



## **EuroMarine Strategic Agenda**

**on**

### **Enhancement of Human Resources to support Blue Growth sectors**

Outcome of the EUROMARINE WORKING GROUP on Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing (EHUSEA) held at the National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy) on 27-29 May 2019.



**National Research Council of Italy**

EuroMarine Strategic Agenda on “Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing (EHUSEA)”.

This Strategic Agenda is the main result of the EUROMARINE WORKING GROUP meeting on Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing (EHUSEA) held at the National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy) on 27-29 May 2019.

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## Executive summary

This Strategic Agenda (SA) is the main outcome of the EuroMarine Network Working Group on 'Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing' (EHUSEA WG), held at the National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy) on 27-29 May 2019 (see Annex). It is structured in four sections.

The first one has been dedicated to list **"what is needed"** in terms of training and tools in the Fisheries, Aquaculture, and Seafood Processing (FASP) sector, also profiting on the outcomes of previous recent initiatives at EU level. In fact, the document connects the conclusions of relevant meetings, e.g. organized in the framework of European networks, on the subject.

Recognizing the blue skills >> blue growth >> ocean literacy (including awareness of careers in blue economy at school level) virtuous cycle, the second section is about **"what is available"**, examining and compiling enabling European policies and strategies in support to the enhancement of human resources.

The third section is aimed at **matching challenges and opportunities**, linking targets (Research National and Intergovernmental Organizations, Private Companies, Funding Agencies, Regional Authorities), objectives and tools (Frameworks and Instruments), also including a tentative timeframe for implementation.

Finally, the fourth section suggests **lines of action, to pursue in the future**. It reports operative proposals and recommendations for developing EHUSEA actions within and outside the EM network based on the findings of this SA, and recommending measuring impacts, in the short/medium term. Expected outcomes include further uptakes of the EHUSEA EM WG outputs in relevant strategies, programmes, initiatives, and actions, including the FOOD2030 Strategy and the joint calls to be launched by the ERANET COFUND action on Blue Bioeconomy.

Enhanced cooperation has been pursued according to EuroMarine principles, also addressing activities aimed at supporting the development of R&I marine and maritime policy frameworks at macro-regional level.

In a nutshell, by adding a milestone in the complex multi-stakeholders' blue-growth system, the EHUSEA Strategic Agenda aims at supporting key players, including decision makers, in addressing the skills' gap by proposing concrete actions for medium term implementation.

## How to... EHUSEA!

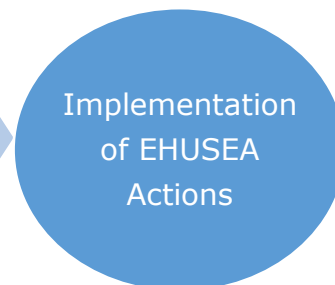
Integrated revision of background works and discussion to assess training needs, existing tools, evolving environments



Promotion of EHUSEA SA findings to develop projects, informing policies



Implementation of EHUSEA Actions



## 1. Introduction and methodology

The European's Blue Economy generates more than EUR 560 billion a year (EC, 2019<sup>1</sup>), i.e. about 4% of our total economic output. It employs over 3.5 million people and has the potential to create additional jobs. Thus, it requires the future workforce having the right skills and competences to fill the new vacancies of the industries of the sector.

Recognizing this trend, one of the aims of the European "Blue Growth" strategy is to bridge the gap existing between business needs and education, to remedy to the lack of cooperation between businesses, educational institutions, and government, to create new occupational profiles, and to increase awareness of gender equitable career opportunities in the blue economy.

Continuous skills development is the key to enabling Blue Growth and to promote a culture of sustainable development of social and economic activities. Blue Growth will require operators in the marine and maritime sectors to work towards a synergistic and non-conflicting approach to sustainable use of the sea (EuroMarine, 2018). Continual updates of the thematic needs and training tools is deemed necessary to provide strategic input to the policies for implementing impactful actions.

In particular, the Fisheries, Aquaculture and Seafood Processing (FASP) is considered a key sector, requiring new professional profiles to respond to the production chain's

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<sup>1</sup> European Commission (2019), *The EU Blue Economy Report*, 2019. Publications Office of the European Union. Luxembourg, <https://op.europa.eu/en/publication-detail/-/publication/676bbd4a-7dd9-11e9-9f05-01aa75ed71a1/language-en/>.

challenges with innovative solutions, and at the same time requiring strategic actions for the sustainable development of traditional activities leading to blue growth, thus addressing both academia curricula and vocational education and training (VET).

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## Background

While recalling the stimulating environment of the Euromarine Network (EM, [www.euromarinetwork.eu/](http://www.euromarinetwork.eu/)), which recently launched the [Young Scientists Working Group](#) and a [Call for fellowships](#) allowing the participation of young scientists in valuable training programmes to ensure the continued success of research and development in the European marine science community in the future, **this Euromarine Strategic Agenda (EM-SA) on EHUSEA builds**

on the following key works:

- the Cooperation on Fisheries Aquaculture and Seafood Processing (COFASP) ERANET Strategic Research Agenda, published on December 2016;
- the European Marine Board science brief "Training the 21st Century Marine Professional", published on April 2018;

and on the outcomes of:

- the EuroMarine Workshop "Training 21st Century Marine Scientists and Engineers for Academic and Non-Academic Careers", held in Naples on 23th February 2015;
- the COFASP FP7 ERANET Workshop "Strengthening human capital through targeted mobility actions in the FASP sector", held in Kiel (Germany) on 9th December 2016;
- the EuroMarine Working Group on "Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing (EHUSEA)" held in Capo Granitola (TP, Italy) on 27-29 May 2019.

