hydrothermal vent ecosystem including: basal inorganic sources, microbe-host interactions and trophic structure. The aim is to provide an integrated view of geochemical-microbe-metazoan interactions at multiple scales and provide an "end-to-end" overview of the hydrothermal vent food web from an isotopic perspective.

S3
MarinEye – Building a multitrophic sensor for oceanic monitoring

The understanding of the complex exchanges among biological, chemical, physical, atmospheric, and geological processes in the ocean basins is severely limited by the paucity of infrastructures able to support sustained and timely observations.

Data collection at sea (mainly ship time and personnel costs) represents the main cost of marine monitoring, with a very small part of the budget going into data analysis. During the last years there has been a significant increase in requirements for data acquisition and analysis with the implementation of the European Union Marine Strategy Framework Directive (EU- MSDF), and the development of strategies for the continuous assessment of the marine waters Good Environmental Status (GES) and the implementing of ocean management laws related with Marine Protected Areas, environmental regulation, etc.

Resources are finite, and new technologies have increased the capacity of researchers to obtain and analyse data. Therefore, the development of an autonomous system for integrated marine chemical, physical, and biological monitoring as the MarinEye system is especially important. MarinEye is combining different technologies in a modular, compact system that can be deployed on fixed or mobile platforms. The data acquisition system will include high-resolution imaging (targeting plankton), acoustic techniques (targeting plankton and small pelagic fishes), a hydrophone (targeting mammals and anthropogenic sound), fraction filtration systems (targeting prokaryotes and unicellular eukaryotes), and sensors (for physical-chemical variables such as salinity, dCO2, dO2, temperature and pH).

However, some questions can be raised given the fact that researchers are extremely reluctant to modify ongoing methodologies and data acquisition strategies, something which is understandable due to the importance of consistent data series for the study of long-term ocean variability. In few cases, new technologies have, however, implied an extra dedication of personnel, maintenance costs and even in some cases of vessel time, and data produced on new variables and parameters have been added into existing data bases.

Nevertheless, MarinEye is a starting point for increasing ocean knowledge, complementing the information from existing observatories by providing novel integrative data that are not currently supplied. MarinEye will also give an extremely important contribution for the consolidation of infrastructures dedicated to the observation of the marine environment.

S4
Blue photonics: optics and sensors to sense the ocean

With the Economic pressure driven towards the Ocean resources, the in-situ real time perception of its physical, chemical and biological properties and condition is a fundamental requirement for an efficient and sustainable management of its exploitation. In this regard, there is a high demand for a diversity of sensor technology capable of operating in marine like environments, providing critical information in multiple dimensions: understanding the evolution of water quality, evaluating the impact on biodiversity, assessing the integrity of operating vessels and infrastructures etc. However, meeting these demands and developing effective sensor technology for monitoring physical, chemical and biological parameters in real time, in such a complex system, requires overcoming very demanding Scientific and Technological challenges.

In this context, optical based technologies, particularly when associated with optical fibers, offer a unique set of advantages that are most valuable precisely in such harsh environments. Immunity to electromagnetic interference, chemical robustness, ability for remote, real-time operation, reduced dimensions and geometrical versatility, compatibility with multi-point and multi-parameter configurations are some of the most appealing features.

In this talk, an overview of the applications of optical fiber based technologies for sensing physical, chemical and biological parameters in the context of ocean monitoring will be given.

PS2
Life and Light in the Deep Ocean

It is not often appreciated that the largest living space on the planet is the deep-sea (>200m). An even lesser appreciated fact is that this means most of the living space on the planet is also completely dark. However, while solar light is undetectable beyond the relatively shallow photic zone, light is an incredibly significant, albeit often over looked aspect of life in the deep-sea. Light influences deep-sea organisms in two ways, 1) adaptation to life in the dark can have highly significant effects on the evolution, physiology, morphology and behaviour of organisms, 2) the production and detection of biologically produced light is widespread through most taxa and can have startling effects on behaviour, biology, ecology and the dynamics of the optical landscape of the oceans. Furthermore, the study of bioluminescence has led many different scientific insights, such as predator-prey interactions, effects of underwater topographical features on the overlying water column, large scale temporal hydrography, effects of deep-water trawling and, perhaps the most bizarre, the search for the galactic centre in high-energy sub-atomic particle physics.

