ASSEMBLE

ASSOCIATION OF EUROPEAN MARINE BIOLOGICAL LABORATORIES EXPANDED

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Abstract

The deliverable constitutes a report providing for each of the five Thematic Research Fields, as covered by Joint Research Activities, as well as for the Transnational Access, a chapter containing:

- **External Drivers;**
- **The involved types of research infrastructure (experimental facilities, technological platforms, biological resources, and their associated research services);**
- **Foreseen technological advances therein;**
- **Gaps and redundancies in the service provision across the Consortium;**
- **Quality benchmarks, recommended policies, procedures, best-practices;**
- **Feedback from TA-Users on the service delivery.**

In addition, the report proposes a set of general recommendations on which services should be provided internally and where, and which ones can be provided faster, better and cheaper externally (e.g., by cognate RIs).

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1. Introduction

An overarching objective of the ASSEMBLE+ consortium is to improve the quality and quantity of the service provision to the User community within its areas of excellence in marine biology and ecology. To achieve this, the Consortium fostered the development of novel key-enabling technologies and data solutions in five key-thematic research fields shared among multiple Consortium partners. To realise this, ASSEMBLE+ launched a call for bottom-up proposals for Joint Research Activities (JRAs) put forward by staff members of scientific services and scientific laboratories. Among the many proposals submitted the Project Implementation Committee selected five (WP7-11) based on the following impact criteria: i) inclusiveness of participation (integration); ii) feasibility of sharing outcomes across the Consortium; iii) improvement of service provision; iv) improvement of interoperability of services:

1. WP7: JRA1 Genomics Observatories;
2. WP8: JRA2 Cryopreservation of Marine Organisms;
3. WP9: JRA3 Functional Genomics;
4. WP10: JRA4 Instrumentation for Marine Biology and Ecology;
5. WP11: JRA5 Scientific Diving.

The tasks were accomplished by staff at Consortium partners involved in the selected JRA proposals. To enable all partners in the Consortium to benefit from JRA deliverables WP3 NA1 fostered workshops and short service-staff exchanges (Task NA1.4, **See Annexes I & II**).

In order to harmonise and regulate the Transnational Access to all partner institutes, WP3 NA1 designed straightforward procedures and clear document templates to be used across the Consortium. To maximise transparency, rules and regulations were published on the ASSEMBLE+ website, and

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updated as the need arose. WP3 NA1 organised workshops and short service-staff exchanges with the aims to enable all partners in the Consortium to benefit from JRA deliverables and to familiarise all of them with the TNA documents and procedures and to share best practices across the Consortium (Task NA1.4, **See Annexes I & II**).

Now the TNA program and the JRA and NA activities are near their completion, a series of insights have been gained and lessons learned on what can be further improved. The Benchmark Report presented here is the result of Task NA1.4 to:

> *"Edit a report including chapters on the thematic fields listed above [the five JRAs]. The chapters will contain quality benchmarks, recommended policies, procedures, best practices, User feedback as well as technological advances in the thematic fields."*

The report includes a set of criteria for a European draft certification standard for service provision at marine stations, as well as advice on how to implement these standards.

2. The five Thematic Research Fields covered by JRA's

2.1 WP7 JRA1 Genomics Observatories

WP7 JRA1 fosters the application of genomics technologies at Long-Term Ecological Research (LTER) sites. Research encompasses populating and verifying databases of taxonomic reference barcodes, harmonization of metabarcoding Standard Operational Procedures (SOPs) across the Consortium so that the resulting data can be compared, and inter-calibration of classical biodiversity data and genomics data. The final objective will be the establishment of a distributed Genomics Observatory across the partnership and beyond of which the data are available for Virtual Access. One outcome of this WP has been the establishment of a Genomics LTER Observatories program in EMBRC-ERIC called EMO-BON[1], which includes LTERs on planktonic systems as well as benthic systems comprising soft-bottom and hard-bottom ecosystems. The latter makes use of the ARMS system[2] developed by the Smithsonian Institution (Washington DC, USA).

Drivers: From their foundation onwards, several ASSEMBLE+ Operators supported LTER monitoring programs. Their results provide up-to-date knowledge of the marine biodiversity and its seasonal cycling, indispensable for tracking inter-annual changes in species composition in the face of global change. These results are used as demonstrators of good environmental status (GES) of the EU's marine waters. Initiatives include e.g., the SZN-based LTER projects MareChiara and NEREA[3], the SBR-based LTER-station SOMLIT-Astan[4], and the AWI-based LTER Helgoland Roads[5].