As for the outputs, **the EM-SA on EHUSEA looks at:**

- EHUSEA as asset for the preparation of future EM services in the short term (1 to 3 years);
  - preparing the ground for broader implementation of concrete actions by key stakeholders in the medium term (5 years);
  - presenting a vision for marine graduate education and training programmes in Europe;
  - paving the way to create a suitable environment for the development of human resources and the transfer of know-how, including by advancing synergies between local and national level;
  - fostering the transdisciplinary approach and enhancing cross-border cooperation with non-European countries for the Mediterranean Sea.
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By revising relevant achievements and projecting into the next European programming framework, **this Strategic Agenda presents the operational proposals of the**

**marine research and innovation community on how to Enhance Human resources to support Blue Growth Sectors (EHUSEA).** Taking into account the evolving landscape of educational and research policies at European and global level as well as the fundamental views of the private sector, this agenda aims to prepare the ground for implementation of actions, spanning from definition of capacity building schemes to the organization of specific courses.

Furthermore, recognizing the Regional specificities, as from the European Commission Sea Basins Strategies, and in order to promote the EHUSEA in the Mediterranean Basin, a promising but challenging area to test the feasibility of the Blue Growth, this document highlights some specificities and provides tailored recommendations for implementation at the Mediterranean Sea level.





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Reflecting on the future of marine/maritime science training scenarios, it has to be taken into account that many sectors in marine-relevant areas do not require advanced qualifications. At the same time, more than 90% of PhD students do not enter academia or other jobs that require higher degrees. This disparity in education and job prospects ***calls for a modernisation of all marine graduate training programmes by engaging the wider marine community across academia, government (policy & funding) and industry to develop suitable training programs.***

<sup>2</sup> OECD (2016), *The Ocean Economy in 2030*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264251724-en>.

However, a general mismatch exists between the formal studies and the market. Training and mobility programmes should necessarily and increasingly integrate academy, technological centres and industry, to avoid the risk of training a workforce that the market will not absorb.

This necessitates the need to adapt Master Courses (MSc) and PhD training to make graduates more employable and ensure that post-doctoral researchers develop skills to pursue realistic career opportunities.

For example, the so called Mix and Match Scenario (Coastal Resources Management Group, University of St Andrews, UK) is based on a learning/training centric model which offers more flexible/bespoke training and qualifications. The training is modulated on demand and it is performed at a multi-institutional level.

Still, the role of research is prominent in the Blue Economy. According to the "Food from the oceans paradigm" of the EC-SAM publication "Food from the oceans"<sup>3</sup>, "fisheries and mariculture development and the policy coherence and tradeoff issues they raise must be afforded in broader 'food system', 'ocean system' and 'bioeconomy' contexts. This means, *inter alia*, joint system-level treatment of several sectors and policy objectives in conjunction with drivers of change such as climate and other such influences on sustainable development."

Looking at the positive trend of investments for a more coordinated European Research Area, collaborative and innovative research is more and more required, besides proposing and transferring solutions, to steer mission-oriented policies towards ambitious and socially relevant goals, with UN Sustainable Development Goals 2030 targets re-shaping in some cases Science, Technology and Innovation (STI) policy agendas (OECD, 2018<sup>4</sup>). As part of the integrated ocean management perspective, the FASP policies, including for human resources, shall address the sustainability and the environment pressure while responding to the blue economy push for profit and employment, maximising its potential whilst minimising the impact. To achieve the goals outlined in directives like the Marine Strategy Framework and Maritime Spatial Planning and improve the management of Marine Protected Areas, will require: (1) finding mechanisms to maximise resilience of marine systems and processes to climate change and global change, (2) reducing human consumption of non-renewable marine resources, and (3) taking a bigger picture approach to integrating sectors such as public health and tourism.

In this framework, while confronted with the growing global market, the regional differences shall be duly taken into account. Regional dimension is indeed important to define local priorities and regional authorities shall play a prominent role in promoting training development, e.g., via local networks between industry, higher education institutions and research infrastructures.

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<sup>3</sup> European Commission. Directorate-General for Research and Innovation. Unit RTD.01 - Scientific Advice Mechanism (SAM). *Food from the Oceans - How can more food and biomass be obtained from the oceans in a way that does not deprive future generations of their benefits?* (2017). [https://ec.europa.eu/research/sam/pdf/sam\\_food-from-oceans\\_report.pdf#view=fit&pagemode=none](https://ec.europa.eu/research/sam/pdf/sam_food-from-oceans_report.pdf#view=fit&pagemode=none)

<sup>4</sup> OECD (2018), *OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*, OECD Publishing, Paris, [https://doi.org/10.1787/sti\\_in\\_outlook-2018-en](https://doi.org/10.1787/sti_in_outlook-2018-en).

The shortage in the supply of workers, and of those with the appropriate level of experience, despite rapid increase of the sector, is related also to the location of production sites. Local infrastructure is crucial to ensure locations are attractive places to live, work and learn. Companies, especially larger companies with dedicated Research & Development departments, are also piloting new ways of working to make the sector more appealing including development of their own training courses. While the provision of in-house training by companies is often high quality, it is not coordinated across the industry and could lead to inconsistency of training.

Industry engagement in schools, colleges and communities can also help to address attractiveness, but is limited at present. The pipeline of entrants from education is currently insufficient to meet demand. Industry needs to support the development of the skills pipeline by offering more opportunities for vocational training and degrees with work-based learning.

### *Needed skills and tools*

The interconnected approach illustrated in the paragraph above relies on actual training needs and innovative learning tools.

As summarized in the list below, some blue skills gaps can be addressed in relation to each sector while it is crucial to enhance trans-disciplinary aspects, embedding fundamental science into the social and economic context, including public health. For example, ecosystem valuation studies do not only require fundamental marine science and economics but also understanding of the potential health benefits and cost, and the social context and interpretation of the outcomes: who will benefit or bear the costs, what trade-off should be made between which ecosystem services, etc. On the contrary, bioeconomy jobs, including blue-bioeconomy, are not necessarily seen as “marine” or “maritime”, e.g. in the case of engineers in seafood processing, automatisisation, ICT/communication, biotech, law, economics.



updated, and enriched during the EM EHUSEA Working Group. The list below addresses the main ones, which generally apply to all EU countries. However, the group also tried to underline those needs having a particular relevance for the Mediterranean Sea, where locally some notable gaps may occur compared to Northern European countries (see the training needs marked with "(M)").