S5
Marine geological data: from shallow seas to deep oceans

Detailed and accurate mapping of the marine environment is important for a number of stakeholder groups, including energy companies (oil and gas, and, increasingly, offshore renewables), policy groups who require environmental data for marine spatial planning, resource and conservation management, and academic researchers who aim to better understand the processes that initially formed, and continue to shape these environments.

Systematic offshore research and exploration has been ongoing for more than 60 years with more than 11,000 industry exploration and production wells, 580 scientific boreholes, and more than 45,000 samples acquired using other techniques acquired in UK waters alone. Integration of these physical samples with 2D and 3D seismic reflection data, and with multibeam echosounder data facilitate the production of detailed maps and an improved understanding of our offshore area. International programmes such as the International Ocean Discovery Program, are also a means by which researchers can acquire offshore data. Furthermore, new initiatives such as the Atlantic Seabed Mapping International Working Group look to progress a pan-Atlantic mapping campaign highlighting collaboration at national levels in the future of offshore exploration.

This presentation will describe both traditional techniques and the development of newer tools for offshore data acquisition, processing and interpretation. Case studies will be presented to illustrate their application in 'real' projects.

S6
Ocean Colour Remote Sensing: Technology Requirements for a Radiative Transfer Approach

Ocean colour remote sensing has transformed our ability to monitor surface interactions between biogeochemistry and physical forcing mechanisms. As remote sensing data is increasingly required for assimilation into and validation of ocean models, there is increased pressure to provide quality assurance on remote sensing products. Establishing algorithm and sensor performance and associated uncertainties is essential. One route to achieving this is to develop a rigorous radiative transfer (RT) approach that enables full characterisation of the physical processes involved in generating remote sensing signals. At this time, the quality of inherent optical property measurements is the limiting factor in pursuing this approach. Here we will present recent results demonstrating current sensor and model capabilities and outline key areas for further development. Looking further ahead, we will look at key areas for future satellite sensor developments that could transform our ability to expand monitoring capabilities.

S7
CORAL: a joint effort for the Sustainability of Ocean Exploitation

A considerable fraction of human populations inhabit coastal regions and crucially depend on the resources and services provided by marine ecosystems. Historically, fisheries have been a central resource providing a substantial fraction of the human dietary intake, namely vital nutrients for human health. Technological development allowed the conquering of other Ocean frontiers in time, iconically the offshore extraction of hydrocarbons. More recent developments have open new horizons for Oceanic resource exploitation, namely those related with discoveries in biotechnology or new mineral non-hydrocarbon sources in deep-sea ecosystems. Here I will present CORAL, a joint effort by CIIMAR and INESC TEC, a project aiming to development technology solutions to tackle Deep Sea resource exploitation under an environmental sustainable framework, in addition to the development of Sensor-based technology for marine or marine-related activities.

S8

Abyssal and hadal fishes of the Pacific Ocean: baited lander studies from three hadal trench systems

Following the global expeditions of the mid-20th Century, deep-abyssal and hadal sampling ground to a halt and even the ability to perform such sampling was lost. In recent years there has been a second wave in the exploration of the world's deepest places, but with very different methodology. Previously trawls and dredges retrieved specimens, which were often greatly damaged during their capture, retrieval and preservation. That they were captured at the seabed at all and not during accent or decent was often in question. The biology of these animals was hypothesised based upon these often damaged specimens with questionable points of origin. In contrast, the second wave is largely visual. Animals are now recorded in situ, often denying us a physical sample but providing accurate representation of the animal in life and at a known location. In recent years the largest systematic assessment of the fish fauna of three Pacific trench systems has been conducted: The Kermadec Trench, the New Hebrides Trench, the adjoining South Fiji Basin and the Mariana Trench. Bait-attending fish were recorded during more than 50 days of baited-lander bottom-time across 83 deployments, and 211 fish specimens across 84 trap deployments. Two fish families; the Synaphobranchidae and the Zoacidae are added to those known to extend into the hadal zone and the Liparidae emerge as the dominant hadal fish fauna with the discovery of two new species. Despite their isolation within their respective trenches, the endemic hadal Liparids appear very similar. The fish of each ocean zone had distinct feeding strategies while attending the bait: The abyssal fishes were almost exclusively scavengers, those spanning the boundary of the abyssal and hadal zones comprised of predatory and generalist feeders and the hadal snailfishes were exclusively predators.