[1] https://www.embrc.eu/emo-bon
[2] https://naturalhistory.si.edu/research/global-arms-program
[3] https://www.nerea-observatory.org
[4] https://ipt.sb-roscoff.fr/ipt/resource?r=phytoplankton_somlit-astan
[5] https://www.awi.de/en/science/biosciences/shelf-sea-system-ecology/working-groups/long-term-observations-lto/helgoland-roads-phytoplankton.html

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In recent years environmental omics methodologies have been incorporated in the LTER projects. Global initiatives in which most ASSEMBLE+ partners are cooperating include: Ocean Sampling Day (OSD)[6] of the FP7 project MicroB3, the ARMS-initiative and the Tara-Oceans[7] project, and the aforementioned EMBRC-wide initiative EMO-BON. Cooperatives such as SILVA[8] and PR2[9] curate reference databases comprising imagery and sequence barcodes of taxonomically authenticated reference strains and specimens, their transcriptomes and even whole genomes.

The research infrastructure: LTER activities make use of coastal vessels with sampling equipment, permanent sampling devices in moored buoys, sample processing facilities and labs, e-infrastructure for meta-data management, platforms for microscopy (LM, SEM, TEM), sequencing, bioinformatics, chemical analysis, culture collections and museum collections for referencing and archiving; in short, research infrastructure available at marine stations. In several stations activities of sampling and sample processing are done by taxonomic services, such as the MOTax[10] unit at the SZN (partner 12).

Technological advances: Genomics Observatories (GO) deploy emergent high-throughput sequencing (HTS) methodologies such as metabarcoding, meta-transcriptomics and/or meta-genomics to assess biodiversity and biocomplexity in environmental samples. These methods, which can be applied in a range of ecosystems, have benefited from following external developments: i) the price of HTS continues to come down drastically; ii) bioinformatics methodologies to sort the raw sequence data have seen rapid developments, and iii) length and reading quality of sequences have improved steadily. Moreover, a cohort of scientists, especially early-career, is being trained in using the ensuing data in their research. Hence, metabarcoding, meta-transcriptomics and even metagenomics are becoming integrated in biodiversity monitoring at LTERs in the ASSEMBLE+ consortium.

Gaps and hurdles: Given their long-term nature, LTERs must be monitored with the same tools through time because change disrupts data-continuity. LTER-staff using LM are reluctant to transfer significant resources towards new methodologies if not conducted in parallel with the classical screening methods. HTS metabarcoding can be applied using a range of sampling methods, DNA-markers, and sequencing platforms. Different LTER-initiatives may pursue different objectives and use different methodologies, rendering data comparison challenging at best; also in this case, change disrupts continuity. Data-producers are often reluctant to rapidly make resulting data freely and openly accessible as they wish to harvest benefits from their efforts before providing open access. Reference barcodes and transcriptomes are needed to translate metabarcodes and meta-transcriptomes into an understanding of "who is present and what are they doing." NCBI-GenBank[11] constitutes a large, openly accessible repository of nucleotide data, but this organisation has no means of validating the taxonomic correctness of the submitted data.

[6] https://www.assembleplus.eu/research/ocean-sampling-day
[7] https://fondationtaraocean.org/en/expedition/tara-oceans/
[8] https://www.arb-silva.de
[9] https://pr2-database.org
[10] https://www.szn.it/index.php/en/research/research-infrastructure-for-marine-biological-resources/technological-platforms/marine-organism-taxonomy-motax
[11] https://www.ncbi.nlm.nih.gov/genbank/

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Quality benchmarks, recommended policies, procedures, best-practices: The aforementioned gaps and hurdles can be overcome. The continuity of time series data when transitioning from classical cell counts to metabarcoding can be guaranteed by validating the latter results with the former. To enable comparison among LTER-sites, the same SOPs need to be deployed, or if unfeasible, procedures need to be harmonised so that at least parts of the datasets are directly comparable.

Rapid sharing of data can be fostered through funding of joint HTS of samples across consortia linked with upfront Access Benefit Sharing (ABS) agreements on how and when to publish the results, and application of FAIR principles[12] of data management to stipulate the conditions according to which the data are accessible. Since LTER stations work with biological and genetic data, and often generate culture strains from the samples for downstream applications, implementation of the Nagoya Protocol on Access and Benefit Sharing[13] is relevant, and need to be incorporated in a shared Consortium-wide policies.