<b>Transversal</b>	<ul style="list-style-type: none"> <li>- ICT;</li> <li>- Foreign languages;</li> <li>- Leadership and organizational management;</li> <li>- Use of new emerging technologies, data science, analysis and management;</li> <li>- Communication skills, people management skills (i.e., interpersonal relations) and social awareness practices (e.g. on perception of seafood quality and human wellbeing);</li> <li>- Social and economic aspects;</li> <li>- Analytical skills;</li> <li>- Knowledge of regulations and statutes (e.g., permitting &amp; food safety);</li> <li>- Project management, from designing to performing experiments;</li> <li>- Trade journals reading;</li> <li>- Collect information from libraries;</li> <li>- Maintain association memberships;</li> <li>- Policy implementation.</li> </ul>
<b>Fisheries</b>	<ul style="list-style-type: none"> <li>- Develop principles of responsible fisheries in young fishers the principles of responsible fisheries;</li> <li>- Involve fishers and other stakeholders in monitoring, surveillance and management of fisheries;</li> <li>- Improve value-added of fisheries products;</li> <li>- Optimize efficiency/sustainability of existing fisheries;</li> <li>- Innovate technologies for more selective fishing gears (M);</li> <li>- Mitigate discarding practices (M);</li> <li>- Develop spatial/temporal approach to fishery management (M);</li> <li>- Collection of fisheries and ecological geo-referenced data;</li> <li>- Data analysis capabilities;</li> <li>- Improve quality of fisheries-dependent data;</li> <li>- Development of innovative technologies to improve fisheries monitoring, surveillance and data collection;</li> <li>- Assessing of impact of different fishing gears on protected species, including marine mammals (also in order to reduce by-catch);</li> <li>- Integrate small scale fisheries with tourism (M);</li> <li>- Promulgate regulatory innovations to make effective the adoption of Territorial Use Rights in Fisheries (TURFs) (M)</li> <li>- Mitigate negative impacts of global change;</li> <li>- Develop Ecosystem approach to fisheries management.</li> </ul>
<b>Aquaculture</b>	<ul style="list-style-type: none"> <li>- Technical skills, with more specialist and niche skills required for more sophisticated and innovative techniques and technology;</li> </ul>

	<ul style="list-style-type: none"> <li>- Regulation/licencing/monitoring/R&amp;D – mainly stock improvement, nutrition, disease (diagnosis and treatments) and shellfish hygiene.</li> <li>- Production and maintenance of tanks and equipment</li> <li>- Application of advanced warning systems in mariculture;</li> <li>- Planning, business management and public communications in aquaculture;</li> <li>- Organic aquaculture (with the main challenge of lowering production costs relative to conventional methods;</li> <li>- Multi-trophic aquaculture (M);</li> <li>- Developing methods to (remotely and automatically) manage diseases affecting aquaculture (M);</li> <li>- Risk assessment/management and fundamentals of aquaculture insurance;</li> <li>- Spatial planning and allocated zones for aquaculture (incl. geographic information system tools for zoning and for the establishment of Allocated Zones for Aquaculture);</li> <li>- Reduction of feed costs combined with feed improvements (M);</li> <li>- Diversification with larger-size, higher-value-added finfish species;</li> <li>- New products development with a consumer focus (from sea bass and sea bream to meagre as promising for its remarkable growth speed, large sizes, low fat content and meat consistency) (M).</li> <li>- Application of blue biotechnology;</li> <li>- Development of floating multi-use platforms adapted to deeper waters (M).</li> <li>- Post-harvest sector/ Sustainability certifications and labelling for a more friendly production (animal welfare, health and naturalness) (M).</li> </ul>
<b>Seafood Processing</b>	<ul style="list-style-type: none"> <li>- Production technologies of new resources such as seaweed and algae, as well as in usage of biodegradable packaging (from seaweed);</li> <li>- Traceability of produce via certification and in labelling as a source of information to guarantee sustainability of production and safety for consumption.</li> </ul>
<b>Intersector/ Multi-disciplinary</b>	<ul style="list-style-type: none"> <li>- Knowledge of basic biology, and working knowledge of aquatic pathology, basic genetics, ecology, physiology and human pathology;</li> <li>- Discard management as a common theme for fisheries, aquaculture and seafood processing (including alternative feeds);</li> <li>- Spatial plans to optimize bio-economy components of coastal fisheries and aquaculture;</li> <li>- Integrated Ecosystem Assessment, monitoring and management;</li> <li>- Taxonomic expertise.</li> </ul>



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## Blue eye on aquaculture

Aquaculture is an old industrial activity that recently became a crucial one to ensure the sustainability of seafood demand worldwide. Production showed a stable increase over the last decades. On a global scale, its contribution to seafood production increase from 25.7 percent in 2000 to 42.2% in 2012 and is expected to reach 50.1% in 2030 (FAO, 2014)<sup>5</sup>. In 2016, global aquaculture production was 110.2 million tons, with value estimated at USD 243.5 billion (FAO, 2016)<sup>6</sup>. Significant regional variations are observed within global trends, due to differential demographic and economic growth, with sharp increases in demand from Asian emerging economies and more moderate positive trends from European countries. The biggest European aquaculture producers are Norway, followed by Spain, United Kingdom, France, Greece, Turkey and Italy, which account for 86% of all aquaculture production in Europe.

In terms of skills' demand, employers and stakeholders report to be greatest in production, rather than processing and the wider supply chain. This is in line with aquaculture sector strategies to 2030 which recognize a proportionate shift in jobs to automated models of production, with more supply chain jobs required in engineering and technical services proportionate to on-farm management. R&D and innovation in the sector has also been responsive to increasing automation as businesses seek to improve productivity and competitiveness. Processes such as feeding are now much more mechanized. Monitoring of fish stocks also makes greater use of digital technology, e.g. cameras and remote sensing of environmental conditions such as oxygen levels. As regard offshore aquaculture further development, ongoing research and investment is needed in developing largescale technology for offshore equipment such as cages. New offshore models are under development and will require a potentially large shift in skills and technology beyond 2030. This will range from innovation in cage design, to offshore renewable power generation, to remote cameras and sensors to monitor higher rates of wear and tear. A range of new engineering and associated scientific skills will be thus required to support this development.