SPEAKERS

Alan J. Jamieson

Senior Lecturer
in Marine Ecology

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Dr. Alan Jamieson has 16 years' experience in the design, construction and implementation of technologies for biological research in extreme marine environments, primarily the deep sea and more recently chemosynthetic habitats. He joined the School of Marine Science and Technology in August 2016 following 16 years at the University of Aberdeen's Oceanlab. He has published over 60 peer-reviewed papers in both science and technology journals, two book chapters and a monograph on the deepest environments on earth. He had participated in 45 sea-going expeditions, often as principal scientist and have been awarded over £3 million in research income. He is considered a world leader in the field of ultra-deep science and technology and as such is the chairman of scientific advisory board to Shanghai Ocean Universities HAST program, was an advisor for the IUCN where he addressed the United Nations in New York on marine genetic resources from areas beyond national jurisdiction and recently gave the Keynote speech at the Deep Sea Biology Symposium in Portugal. He has led a research team for the last 8 years which has seen immense international publicity, and >3 million hits on a YouTube channel dedicated to deep sea science. His main personal research interests are in deep-sea technology for the study of deep-water fish and crustaceans, the exploration of the hadal zone (>6000m deep), deep-sea bioluminescence and anything from extreme marine environments.

Alan J. Jamieson is the Chair of the 2016 STRONGMAR conference.

Antonina dos Santos

Researcher

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Antonina dos Santos has over 20 years of scientific work in taxonomy and ecology of larvae of marine invertebrates. She graduated in Marine Biology and Fisheries at the University of Algarve and has a PhD in Biology (Ecology and Biosystematics) from the University of Lisbon in 2000.

Her main area of work has been the study of unexplored phase of living resources, focusing her studies on larval dispersal and recruitment to the origin population. Besides working on the dispersal and recruitment of larvae of crustaceans she has also done some important work on the taxonomy of adults having already described four new species of shrimp to science (Bresilia saldanhai, Periclimenaeus aurae, Lysmata jundalini and Macrobrachium pantanalense). She has been involved in many (16) scientific projects subject to competitive tendering national and European multidisciplinary, 5 of which as coordinator. The results of her scientific activities are reflected in the publication of over 50 scientific articles published in international journals, and she has been consultant of Spanish scientific projects. She has also been in several Chinese universities as guest speaker and has guided many (35) students from graduates to master's theses, doctoral and post-doc in Portugal and Spain, among others. Has been chief scientist on more than 15 multidisciplinary oceanographic campaigns off the Portuguese coast. Also organized an international conference (Larval Symposium) with participants from 25 countries with concurrent sessions. Since 2014 she is member of ICES SCICOM and PUBCOM.

Bhavani E. Narayanaswamy

Senior Lecturer
in Deep Sea Ecosystems

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Dr Narayanaswamy is a deep-sea benthic ecologist with >15 years' experience. Her research has focussed on the links between the benthic community and differing environmental parameters, in particular the changes in species diversity, community composition and functional diversity along the NE Atlantic continental margin, the Arctic-Atlantic boundary, the abyssal plains of the Weddell Sea and seamounts situated in the SW Indian and North Atlantic Oceans. More recently she has been investigating the presence of microplastics in deep sea-water and benthic invertebrates. She is also keen to develop protocols to standardise methodology when sampling the deep sea habitat. Dr Narayanaswamy has published >40 peer reviewed articles, including most recently, articles investigating ecological adaptation of fauna from the SW Indian Ocean, through to an article for the IUCN looking at the impact and effect of ocean warming on deep-sea communities. She is involved in education, teaching deep-water ecology to undergraduates and as well as supporting her own postgraduate research students and being the Head of the SAMS Graduate School. Dr Narayanaswamy is a Principal Investigator for the International Network for Scientific Investigation of Deep-Sea Ecosystems and is a Fellow of the Royal Society of Biology.

