

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<p><i>“DNA Barcoding e tassonomia tradizionale: un approccio integrato per la conservazione della biodiversità” – MARINE. 1</i></p> <p><i>“DNA barcoding and traditional taxonomy: an integrated approach for biodiversity conservation” - MARINE. 1</i></p>
Tipo Type	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex D.M. 118</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>La diversità biologica, a causa anche dei cambiamenti climatici, sta scomparendo a ritmi allarmante. Tra gli ecosistemi ricchi di biodiversità minacciati dalle pressioni antropiche e dai cambiamenti climatici vi sono le mangrovie. Le mangrovie sono distribuite nella zona di transizione tra mare e terra, per lo più nelle aree tropicali e subtropicali formando un unico ecosistema di zone umide che non è solo l'habitat di vari animali marini, ma ospita anche una flora associata che comprende diversi tipi di alghe. Le alghe contribuiscono in modo determinante alla biodiversità globale e ogni specie mostra una combinazione unica di tratti, svolgendo così diversi ruoli essenziali nell'ecosistema. Sebbene il DNA Barcoding sia uno strumento utile per l'identificazione delle specie e la ricostruzione filogenetica, fino ad ora non è mai stato utilizzato per identificare le alghe associate alle comunità a mangrovie. Scopo di questa ricerca è studiare la diversità algale sia attraverso l'uso del environmental DNA sia attraverso l'impiego della tassonomia classica. Le collaborazioni in corso con altri Istituti italiani e stranieri, come la Victoria University di Wellington e il National Institute of Water and Atmospheric research (NIWA) di Wellington, in Nuova Zelanda, consentiranno possibili scambi di ricerca utili alla crescita del dottorando.</p> <p>ENG</p> <p>Biological diversity is depleting at an alarming rate. Additionally, a vast amount of biodiversity remains undiscovered. Among ecosystems rich in biodiversity threatened by anthropic pressures and climate change there are mangroves. Mangroves are distributed in the transition zone between sea and land, mostly in tropical and subtropical areas forming a unique wetland ecosystem that is not only the habitat of various marine animals, but also hosts an associated flora that includes different types of algae. Algae are major contributors to global biodiversity and each species displays a unique combination of traits, thus playing different essential roles in the ecosystem. Although DNA barcoding is a useful tool for species identification and phylogenetic reconstruction, until now it was not so used in identifying algae associated to mangrove systems. Thus, the aim of this research is to study the algal diversity both through the use of environmental DNA and the classical taxonomy. Current on-going collaborations with other Italian and foreign Institutes, such as the Victoria University of Wellington and National Institute of Water and Atmospheric research (NIWA) in Wellington, New Zealand, will allow possible research exchanges useful for the PhD Student.</p>

Tutor	Prof. Paolo Galli
Mesi previsti in azienda	White Wave Maldives
Expected months at the company	Da definire To be defined
Mesi previsti all'estero	6
Expected months abroad	
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<p><i>“Sviluppo di metodi per la tracciabilità di frodi in prodotti naturali mediante l’impiego di marcatori molecolari” - MARINE. 2</i></p> <p><i>“Development of methods to track fraud in natural products based on recognition of molecular mar” - MARINE. 2</i></p>
Tipo Type	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex D.M. 118/2023</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>La catena di approvvigionamento alimentare è suscettibile di sostituzione delle specie, alle inesattezze di provenienza geografica e a questioni etiche e ambientali, tutto questo con un grave rischio per i consumatori. Questi problemi sono di primaria importanza sia per i produttori che per i consumatori, a causa delle loro implicazioni socioeconomiche, ambientali e sulla salute. Per questi motivi, tra gli Obiettivi di Sviluppo Sostenibile delle Nazioni Unite, molte priorità riguardano la tracciabilità, la sostenibilità, la sicurezza e la qualità del cibo. In questo contesto, lo sviluppo di strumenti efficaci per facilitare il tracciamento delle frodi nella filiera alimentare è di fondamentale importanza. Il progetto ha due obiettivi: il primo riguarda lo sviluppo di strumenti innovativi, universali e trasferibili industrialmente per monitorare l'identità, l'adulterazione e l'origine geografica dei prodotti naturali di interesse (con particolare riferimento al mercato del Luxury). Questo obiettivo sarà raggiunto studiando diversi marcatori molecolari e la loro applicabilità ad un panel di prodotti naturali. Il secondo è testare questi strumenti per valutarne l'accuratezza su larga scala e rilevare la quantità di possibili frodi alimentari in prodotti alimentari di interesse selezionati.</p> <p>ENG</p> <p>The food supply-chain is susceptible to species adulteration, geographic provenance inaccuracies, and ethical and environmental issues, making consumers exposed to fraud events. These issues are of primary concern both for producers and consumers, due to their socio- economical, environmental, and health implications. For these reasons, among the UN Sustainable Development Goals, many priorities relate to the traceability, sustainability, safety, and quality of food. In this context, the development of effective tools to facilitate the tracking of fraud in the food supply-chain is of fundamental importance. The project has two aims. The first is developing innovative, universal, and industrially transferrable tools for monitoring the identity, adulteration, and geographic origin of natural products of interest. This objective will be achieved by studying different molecular markers and their applicability to a panel of natural products. The second is to test these tools in order to assess their accuracy on a large scale and to detect the amount of possible food frauds in selected food items of interest.</p>
Tutor	Prof. Davide Seveso