Regarding reference data, efforts put into collecting and properly lodging them is cumulative; results are applicable worldwide. EMBRC-ERIC could liaise with emergent RIs such as e-LTER[14] and DANUBIUS[15] to aid the harmonisation and benchmarking of data collection, with data repositories such as NCBI, PR2, SILVA and OBIS[16] to implement taxonomic quality benchmarks before submitting the data and with e-infrastructures LifeWatch-ERIC[17] and ELIXIR[18] for the linking of data resources and the analytical tools required to explore the data. Further support can be provided by means of hosting exchange-of-best-practice workshops, training courses, and short sabbaticals for internal service staff on various aspects of data collection and custodianship (**See Annexes I & II**).

The EMBRC-ERIC's EMO-BON initiative forms a test-case for the successful deployment of a consortium of Genomics Observatories (GOs), i.e., LTERs at which metabarcoding, meta-transcriptomics and meta-genomics data are collected. A phased approach is implemented, starting with the deployment of the in-shore sampling component and the testing of the concept and ASSEMBLE+'s ability to coordinate multiple sampling sites, followed by the deployment of, ARMS devices, and finally the soft sediment protocols and tools. Trailblazing partners in each member state decide on -and implement- shared SOPs of sampling and data processing decided upon by an Operational Committee in EMBRC-ERIC. The ERIC then coordinates and supports the DNA extraction, HTS sequencing, the ABS related negotiations, and data releases.

For EMO-BON, the biological and genetic resource provenance and data flow protocols have been developed in EOSC-Life[19]. EOSC-Life brings together the thirteen Life Science 'ESFRI' research infrastructures to create an open, digital and collaborative space for biological and medical research.

[12] https://www.go-fair.org/fair-principles/
[13] https://www.cbd.int/abs/
[14] https://www.lter-europe.net/elter-esfri
[15] https://www.danubius-ri.eu
[16] https://obis.org
[17] https://www.lifewatch.eu
[18] https://elixir-europe.org
[19] https://www.eosc-life.eu

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The project will publish 'FAIR' data and a catalogue of services provided by participating RIs for the management, storage and reuse of data in the European Open Science Cloud (EOSC). Participation in EMO-BON implies that the data are released to all EMBRC partners in the Consortium immediately upon production and are openly accessible upon only a brief moratorium.

User feedback from the TNA projects: Transnational Access Users who have made use of the facilities offered at Operators in ASSEMBLE+ Consortium have been satisfied with the use of the offered experimental facilities.

> *"The cruise was very successful, we sampled 19 stations, and the vessel was very well equipped for our work. Support by Gdansk University before, during and after the cruise was excellent"*

This feedback shows that whenever an issue arose, the access provider was able to solve it or offer satisfactory alternatives.

2.2 WP8 JRA2 Cryopreservation of Marine Organisms

WP8 JRA2 addresses a constraint in the exploitation of marine genetic and biological resources: paucity of capability to conserve these resources ex situ with guaranteed genetic, phenotypic and functional stability. The JRA developed robust, reproducible cryopreservation methodologies for various life-stages of a range of marine macro-organisms and cryo-recalcitrant microorganisms. The results will improve and expand the availability of biological resources for TA at reduced costs.

Drivers: ever-increasing numbers of marine species are relevant in the context of the EC's Blue Economy drive because they are sources of food, feed and valuable products (e.g., biomaterials, medicines, antibiotics). In addition, marine species constitute important models in research fields such as evo-devo, neurology, ethology, biogenesis, biophysics, and biosensing. Maintaining these organisms or their cell lines on continuous-culture over extended periods is expensive, time consuming and difficult. In addition, strain identity cannot always be assured (genetic changes and risk of transfer errors accumulating with time). The solution; maintain strains metabolically inactive over extended periods of time, either as spores or otherwise dormant, desiccated, or cryopreserved.

The research infrastructure: several ASSEMBLE+ Operators maintain Culture Collections of marine algae, protozoa and bacteria, or biobanks of cell lines or tissue samples. Culture collections focus on the acquisition, authentication, production, preservation, cataloguing and distribution of viable cultures of standard reference microorganisms, cell lines and other biological materials for research purposes. Their holdings are accessible via a web-based system through which material can be procured. Buyers' rights and obligations regarding use of the material are defined in a legally binding Material Transfer Agreement.

Cryopreservation facilities include specialized cooling devices, a regular supply of liquid N_2, biobanking Dewars (N_2 at -196 °C) and freezers (-80 °C) for long term storage in a well air-conditioned and temperature isolated room with secure backup power systems, and experimental facilities for thawing cryopreserved samples under precisely controlled conditions.

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Technological advances: novel protocols have been developed that allow ever increasing numbers of species and their cell lines to be cryopreserved and -more importantly- to be revitalised reliably following prolonged periods of preservation[20].