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<sup>5</sup> FAO. 2014. *The State of World Fisheries and Aquaculture 2014*. Rome. 223 pp. <http://www.fao.org/3/a-i3720e.pdf>

<sup>6</sup> FAO. 2016. *The State of World Fisheries and Aquaculture 2016*. Contributing to food security and nutrition for all. Rome. 200 pp. <http://www.fao.org/3/a-i5555e.pdf>

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To complete the picture, **it is very important to consider climate change as job change driver**. Aquaculture likewise most other food production processes is sensitive to climatic conditions and environment degradation and pollution and the expected consequences of climate change are highly variable in relation to climatic zones. Climate change affects the sea level, ocean acidity, temperature and introduces stress to organisms. These factors can have an effect on the growth, health and reproduction of organisms in aquaculture facilities thus requiring a set of dedicated knowledge and technical skills to cope with this change.

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### Learning systems

As from the list of training needs above, the FASP need multidisciplinary and multi-sectoral skills, and related curricula, while **mobility** is playing a fundamental role in this approach, not only with reference to the opportunities offered to study/be trained abroad but also as tool for cross-sectoral job mobility. Mobility as part of human capacity building (HCB) involves in the FASP a very large number of different expertise and qualifications, including scientific and technical personnel from both public and private institutions as well as policy managers, legal officers and employees from the private sector (fishermen, aquaculture and seafood processing operators, etc.).

The background environment should be designed so to overcome common obstacles such as language barrier, lack of time, funding mechanism, suitable training tool, involving multiple expertise from both public and private sector.

In HCB schemes, **e-learning** and other similar approaches that foster a mind-set open to continuous training shall play a key role. Adults engaging in **Lifelong Learning** are active learners committed with continued professional development and seek access to appropriate resources, engagement with fellow learners and more expert practitioners. Lifelong learning tools are needed to ensure sustainability of these sectors. Virtual education should develop a system of harmonized credits (ECTS) similar as far as possible to what exists in conventional education so that students' achievements are reflected in their CVs and recognized by educational institutions. This might not be applicable to some informal learning tools though. With particular reference to the COFASP sectors, e-learning should envisage both subject-specific training, and non-subject skills such as languages, IT literacy, environmental and regulation issues, soft skills (time management tools, communication, problem solving, entrepreneurship, etc.), among others. Given the gap detected between the industry's necessities and what the traditional education system offers, an e-learning program should focus on a closer collaboration with the industry, by for example inviting specialists working in the FASP fields to design the contents, be co-lecturers on specific topics, instructors with practical sessions, mentors, appraisers and others alike to provide a practical view apart from the theoretical one.

As reported by the [European Commission-DG MARE Expert Group on Skills and Career Development](#), there is the need to look more into life-long learning opportunities and development provided by the companies of a specific sector. The collaboration between



universities and industry, like in the form of hybrid lecturers, is a very good approach. The licencing of professors and the professional recognition of training experience is necessary, as is a continuous collaboration between teachers (scientists) and industry and its support. The experience of the ageing skilled labour force shall be used as far as possible; at the same time, the appeal of new digital skills shall be reflected in the blue economy sector in customised state-of-the-art, smart, digital, technologically superior skill-sets.

### 3. What is available, relevant European policy frameworks and strategies

Recognizing the **blue skills >> blue growth >> ocean literacy** (including awareness of careers in blue economy at school level) **virtuous cycle**, major sectoral policy drivers embed implicitly or explicitly agendas for skills development. Education and training elements in the blue economy form a consistent and significant part of the **Integrated Maritime Policy** ([https://ec.europa.eu/maritimeaffairs/policy\\_en](https://ec.europa.eu/maritimeaffairs/policy_en)). To this end, skills' related objectives have been included for instance in the work programme funded by the European Maritime and Fisheries Fund (EMFF): to equip the blue workforce with the required skills for the future jobs; to provide students with the proper skills to let them develop their own innovative ideas and products, and to increase collaboration between educational institutes and entities such as incubators and science parks. The 2018 call addressed in particular courses/programmes for the development of entrepreneurial skills; permanent collaboration frameworks between industry and education (hybrid teaching, apprenticeship schemes); industry-education networks at sea basin level (development of common curricula and training from existing ones); innovative teaching and training methodologies to boost entrepreneurial skills; the promotion of structured and permanent collaboration frameworks between industry and education, whereby the most recent technological and market developments are directly integrated into the educational offer, enabling to reply to labour market needs.

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#### **From Strategy to Action, the Blueprint on skills cooperation for maritime technology**

As part of the New Skills Agenda for Europe launched on 10 June 2016, the Blueprint on sectorial skills cooperation, the maritime technology pilot turned into an industry-led project: MATES, Maritime Alliance for fostering the European Blue Economy through a Marine Technology Skilling Strategy ([www.projectmates.eu](http://www.projectmates.eu), EC-Erasmus+ grant, 2018-2021). It tackles skills gap mainly in shipbuilding and offshore renewable energy, by examining skills shortages and mismatches, mapping education and training offer available, proposing a strategy, piloting actions. The aim is to translate the sectoral strategy into forecasts and actions on jobs and skills needs for the next 5 to 10 years, leading to establishing a sectorial skills platform at EU level and roll-out at national/regional level by European Structural and Investment Funds.