David McKee

Senior Lecturer in Marine
Optics and Remote Sensing

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Dr David McKee is a Senior Lecturer leading the Marine Optics and Remote Sensing group in the Physics Department, University of Strathclyde. He specializes in measurements of in situ radiometry and inherent optical properties (IOPs) in optically complex shelf seas to support a radiative transfer approach to interpretation of ocean colour data that is based upon quantitative measurements of IOPs and associated biogeochemistry. He has a wide range of interests spanning ocean colour remote sensing and associated algorithm development, quantitative IOP measurements and variable relationships with biogeochemical proxies, multiple scattering and radiative transfer theory.

Eduardo Silva

Coordinator of the
Centre for Robotics and
Autonomous Systems
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Eduardo Silva is the Coordinator of the Centre for Robotics and Autonomous Systems (CRAS) at INESC TEC and Professor at the School of Engineering (ISEP) of the Porto Polytechnic Institute (IPP). He has a PhD in Electrical and Computer Engineering from the University of Porto. His main research areas are marine robotics, control architectures, perception and navigation for autonomous robots. He has participated in more than 14 research projects. He has more than 60 publications in the area of the Field Robotics.

Eduardo Silva is the Principal Investigator of the STRONGMAR project.

Filipe Castro

Researcher, BoD member

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Filipe Castro has a broad background in biology, with specific training and expertise in molecular biology, evolution and environmental sciences. His research includes: 1) Screening of natural substances from marine organisms with potential pharmacological and ecological applications with a Nuclear receptor-based pipeline. 2) The modulation of retinoic acid signalling pathways by environmental pollutants in Metazoans and 3) the study of evolutionary processes in Metazoans. He has participated as PI or co-Investigator on several funded grants and produced more than 75 peer-reviewed publications. Filipe Castro is a member of the Board of Directors of CIIMAR.

Francis Neat

Senior Scientist

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In 1993 Francis Neat graduated with honours in Zoology from the University of Edinburgh and in 1996 completed a Ph.D in fish behaviour at Glasgow University. He spent the next few years undertaking fish biology research in Zambia (Lake Tanganyika), Mexico (Sea of Cortez), and in the Mediterranean as an EC Marie Curie Research Fellow in Italy. In 2003 he joined Marine Scotland in Aberdeen and began to develop programme of research in deep-sea fisheries and ecology. By 2007 he was leading the MRV Scotia deep-water survey and had secured funding for longer term study. He has been chief scientist on 14 Scotia surveys and has experience of a multitude of methods including TV surveys, trawl surveys, seabed coring and multibeam mapping. He has made several significant discoveries and published numerous papers on deep-sea fish and ecology, including journals such as Current Biology (Clarke et al 2015). He was a convenor for the international FSBI symposium 'Deep Sea Fish Biology' held in Glasgow in 2013. His work is applied to management, notably with respect to conservation and Marine Protected Areas. He is a past chair of the ICES working group on deep-sea ecology and regularly advises the Scottish Government on deep-sea conservation issues. At an international level, he been an invited expert to the FAO, presented at the European Parliament, and in 2016, was scientific advisor to the delegation of the European Union at the United Nations in New York.

Heather Stewart

Marine Geologist

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Heather Stewart works for the British Geological Survey as a marine geologist. Since starting with the British Geological Survey in 2001 she has worked on a wide variety of projects ranging from leading teams to explore the submarine canyons of the South West Approaches of the UK to studying the offshore expression of the last British and Irish Ice Sheet. As well as being involved in investigating the UK deep-water areas of the Faroe–Shetland Channel and Hatton–Rockall areas Heather has carried out extensive research on sea-bed composition, dynamics, geomorphology and Quaternary history of the Central and Northern North Sea. Additionally, Heather works with engineers looking at current and future developments in offshore sampling techniques.