Mesi previsti in azienda Expected months at the company	Clinica Modena Sud Da definire To be defined
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>“Geospatial modeling for evaluating restoration suitability of marine ecosystems of the Mediterranean Seas and Tropical regions” - MARINE. 3</i>
Tipo/Type	Borsa PNRR MUSA cofinanziata ex D.M. 118/2023 Scholarship PNRR MUSA co-funded ex D.M. 118/2023
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Marine ecosystem restoration actions are becoming increasingly more popular in many areas of the world, representing one of the greatest challenges to date that can deliver results in line with the UN 2030 Agenda for Sustainable Development. However, their success rate is highly variable and depends mainly on the specific biological and ecological characteristics of the species involved, their ecosystem functioning, and undoubtedly on how, where and when restoration is conducted. Knowledge about the factors that enhance or limit the success of restoration efforts, with respect to a given habitat is, to date, very limited for the marine environment. Different sensitivity to human pressures and the spatial variability in the ecological variables that determine their presence and distribution are undoubtedly key factors, and it is therefore necessary to provide detailed and focused information on the selection of restoration sites and methods, from which successful and sustainable restoration actions depend.</p> <p>This project will focus on the provision of high-resolution mapping of selected benthic habitats of the Mediterranean Sea and tropical regions as a source dataset for the development of an innovative approach, based on the application of geospatial modelling techniques, for the semi-automatic selection of appropriate restoration sites. The proposed work flow is based on performing quantitative analysis of acoustic remote sensing data (i.e. Multibeam bathymetry and side-scan sonar backscatter intensity) applying Object-Based Image Analysis (OBIA) techniques, and ad-hoc developed geospatial modeling. Our major goal is to classify seafloor suitability for restoration actions, according to variation in landscape spatial arrangement of selected engineering habitats (e.g. Posidonia oceanica meadows, coral reefs, etc), quantified through the morphometric characterization of their geospatial configuration and architecture.</p> <p>The project integrates the collaboration of national (CMCC - Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici) and foreign partners (Arctic University of Tromso – UiT), through the participation in ongoing projects (i.e.: RENOVATE: ecosystem approach to assessing and testing compensation and mitigation actions in the marine environment: the case of the Civitavecchia port hub - CMCC funding; BridgET: Bridging the gap between the land and the sea in a virtual environment for innovative teaching and community involvement in the science of climate change-induced marine and coastal geohazard – Erasmus+ KA220-HED funding). The candidate is expected to spend a period abroad of at least 6 months in one of the European university participating in the BridgET project.</p>