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The European science-rooted policy trends of the sector have been boosted recently by the urgent call of the new-President elected of the European Parliament to strengthen the 'From Farm to Fork'<sup>7</sup> strategy on sustainable food «drawing on the potential of sustainable seafood as a low-carbon food source and the potential of the aquaculture

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<sup>7</sup> Ursula von der Leyen President-elect of the European Commission, *Mission letter to Virginijus Sinkevičius Commissioner-designate for Environment and Oceans*, Brussels, 10 September 2019, [https://ec.europa.eu/commission/sites/beta-political/files/mission-letter-virginijus-sinkevicius\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/mission-letter-virginijus-sinkevicius_en.pdf)

sector». In this perspective, upcoming needs include the revision of the [Common Fishery Policy](#), to push for more and sustainable marine production due to rising food demands, as from the [Food 2030 Strategy](#), and the increase of the inclusion of blue value chains in bioeconomy strategies. The [Bioeconomy Strategy](#) addresses sustainable and innovative use of biomass and biological knowledge to provide food, feed, industrial products, bioenergy, and ecological and other services. The sustainable use of biomass through fisheries and aquaculture requires science and monitoring, modelling/understanding and management. In processing, this is declined into a much more circular approach, using the “waste” for other purposes – directly or in collaboration with other industry partners and boosting the interlinkage between land and marine ecosystems and the services they provide. For example, the use of marine biomass from the marine area as feed for cheeks, the aquaculture on land, addressing together all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture). It comprises all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services.

As regard the European policies for research and innovation, works are on-going to define the upcoming [Horizon Europe](#) R&I Framework Programme **2021-2027**, with 100 billion € budget allocated for Seas and Oceans and one Mission clearly targeting Oceans and Seas’ Health. Large public-public partnerships are likely foreseen to implement the blue-economy R&I actions.

All this trends are reflected at regional level, through initiatives acting to cope the regional differences in relation with European and global directions, the powerful one actually being the [Decade of Ocean Science for Sustainable Development 2021-2030](#) proclaimed by the United Nations to support efforts to reverse cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. The Life Under Water SDG14 and Zero hunger SDG2 are key targets for the FASP sector among others.

The [BLUEMED Research and Innovation Initiative](#) for blue jobs and growth in the Mediterranean Area addresses ‘Building capacity, blue skills and blue professionals’ as one of the key priorities of the Strategic Research and Innovation Agenda. The regional dimension is also the most suitable one for creating education-industry-public authorities’ networks at sea basin level, to map existing educational activities, enable pooling and sharing of best practices as well as of human and physical capital (e.g. training simulators), develop common training programmes, and foster transnational mobility of learners and teachers.

## **Useful environments and tools**

From macro organizations and systems to micro projects/courses, the following table lists some available and most powerful means to support the enhancement of human resources.

What	How it can support EHUSEA	Example
Business incubator	Such an environment envisions innovation on a global scale with solutions that can be applied on a local scale, approaching actual complexity, including information flow, in an ecosystem way. As intermediate environment between research and business innovation, it connects resources, talents and market opportunities; it supports the development of research and innovation patents, spin-offs, PhDs for young researchers; it targets the entrepreneur as the engine enabling innovative ecosystems where young researchers are natural bridges between the research and innovation worlds to find a new and untapped opportunity.	<a href="#">ARCA</a> , Consortium for the application of research and the creation of innovative enterprises
Partnership of Higher Education and Research to support the development of blue careers	<p>Developing a blue skills' ecosystem:</p> <ul style="list-style-type: none"> <li>- to encourage the advance of marine science and technology by facilitating and improving the co-ordination of marine science across Universities, to engage researchers in all areas of marine science and promote Graduate Schools, providing education and training to the student community, external training and experimental activities, ensuring that graduate students have the full complement of skills required to achieve the best in their future careers;</li> <li>- to deliver tailored Postgraduate Certificate in Researcher Professional Development for Marine Science and Technology;</li> <li>- to create virtuous circular processes that train teachers from the industries world, that are then able to teach and train new graduates in the blue economy;</li> <li>- to promote tailored PhD, Summer School, Advanced Masters, mobility programmes for young researchers, professional tranships, specific workshops.</li> </ul>	<p>Marine Alliance for Science and Technology for Scotland (<a href="#">MASTS</a>)</p> <p>Blueskills - Blue Jobs and Responsible Growth in the Mediterranean throughout Enhancing Skills and Developing Capacities (project implemented by OGS, IT and flagged by UfM, <a href="https://ufmsecretariat.org/project/blueskills-blue-jobs/">https://ufmsecretariat.org/project/blueskills-blue-jobs/</a>)</p> <p>UNIMED – Mediterranean Universities Union – SubNetwork Bluemed <a href="http://www.unimed.net/en/subnetwork-on-blumed/">http://www.unimed.net/en/subnetwork-on-blumed/</a> and its general networking dimension</p>

What	How it can support EHUSEA	Example
e-School	Piloting BlueSTEM pathways in high schools, from the launch of career videos and of a dedicated website, to summer immersion programmes and internships, to the establishment of a dedicated blue economy education collaborative system (not separating the marine subjects from other education patterns).	<a href="#">Ocean School</a> (a ground-breaking learning experience that uses powerful storytelling techniques, immersive technologies and interactive media. Its inquiry-based approach advances critical thinking, innovation and environmental awareness)
Careers centre	To recruit skilled personnel, to establish and propagate maritime academies, to build apprenticeship desk providing career guidance and mentoring, to organize blue careers fairs.	Spin-off of relevant EC Blue Careers funded projects (e.g. ENTREFISH for the sector concerned)
Research Infrastructure	It provides access to all scientific communities, national or international, academic or industrial to: <ul style="list-style-type: none"> <li>- training facilities: teaching laboratories, field sites;</li> <li>- experimental facilities&amp;services;</li> </ul> for: <ul style="list-style-type: none"> <li>- higher education training: master;</li> <li>- vocational training: methodologies, techniques and specialised training courses.</li> </ul>	European Marine Biology Research Infrastructure Consortium ( <a href="#">EMBRC</a> )
Observatory	Suitable environment to: <ul style="list-style-type: none"> <li>- consult stakeholders (i.e. members) on a regular basis;</li> <li>- discuss sustainable policies and ethical growth with the blue companies;</li> <li>- facilitate the communication between the fishing jobs and the scientific research;</li> <li>- build the new entrepreneurial class by looking at fishermen as managers of the marine environment;</li> <li>- to promote environmental information (e.g. better management of fishing quotas) to be injected into the economic flow (e.g. greater education on market certificate).</li> </ul>	The <a href="#">Mediterranean Fisheries Observatory</a> (Mazara del Vallo, Trapani, Italy)