Gaps and Hurdles: the main time- and resources-demanding activity of Culture Collections is strain maintenance (sub-culturing), which can be overcome by cryopreservation. Yet, there are also costs associated to cryopreservation; it requires energy-intensive long-term maintenance as well as investment in the tools to make that possible. Another issue is the reproducibility of results obtained with cryopreservation. Within WP8 a ring-test was performed, applying the same cryopreservation protocol on the same culture strains at the participating partners. Results showed success varying among partners, meaning that there is still a need for improvement of SOPs.

Quality benchmarks, recommended policies, procedures, best-practices: Collaboration among Operators in this JRA should be continued following ASSEMBLE+. A Working Group of experts from ISO (or similarly) certified culture collections in biological resource centre-ERICs (EMBRC-ERIC, MIRRI-ERIC, BBMRI-ERIC) could build forth on WP8 Deliverables, list benchmark criteria needed for ISO or comparable compliance, and help committed Operators defining the work to be done (incl. timeline) to achieve compliance. The reproducibility-issue can be tackled through a commonly shared ISO for organismal group-dependent common laboratory procedures and protocols. The group should report back on the progress, and the Operators should be committed to achieving ISO or similar compliance. Those making use of WG members for consultancy should provide financial compensation. Exchange of best practices was fostered through workshops and short sabbaticals (**see Annexes I & II**).

User feedback from the TNA program: Transnational Access Users who have made use of the cryopreservation facilities offered at Operators in ASSEMBLE+ Consortium have been satisfied.

> *"The initial results on different chilling sensitivity of different stage of turbot embryos and differences of cryoprotectant's effectiveness in protecting embryos from chilling injury have provided interesting lines of investigation which warrant further investigation."*

2.3 WP9 JRA3 Functional Genomics

WP9 JRA3 addresses demands to establish links between genomic information and phenotypes of marine model species. It developed small-scale functional genomic approaches for several marine models for the generation of Genetically Modified Marine Organisms (GMOs), a reference set of phenotyped - genotyped GMOs, and phenotypic or genotypic data for the functional description of the GMOs, all of which will be available for TA.

Drivers: Post-genomic approaches such as gene editing techniques are integral parts of many research projects because they allow a wide variety of biological questions to be addressed. The acquired knowledge from these approaches feeds into the large-scale production of bacteria protists, algae, and

[20] See http://www.assembleplus.eu/results/deliverables D8.1 and D8.2

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animals of commercial interest. Research in the domain of metabolic engineering can be applied to the tailoring of cell factories with enhanced performances for bioreactors and land-based raceways.

The research infrastructure for post-genomic approaches, would ideally include laboratories equipped with instrumentation for functional genomics technologies such as advanced transfection methods, embryo micromanipulation, mutagenesis, gene silencing and genome editing. High through-put phenotyping techniques should be applicable at all levels (cells, tissues, organisms). These laboratories should be operated by staff dedicated to providing scientific advice.

Technological advances: The three work packages of this JRA (basically dedicated to metazoans, macroalgae, and microorganisms) have already developed the necessary techniques for transformation/microinjections of the different biological models. These techniques are essential for the next steps which are the generation of mutants and/or transgenics using different approaches including CRISPR-Cas9

Gaps and Hurdles: Various post genomics-approaches are often still in the developmental stage and operated by research teams for their own use. This is not the optimal situation for Users wishing to protect their IPR and be the sole owner of the result.

Quality benchmarks, recommended policies, procedures, best-practices: Strict regulations are in place for working with genetically modified organisms and all laboratories working with such organisms have their permits in place (this is the Operator's responsibility). JRA3 is dedicated to exchange of gene editing methods and best practices applied on a series of marine model organisms. These methods will be shared across the Consortium. A list will be drawn up of laboratories where such technologies are implemented successfully, and that are willing to host colleagues wishing to learn about such technologies. Exchange of best practices was fostered through workshops and short sabbaticals (**see Annexes I & II**).

Selected Operators should incorporate consultancy services for post-genomic approaches. These should then provide advice on developing gene editing tools for marine model organisms, incorporate applications developed outside marine biology, and train Users in mastering the novel techniques.

User feedback: Transnational Access Users who wished to apply or learn post-genomics techniques such as gene editing have accessed research laboratories at Operators in ASSEMBLE+ Consortium. They have expressed satisfaction with the use of the offered experimental facilities. One of the User feedbacks stated:

> *"All the analyses performed using the Pico-PLAZA platform have been possible only thanks to the TA that allowed us to benefit from the expertise of the Access Provider institution and to have full access to the tools developed for comparative genomics."*

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2.4 WP10 JRA4 Instrumentation for Marine Biology and Ecology

WP10 JRA4 produces technical benchmarks for implementation of standardized experimental maintenance and rearing systems for marine organisms. This will improve efficiency of service provision across the consortium and ensure that the resulting know-how will be perpetuated beyond the duration of ASSEMBLE+.