Pedro Jorge

Senior Researcher

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Pedro Alberto da Silva Jorge graduated in Applied Physics (Optics and Lasers) at the Univ. of Minho (1996), MSc in Optoelectronics and Lasers at the Physics Depart. of Univ. of Porto (2000); in 2006 concluded his PhD program at Porto Univ. in collaboration with the Depart. of Physics and Optical Sciences at the Univ. of Charlotte, North Carolina, USA, with work in luminescence based optical fibre systems for biochemical sensing applications. Since 1997 Pedro Jorge has been involved in several research and technology transfer projects related to optical fibre sensing technology, developing new sensing configurations and interrogation techniques for optical sensors. Pedro Jorge is a Senior researcher at INESC TEC where he leads the Biochemical Sensors team exploring the potential of optical fibre and integrated optics technologies in environmental and medical applications coordinating several projects. He has more than 200 publications in the fields of sensors in national and international conferences and peer reviewed journals, is author of 3 book chapters and also holds one patent. Pedro Jorge is a member of SPIE and SPOF.

Thomas D. Linley

Research Assistant
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Following BSc and MSc degrees in marine biology Thomas entered the marine survey industry in 2006, conducting environmental surveys (predominantly oil and gas pre-development surveys) for Gardline Survey Ltd. In three years with the company he accrued over 500 days at sea, gaining experience in assessing sonar data for indications of protected habitats, seafloor assessment using ROV or drop-down cameras, and physical sample collection through various types of cores, grabs, trawls, Niskin bottles, CTD rosettes. The operation and maintenance of a wide variety equipment fostered an interest in the technology of marine science. He became a Senior Field Environmental Scientist with the company before re-entering academia. He joined the University of Aberdeen's Oceanlab in 2009 to work on the EU FP7 project CoralFISH, investigating the interaction between fish and cold-water coral habitats across European reefs and contributed to the Large NERC grant ECOMAR in addition to other Oceanlab projects. He completed and defended an MPhil thesis based on this work. In 2012 he joined the Jamieson hadal group as a PhD student and having explored and published a series of papers on the deepest living fish communities has become a highly accomplished technologist. Also, his contribution to public outreach and media engagement has been vast and diverse. He joined the School of Marine Science and Technology in August 2016.

William Reid

Research Associate
(biological modeller)

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Dr William Reid, is a quantitative biologist with 10+ years' experience researching ecological and physiological processes in polar and deep-sea ecosystems using field research, experimental and modelling techniques. He has a PhD, MSc in Oceanography, 3 years of PDRA experience and a 3 further years' experience as a research scientists working for British Antarctic Survey. He researches whole organism biology in order to gain mechanistic understanding of animal physiology and behaviour, with specific emphasis on ecophysiological interactions among animals, their microbiomes and their environment. He has extensive expertise in using stable isotope, amino acid and lipid analyses to elucidate trophic interactions and nutrient cycling within tissues and deep-sea ecosystems. He has worked on a variety of deep-sea habitats including chemosynthetic habitats, seamounts, continental slopes and abyssal plains, and has recently begun modelling host- and environment-microbe interactions. He has been involved with 9 ocean going research surveys and has 18 peer-reviewed publications which cover a range of themes including ecology, reproductive and developmental biology, microbiology and immunology. Within these publications he has used an array of analytical techniques including: biostatistics, multivariate community analysis, structural equation modelling, inverse-modelling of continuum models, simulation and Bayesian techniques. He has presented at international and national conferences including the Deep-Sea Biology Symposium, ISOECOL and UK Antarctic Science Conference.