What	How it can support EHUSEA	Example
Awareness Portal	Virtual place with multiple functions: <ul style="list-style-type: none"> <li>- to raise awareness as to the opportunities for blue careers, to boost ocean literacy in the form of blue schools and maritime education from the early, formative years of one person's life as pre-requisite to attract and retain talent and skilled workforce in the blue economy sectors;</li> <li>- to act as one-stop-shop for trainees in search of a training, trainers in search of assistance, stakeholders in research of insights;</li> <li>- to provide advertising material, online application/registration tools, online training resource directory, template of certificate of attendance.</li> </ul>	<a href="#">Marine Training Portal</a> - "EU4Oceans" Dedicated platforms on Ocean Literacy (to be launched)
Start-up project	Strengthening cooperation between industry and education, create partnership at local/regional level and design and implement concrete action to address the skills gap and create blue careers awareness.	<a href="#">EC-DG MARE Blue Careers Work Programme</a> Calls for projects
Training course	To improve global ecosystem-based governance of large marine ecosystems and their coasts by generating knowledge, building capacity, harnessing public and private partners and supporting south-to-south learning and north-to-south learning.  Potential topics: stock assessment, modelling carrying capacity/deposition, spatial planning, modelling of genetic interactions, fish health and disease and climate change, harmful algal blooms and mollusc disease and climate change, Integrated Multi-Trophic Aquaculture (IMTA), geostatistics, logbook data, genetics, new sensors, outreach, public perception and acceptance.	<a href="#">ICES</a> Training Courses
Networks of Early Career Researchers	Identify targets and priority areas that arise within the networks and raise awareness about the needs and skills required by ECRs and employers.	EuroMarine <a href="#">OYSTER</a> Working Group

#### 4. Matching challenges and opportunities



The table below proposes a sample of ideas based on EHUSEA-training chain, linking targets, challenges and tools. It also includes a tentative timeframe for implementation. It emphasises synergies with existing initiatives and programmes while addressing new proposals, including Med specific ones, as regards themes to be tackled and tools.

Target	Object	Framework/ Instrument	Timeframe [yr]
Training Institution/ University	Develop a blue learning factory, including by launching an e-platform matching the Lab/the Office	Call for tender	1-3
	<a href="#">Med Focus</a> . Addressing the governance and curricula development of higher education by improving FASP capacity building in and with southern Mediterranean Countries by means of mobility. Rely on	UNIMED BlueMed subnetwork / ERASMUS+	2

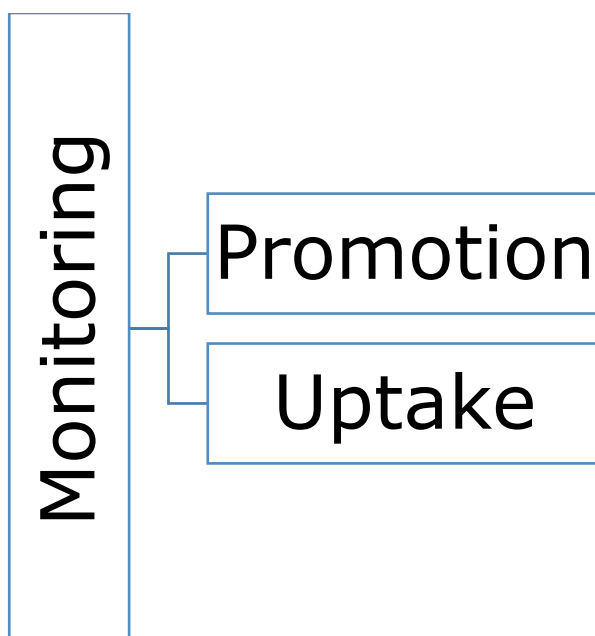
Target	Object	Framework/ Instrument	Timeframe [yr]
	local communities and regional actors while considering existing bottlenecks, e.g. the lack of autonomy at University level		
Research Organization	“Knock at a different door” proposal for a pilot on a training course scheme targeting marine products in a pharma/cosmetic company	Maritime Cluster / Memorandum of Understanding for a Public-Private Collaboration	1
	Integrated ocean management training course: from the governance model to coordinate requests for scientific advice to education of market’s driver, the consumer; the balance between specialization vs capacity to interact with other sectors	Massive online open course (MOOC) / Proposal submitted to ICES	2
	Sharing operational practices to align short-term mobility programmes funded at institutional level on a common FASP theme, setting up a sustainable Staff Exchange Scheme	EU-COST Action	1
Funding Agency	Mobility Relay Race targeting the FASP as fully part of the Blue Economy, foreseeing overlapping training period for two trainee in the same organization, passing the ‘baton’	Memorandum of Understanding among EM members / Bluebio COFUND Additional Activities	1
Private Company	Launch the Blue-industry training hub promoted by a cluster of networks, coordinated by a private company, to build training	EC-Blue Careers Call / Structural funds for sustainability at local level	2



Target	Object	Framework/ Instrument	Timeframe [yr]
	programmes based on those needs that shape the labour market (e.g. Business Administration, state-of-the-art technologies, etc.)		
Intergovernmental Organization	<a href="#">Med Focus</a> . Organize a summer school on e.g. (i) the FASP as the key component of the Mediterranean healthy diet and awareness of the blue fish label (Marine Stewardship Council, <a href="http://www.msc.org">www.msc.org</a> ); (ii) climate change as driver for transformation of FASP job	FAO project / Regional cooperation / BG Summer School / UNIMED	1
Regional Authority	Open a blue careers center to promote and support the blue employment	Structural Funds	3

## 5. EHUSEA in action

Operative proposals & recommendations for developing EHUSEA actions within and outside the EM network are reported in this paragraph, including a list of promotional activities for further and effective uptake, e.g. participation in events, positive lobby actions, etc.



**Promoting the EM-EHUSEA Strategic Agenda** and monitoring the impacts of the promotion actions (short term, six months from the SA release, Objective O4 of the EHUSEA WG).