Tutor	Prof. Alessandra Savini
Mesi previsti in azienda Expected months at the company	GEOEVO 6
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>"The application of 3D photogrammetry and geospatial modelling techniques for Cold-Seeps habitat classification in the Arctic ocean"</i> - MARINE. 4
Tipo Type	Borsa PNRR CN BIODIV cofinanziata ex D.M. 118/2023 Scholarship PNRR CN BIODIV co-funded ex D.M. 118/2023
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Cold seeps represent areas where gases and fluids migrate through the sediment and discharge into the overlying water body. Cold seeps have been the subject of intensive research resulting in the still ongoing discovery of numerous seeps at various water depths, broadly ranging from the intertidal zone of continental margins down to oceanic trenches in the hadal zone (> 6,300 m). Cold seeps deeply influence species abundance and biodiversity, especially in cold and deep waters, and show considerable variation in their geomorphological expression at the seafloor, and associated habitats as well, as a result of the different fluid sources and formation mechanisms. Over the last two decades, research efforts to identify, map and manage these environments have increased along with the advances in data acquisition. Especially the use of advanced ocean robotic systems (i.e.: Remotely Operated Vehicles – ROV) made it possible to obtain relevant dataset on the fine-scale heterogeneity of these habitats, promoted by the diversification of the sediment biogeochemical signature and the biotic component, which is often overlooked, and not adequately investigated.</p> <p>The project aims at exploring innovative seabed mapping techniques to further understand and categorize cold-seeps habitats of the Arctic ocean, developing 3D imaging classification workflow. Photogrammetric and advanced geospatial modeling techniques, such as OBIA (Object-based Image Analysis), will be applied to a wide dataset of ROV videos (collected within the framework of the international project AKMA), to obtain high-resolution photorealistic 3D models and orthomosaics, in order to represent cold-seeps habitats in high-resolution and classify seabed sedimentary properties and macrofauna. An additional project goal is also to develop new forms of visualization of 3D data of underwater environments to derive meaningful information from dense optical datasets.</p> <p>The project integrates the collaboration with foreign partners (Arctic University of Norway – UiT), and the participation in ongoing international projects (i.e.: the international project AKMA – Advanced Knowledge of Methane in the Arctic). The candidate is expected to spend a period abroad of at least 6 months at the Arctic University of Norway in Tromsø, and to participate in oceanographic expeditions in the Arctic ocean.</p>
Tutor	Prof. Alessandra Savini
Mesi previsti in azienda	GEOEVO

Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>"The Maritime Spaces in a Globalized World: Economics and Environment"</i> - MARINE. 5
Tipo/Type	Borsa PNRR CN BIODIV cofinanziata ex D.M. 118/2023 Scholarship PNRR CN BIODIV co-funded ex D.M. 118/2023
Borse/Scholarships	1
Abstract	ENG In recent decades, the acceleration in the globalization process has made the link between economic development and long-distance trade even closer than before. That same acceleration, on the other hand, has also brought out the negative externalities caused by an intensive and poorly regulated use of marine spaces, especially from an environmental point of view. Even institutions mainly dedicated to economic analysis, such as the OECD, are actively dedicating themselves to the study of the complex relationships between commercial navigation and environmental protection, in an attempt to build a balance that protects two fundamental dimensions of our life horizon: economic well-being and the health of the marine ecosystem. A specific literature has emerged, tackling subjects as the compatibility between capitalistic development and environmental sustainability, without reaching a shared vision. On one extreme, Adam Tooze said, "The new challenge before us is how to disarm economic growth as a planetary threat." On the other, the appeals to free markets and "business as usual" consider the environment as the dependent variable inside the ongoing path of human development. Clearly an interpretative 'middle ground' is needed, along with the generation of a new stream of studies, dealing with economic development and environmental sustainability at the same time. The research project aims to contextualize the fundamental aspects of contemporary economic globalization, the role played within it by activities related to the sea, and the attitude of the main international institutions (UN, OECD, EU) towards problems related to the environmental impact of maritime economic activities, also from a regulatory point of view, within the difficult context of ruling activities carried out in international waters.
Tutor	Prof. Giulio Mellinato
Mesi previsti in azienda Expected months at the company	White Wave Maldives 6
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>"Production of new materials for sustainable cosmetic" – MARINE. 6</i>
Tipo/Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 INTERCOS S.p.A.
Borse/Scholarships	1
Abstract	<p>ENG</p> <p>The global market is moving towards an increasingly sustainable approach, especially the cosmetics sector which is constantly evolving. The research for new natural or semi-synthetic materials is now the basis of the formulations in view of regulations regarding the removal or reduction of certain substances or classes of molecules from current formulations.</p> <p>Among the challenges, the removal of microplastic is one of the most appealing in which solid and semi-solid products are required to be appreciated.</p> <p>By modifying natural raw materials through biocompatible molecules could improve texturizant properties in terms of softness and free-flowing, anti-aging effects, humectant and SPF actions.</p> <p>This project will aim to design and synthesize alternative materials to be employed in common to advanced formulations. The reactions will be based on using green and cheap reagents including solvents (mostly water based synthesis) capable of being scalable to meet the needs of the company. Specific tools for the production and characterization of new or modified raw materials will be exploited such as Jet Mill Micronizer, Ball Mill, Rheometer and Scanning Electron Microscopy. Moreover, techniques such as micro-encapsulation of actives or other molecules will be evaluated to acquire specific properties by applying methods such as spray drying and microprecipitation – quantifying the loading, release and skin penetration.</p> <p>In vitro assessments will be considered to test the impact of new materials in the formulations on skin and hairs. This PhD project will be mainly conducted at the laboratories of JOINTLAB INTERCOS-UNIMIB in Kytos (Ex-U28) and Bios (Ex-U3) departments. The ideal candidate should have a master's degree in Chemistry or Pharmaceutical Chemistry.</p>
Tutor	Prof. Miriam Colombo
Mesi previsti in azienda Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: standard	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>“Extraction of natural polymers and chemicals from marine sources” – MARINE. 7</i>
Tipo Type	Borsa finanziata da Enti esterni Scholarship funded by external Body ISTITUTO ITALIANO DI TECNOLOGIA
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Oceans supporting 90% of the earth’s biosphere have a vast biodiversity most of which is still unexplored. Nevertheless, the already known marine species can endlessly supply unique materials. Indeed, marine animals, algae and marine microbes can be valuable sources for the extraction of various chemicals, such as small bioactive molecules or large macromolecules. Indeed, secondary metabolites, polysaccharides, peptides and proteins extracted from marine species are increasingly used in industrial sectors such as food, biomedicine or cosmetics.</p> <p>This project will focus on the extraction of raw materials from different marine species using green chemistry methods and bioengineering. Green solvents combined with low energy thermomechanical processes and degrading enzymes will be studied and used for the extraction and purification of marine chemicals. The extracted chemicals will be extensively characterized by spectroscopy and analytical techniques.</p> <p>The extracted chemicals will be used, following the circular economy approach, to the development of functional and active composites to be used for the remediation of marine ecosystems such as coral reefs, coral reefs, seagrass meadows and mangrove forests.</p> <p>The PhD candidate will learn various physicochemical characterization methods and analytical techniques, like spectroscopy, electronic microscopy, light or radiation scattering, calorimetry, chromatography, among others. The candidate will also become an expert in development of materials using techniques like solvent casting, various coating methods and melt processing methods. The candidate will be working in a multicultural and multi-disciplinary group, where physicists, chemists, biologists, biotechnologists, as well as materials, chemical, mechanical and biomedical engineers, collaborate, use and expand their own expertise, to carry out common research.</p> <p>During the project, the PhD candidate will have the opportunity to collaborate with numerous national and international institutions.</p>
Tutor	Prof. Paolo Galli