STRONGMAR PROJECT

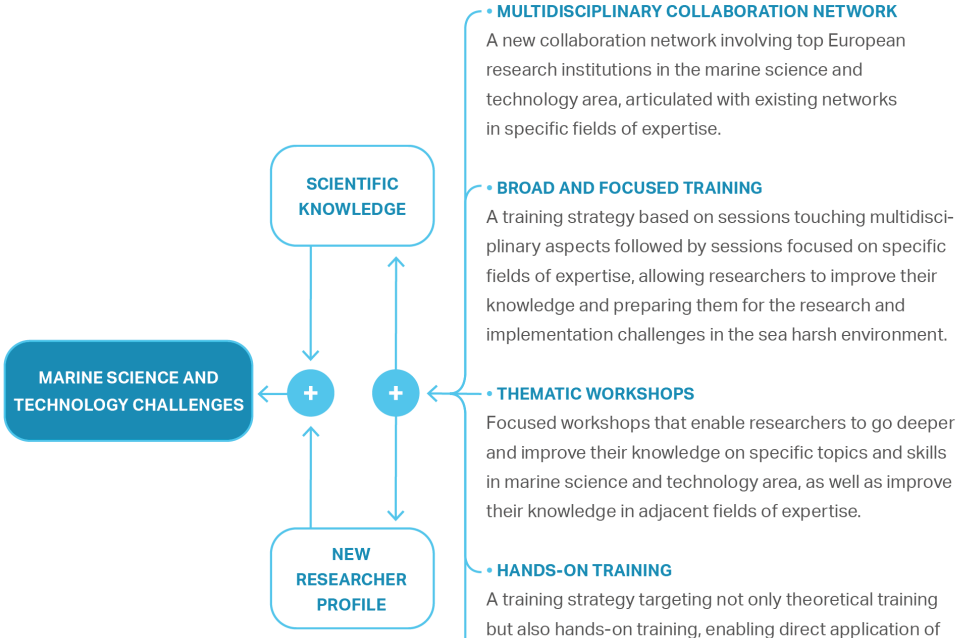
INESC TEC is strongly committed to become a center of excellence in maritime technology and, in particular, deep sea technology. It is strategically located, with fast access to deep sea, it has been steadily building up its skills, capabilities and resources, and is presently in the process of implementing an open research infrastructure, thus preparing itself to become capable of providing services and open access to the European academic and industrial communities and, thus, become a recognized European maritime research asset.

The STRONGMAR project thus aims at creating solid and productive links in the global field of marine science and technology between INESC TEC and established leading research European institutions, capable of enhancing the scientific and technological capacity of INESC TEC and linked institutions (as well as the capacity of partnering institutions involved in the twinning action), helping raising its staff's research profile and its recognition as a European maritime research center of excellence.

These objectives will be fulfilled through a set of measures: summer schools, winter schools, short-term scientific meetings, long-term staff visits, networking meetings, workshops, conferences, technology transfer workshops with stakeholders, and other dissemination activities. Therefore, the STRONGMAR project places INESC TEC as the pivot of a network of excellence, involving four European partners which are international leaders in deep sea technology.

CONCEPT

Five main pillars support the project's concept:



- **MULTIDISCIPLINARY COLLABORATION NETWORK**
  A new collaboration network involving top European research institutions in the marine science and technology area, articulated with existing networks in specific fields of expertise.
- **BROAD AND FOCUSED TRAINING**
  A training strategy based on sessions touching multidisciplinary aspects followed by sessions focused on specific fields of expertise, allowing researchers to improve their knowledge and preparing them for the research and implementation challenges in the sea harsh environment.
- **THEMATIC WORKSHOPS**
  Focused workshops that enable researchers to go deeper and improve their knowledge on specific topics and skills in marine science and technology area, as well as improve their knowledge in adjacent fields of expertise.
- **HANDS-ON TRAINING**
  A training strategy targeting not only theoretical training but also hands-on training, enabling direct application of the knowledge acquired and improve their understanding of the actual requirements of the stakeholders, allowing them to design solutions with higher economic potential.
- **CROSS-FERTILIZATION AMONG FIELDS OF EXPERTISE**
  Interchange and interaction among different fields of expertise is fundamental to address the ocean challenges, due to the multidisciplinary nature of the application area. Cross-fertilization among fields of expertise is also key to stimulate the design of better specific solutions.

CONSORTIUM

DATA

NAME
Strengthening Maritime Technology Research Center

ACRONYM
STRONGMAR

REFERENCE
692427

DURATION
01/01/2016 to 31/12/2018 (36 months)

TYPE OF ACTION
Coordination & Support Action (CSA)

TOPIC
Twinning

CALL FOR PROPOSAL
H2020-TWINN-2015

EU CONTRIBUTION
999.203,75 €

PROJECT OFFICER
Simona Misiti

COORDINATOR
INESC TEC (Portugal)

PARTNERS
CINTAL (Portugal), Heriot-Watt University (United Kingdom), NATO Science & Technology Organization (Belgium), Universitat de Girona (Spain) and University of Aberdeen (United Kingdom)

CORDIS
www.cordis.europa.eu/project/rcn/199452_en.html

WEBSITE
www.strongmar.eu

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Go deeper into the STRONGMAR project.

www.strongmar.eu

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