Promotion Action	Means of promotion	When	Level of impact	Indicator
SA dissemination	EM Website	2019	EU	Number of downloads
	Networks of the EM Members and EHUSEA WG participants	2019	EU & Med	Number of contacts
	Official Sending to the following networks: the Scar-Fish Group representing countries' Ministry, EU Parliament SeaRica Group, EFARO, BLUEMED Initiative	2019	EU	Acknowledgment of Receipt

Promotion Action	Means of promotion	When	Level of impact	Indicator
<b>SA presentation</b>	EM General Assembly	2020	EU	Number of participants
	UNIMED Week	2020	EU & Med	Number of participants
	IOC-UNESCO Mediterranean Regional Workshop	2020	Med & Global	Number of participants
<b>SA 'audited'</b>	Meeting of the EC Expert Group on Skills and Career development in the Blue Economy	2020	EU	Minutes of the meeting

In line with the objectives (O) of the EM Working Group, the following table summarizes **proposals for the uptake of the findings of the EM-EHUSEA Strategic Agenda**, and measuring impacts, in the short/medium term (i.e. one year and half from the SA release). It provides operative and realistic inputs according to the findings of the above section on matching challenges and opportunities.

Uptake action	How to uptake	When	Level of impact	Indicator
EM experts in relevant boards (O2)	Letter of intent (within the EM network or between EM and the concerned Boards)	2020	EU and Med	Increase in the number of EM experts in relevant boards
EM O3	EuroMarine call to organize an integrated course (check <a href="#">JPIO toolkit</a> )	2020	EU and Med	Number of projects
<b>EHUSEA Working Group follow-up</b>	EuroMarine call (e.g. developing a virtual module targeting specific skills within the Network)	2021	EU	Number of proposals
Bluebio COFUND additional activities	Call for projects focused on mobility & training	2021	EU	Call text



The EHUSEA EM WG. National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy), 27-29 May 2019. Credits: Mark James.

## References

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European Marine Board (2013). Navigating the Future IV. Position Paper 20 of the European Marine Board, Ostend, Belgium. ISBN: 9789082093100.

European Marine Board (2019) Navigating the Future V: Marine Science for a Sustainable Future. Position Paper 24 of the European Marine Board, Ostend, Belgium. ISBN: 9789492043757. ISSN: 0167-9309. DOI: 10.5281/zenodo.2809392.

Annex. Agenda of the EM WG on “Enhancement of Human resources: a focus on fisheries, aquaculture, and seafood processing” (EHUSEA)



### **EUROMARINE WORKING GROUP**

*Enhancement of **H**uman resources: a focus on fisheries, aquaculture, and **s**eafood processing (**EHUSEA**)*

***Towards the definition of a EuroMarine Strategic Agenda***  
***Enhancement of Human Resources to support Blue Growth sectors***



**National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy)**

**27-29 May 2019**

## CONCEPT NOTE & AGENDA

Skills development is key for enabling Blue Growth and to promote foresight analyses of the ocean. Within the EM Network, the topic was firstly addressed by the workshop "Training 21st Century Marine Scientists and Engineers for Academic and Non-Academic Careers", held in Naples on 23th February 2015. On the other hand, the COFASP FP7 ERANET workshop "Strengthening human capital through targeted mobility actions in the FASP sector", held in Kiel (Germany) on 9th December 2016, addressed possible scenarios in creating tailored multidisciplinary PhD programmes targeting FASP needs. In addition, the European Marine Board has recently released the science brief "Training the 21st Century Marine Professional", presenting a vision for marine graduate education and training programmes in Europe.

This EM Working Group (WG), co-sponsored by the H2020 BLUEMED Coordination and Support Action project, will define a strategic agenda to identify:

- essential training topics for the next generation of marine scientists;
- specific training needs in the extensive framework of Blue Growth, with a special attention to Fisheries, Aquaculture and Seafood Processing (FASP) sectors.

This strategic agenda aims at paving the way to create a suitable environment for the development of human resources and the transfer of know-how, while promoting transdisciplinary approach and enhancing "cross-border cooperation with non-European countries for the Mediterranean Sea" to be conceived as asset for the preparation of future EM services. Focusing on the FASP sector as a case study requiring new professional profiles to respond to the production chain's challenges with innovative solutions, and at the same time requiring strategic actions for the sustainable development of traditional activities leading to blue growth, the WG will address both academia curricula and vocational education and provide an analysis of training opportunities and a strategy to increase the impact into different stakeholders, from public and private sectors, seeking for alignment and avoiding duplication in the flourishing scenario of training initiatives related to the Blue Growth, and promoting synergies between local and national level.

The WG addresses the following main aspects:

- 1) Establishment of training needs in support of Blue Growth; presentations by invited speakers and round table. Showcase of relevant initiatives and best practice sharing.
- 2) Identification of optimal MSc, PhD courses and Postdoc training able to join competences from academic and non-academic sectors (fostering of T-Skills).
- 3) Proposal of operative tools/instruments to support the training of marine scientists and professionals, with special emphasis on the identified training needs. The role of the EM network.

The main outcome of the WG will be the publication of the Strategic Agenda (SA) on the "Enhancement of Human Resources in support of the Blue Growth", identifying EM concrete actions in support of Blue Growth through interdisciplinary training and mobility.

Expected impacts include further uptakes of the EM WG outputs in relevant strategies, programmes, initiatives, and actions, including the FOOD2030 Strategy and the joint calls to be launched by the ERANET COFUND on Blue Bioeconomy. Enhanced cooperation will be pursued according to EM principles, also addressing activities aimed at supporting the development of R&I marine and maritime policy frameworks at macro-regional level.