Mesi previsti in azienda Expected months at the company	12
Mesi previsti all'estero Expected months abroad	6 – 12
Specific IPR rules: Intellectual property clauses agreed with the Company apply to this scholarship	

Marine Sciences, Technology and Management

Progetto di ricerca Research project	<i>"Engineering of marine biopolymers for value-added products"</i> – MARINE.8
Tipo Type	Borsa finanziata da Enti esterni Scholarship funded by external Body ISTITUTO ITALIANO DI TECNOLOGIA
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Ocean is an invaluable resource of natural polymers such as alginate, chitosan, carrageenan, collagen, gelatin, etc. These marine biopolymers can be processed, separately or in combination, into new materials with tunable structures and various physicochemical properties. Such potential combined with their excellent biocompatibility and biodegradability places them among the most promising future materials for various industrial sectors, especially nowadays that the need to reduce plastic pollution has become imperative. On the top, materials based on marine polymers can have functional properties, like antibacterial, antioxidant, oxygen barrier or extreme and reversible water retention, which can turn them into high value added products.</p> <p>This project will focus on the chemical modifications of natural marine polymers using green chemistry methods and on their engineering using polymer processing methods in order to develop new high added value biodegradable products. Multilayered composite materials with various structures and properties will be developed. The application focus of the developed materials will be functional packaging of food and cosmetic products, a sector that is currently heavily contributing to the accumulation of plastic waste to the environment.</p> <p>The PhD candidate will become skilled on polymer processing techniques such as melt extrusion, injection molding, blow molding, 3D printing and hot press. The candidate will learn and systematically use various physicochemical characterization methods, like UV/visible and IR spectroscopy, electronic microscopy, thermomechanical characterizations, oxygen barrier and biodegradation analysis, among others. The candidate will be working in a multicultural and multi-disciplinary group, where physicists, chemists, biologists, biotechnologists, as well as materials, chemical, mechanical and biomedical engineers, collaborate, use and expand their own expertise, to carry out common research.</p> <p>During the project the PhD candidate will have the opportunity to collaborate with numerous national and international institutions.</p>
Tutor	Prof. Paolo Galli
Mesi previsti in azienda	12

Expected months at the company	
Mesi previsti all'estero Expected months abroad	6 – 12
Specific IPR rules: Intellectual property clauses agreed with the Company apply to this scholarship	