## Day 1: 27 May 2019, Capo Granitola

- 09:30-10:00** Participants welcoming, by *Mario Sprovieri (IAS-CNR Director)*
- 10:00-10:20** *Bernardo Patti and Margherita Cappelletto (CNR)*: Scope of the Working Group, Background documents revision and presentation of the work plan
- 10:20-10:40** *Patrizio Mariani (DTU Aqua)*: Building on the outcomes of the EM WG on Training 21st Century Marine Scientists and Engineers for Academic (focusing on the identification of optimal MSc, PhD courses and Postdoc training) and Non-Academic Careers (with a focus on the role of new technologies for the vocational education and training)
- 10:40-11:00** *Dennis Lisbjerg (DTU Aqua)*: On training needs, setting the scene focusing on the FASP

### 11:00-11:30 Coffee break

- 11:30-12:00** *Julie Kellner (ICES)*: Exercise 1 – The transferability room

- 12:00-12:20** *Andreea Magdalena Strachinescu (EC, DG-MARE)*: Progress of the EU landscape, updates of: (i) the New Skills Agenda for Europe action Blueprint for sectorial cooperation on skills, (ii) the Blue Careers Initiative, (iii) the expert group on skills and career development in the blue economy devoted to mobility, p-p cooperation, boosting ocean literacy and raising awareness on career opportunities

- 12:20-12:40** *Simone Mirto (CNR)*: Which skills for aquaculture?

### 12:40-14:40 Light lunch, group picture and swim (...bring the bathing suit)

- 14:40-15:00** *Nicolas Pade (Sorbonne university)*: On the role of the EM network to ASSEMBLE Plus

- 15:00-15:20** *Sheila Heymans (EMB)*: The 'need for training' according to the European Marine Board, including an overview of the EuroOCEAN2019 Conference (*online via Skype*)

- 15:20-15:50** *Mark James (EMB)*: Exercise 2 - How to...? Tackling key areas for advancing graduate training (led by the *European Marine Board* based on the outcomes of the Future Science Brief on Training the 21st Century Marine Professional)

### 15:50-16:20 Coffee break

- 16:20-16:50** Short presentations (10 minutes each) by invited speakers on proposed actions and their feasibility

*Rapporteurs:* *Serena Ferraro (CNR), Francesca Vaccaro (CNR)*

## Day 2: 28 May 2019, Capo Granitola – Mazara del Vallo & Marsala

- 09:00-09:30** *Mounir Ghribi (OGS)*: Forward looking breakfast, is time mature for a Med Sea Schoolserving as hub for training? (*online via Skype*)



**09:30-10:00** *Dennis Lisbjerg (DTU Aqua):* Inputs from EFARO community: how to operationalise the Ecosystem Approach in the context of the Blue Economy

**10:00-11:00** Short presentations (10 minutes each) by invited speakers on proposed actions and their feasibility (continue...)

**11:00-11:30** **Coffee break**

**11:30-11:50** *Marcello Scalisi (UNIMED):* Addressing the specificities of the Mediterranean Area, perspectives from the Med University Network

**11:50-12:10** *Enrico Arneri (FAO):* The role of MEDSUDMED and ADRIAMED

**12:10-14:00** **Light lunch and Transfer to COSVAP Mazara del Vallo**

**14:00- 16:00** *Fabio Fiorentino (CNR, moderator) - Cosvap lead:* discussion on best practices, available tools and identification of relevant (private) stakeholders; making the next generation equipped for new emerging blue sectors/jobs and co-create joint pilot activities to strengthen common partnerships addressing youth unemployment; (ii) feeding a Network of blue professions for the reinforcement of capacities for the promotions of Blue Economy activities; (iii) create networks of incubators to boost capacity for young entrepreneurs on the Blue Economy.

**16:00-16:30** *Fabio Montagnino (Consorzio Arca):* Exercise 3 – The role of business incubators and technology transfer

*Rapporteurs:* *Salvatore Bondì (CNR), Francesca Vaccaro (CNR)*

**16:30-22:00** **Transfer to Marsala, aperitif and Social Dinner at “Baglio Donna Franca” (<https://www.donnafranca.it/>)**

### **Day 3: 29 May 2019, Capo Granitola - Mazara del Vallo**

**09:00-09:30** **Welcome coffee and visit to the Sicilian Biodiversity Observatory**

**09:30-10:00** Summary of results and recommendations

**10:00-11:00** *Margherita Cappelletto (CNR, moderator):* discussions to agree on the general structure and preliminary contents (focus on modelling the education offer) with reference to:

- essential training topics for the next generation of marine scientists;
- specific training needs in the extensive framework of Blue Growth, with a special attention to Fisheries, Aquaculture and Seafood Processing (FASP) sectors of the Strategic Agenda (active participation by writing/attaching proposals on a poster/blackboard) and scheduling future works.

**11:00-11:30** **Coffee break**

**11:30-13:00** *Conclusions (moderated by Bernardo Patti, CNR):* wrap up and next steps to draft the Strategic Agenda as a concrete and shared EM initiative in support of Blue Growth.  
Inputs from:

- FAO policies and GFCM/FAO programmes, by *Enrico Arneri* (FAO);
- Bluebio COFUND additional activities, by *Gianna Fabi* (CNR);

- the BLUEMED SRIA Implementation, by *Ivica Vibilic* (IZOR);
- EFARO, by *Dennis Lisbjerg* (DTU Aqua)
- ICES, by *Julie Kellner*.

Relevant issues to be discussed: How to attract talents and focus on competence and skills development to make a younger generation fit for new emerging blue sectors/jobs; how to co-create joint pilot activities to strengthen common partnerships addressing youth unemployment as well as training new researchers and entrepreneurs to develop the skills and competencies needed for blue jobs; how to create impacts on relevant Programmes (e.g. Horizon Europe, UN-Decade for Ocean Science).

Planning of other expected outputs: O1 >> Strategy document, O2 >> Letter of intent, O3 >> Call for Actions, O4 >> Dissemination

*Rapporteurs:* Annalisa Alessi (CNR), Francesca Vaccaro (CNR)

**13:00-14:00    Transfer to Palermo airport**

## Pictures



The EHUSEA EM WG. National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy), 27-29 May 2019. Credits: Carlo Patti.





The EHUSEA EM WG. National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy), 27-29 May 2019. Visit to Mazara del Vallo fishing harbor. Credits: Mark James.



The EHUSEA EM WG. National Research Council of Italy, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, Capo Granitola (TP, Italy), 27-29 May 2019. Credits: Mark James.