Drivers: global warming and ocean acidification are among the Grand Challenges that threaten environmental and human health and wellbeing. These challenges affect marine life on top of human-induced pressures such as habitat destruction, over-exploitation, pollution, and aquaculture. All these pressures affect ecosystem functioning and the long-term availability of marine resources. Ecosystems are more than the sum of their individual species, and therefore, it is risky to draw conclusions on ecosystem functioning based on results from lab experiments with small numbers of specimens. There is an increasing need to investigate the 'biodiversity - ecosystem functioning - ecosystem services' cascade in situ, allowing for testing hypotheses derived from lab experiments in the real world.

The research infrastructure: the experimental facilities include on site and indoor mesocosms for testing effects of controlled environmental parameters on ecosystems; aquaria and tanks to maintain and rear organisms in captivity and study their behaviour; bioreactors to produce biomass for further downstream application, and more exotic instrumentation in which aspects of the organisms' biological functions can be studied. Some of these facilities work with potentially harmful species that need to be maintained in strictly regulated containment. The staff of these facilities are responsible for maintenance, operation and service provision.

Technological advances: in recent years remarkable developments have been observed in indoor mesocosm systems, enabling experiments under controlled environmental parameters. The results are precise, accurate and obtained in real-time by means of ever improving and ever-more affordable monitoring devices, whilst video-logs enable remote observation. This way, experiments can be conducted that are impossible to conduct in nature.

Gaps and Hurdles: The portfolio of currently available experimental facilities in ASSEMBLE+ often lacks the controls to enable sophisticated experiments, and most facilities are lab-based. Planned experiments are usually not advertised widely, missing opportunities for external Users to pursue additional research queries within ongoing experiments. There is a need for harmonisation of experimental protocols across the Consortium to guarantee reproducibility of results.

Quality benchmarks, recommended policies, procedures, best-practices: the Operators should invest in further sophistication of experimental facilities. A WG should be established of experts from ISO or similarly certified experimental facilities in EMBRC-ERIC, other ASSEMBLE+ Operators and sister Consortia (e.g., AquaExcel2020 and AQUACOSM) to list benchmark criteria to which relevant experimental facilities have to adhere to be ISO or similarly certified. The WG then tasks itself to help each committed Operator with its auto-assessment of the work to be done, and a timeline for achieving compliance. The WG should report back on the progress done to the Operators as well as to the EMBRC-ERIC national node directors. Operators are responsible for achieving ISO or comparable

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compliance for their experimental facilities. If they want to make use of WG members for consultancy, then they should provide the financial compensation.

A web-based platform needs to be established where mesocosm experiments are announced in advance, and where external contributions are solicited. Evaluation of these contributions should assess feasibility, compatibility with the main experimental design, additivity of the expected results and scientific excellence. Care should be taken to protect the applicants' IPR (external proposal evaluation). Service staff operating the facilities could engage in sharing best practices among peers and receiving expert training to enable them to deliver services at the highest quality standards through workshops and short sabbaticals (**see Annexes I & II**).

User feedback: Transnational Access Users who have made use of the experimental facilities offered at Operators in ASSEMBLE+ Consortium have been satisfied.

> *"I am very happy with how this project worked out. The IUI is an amazing research facility and the people of the institute (research and technical staff) were very helpful and supportive. Work in the lab and Red Sea Simulator facility was super productive."*

The only glitch encountered:

> *"Due to the malfunction of one of the machines it was not possible to complete the proximate analysis on the feed and on the faeces during the 4 weeks foreseen by the project."*

Such technical issues can be resolved by immediate response service contracts of critical equipment for research infrastructure functioning.

2.5 WP11 JRA5 Scientific Diving

WP11 JRA5 enhances diving-based science delivery by refining and testing emerging underwater scientific technologies at various partner sites and standardizes these wherever possible. The results are made available across the ASSEMBLE+ consortium to facilitate photogrammetry in under-water studies everywhere.

Drivers: Scientific diving is a widely-used, well-established research platform within the Assemble+ consortium. WP11 is a partnership of diving units working across a geographical gradient and presenting an exceptional diversity of subtidal and littoral ecosystems. This diversity enables testing the robustness of these emerging technologies. The WP will generate standard operating procedures which will markedly enhance diving-based science delivery across the network, while creating a common service with the potential engage with a wider, and more diverse, User-group

The research infrastructure: This JRA is based on the scientific diving capability that exists presently within the Assemble+ partnership. The infrastructure has been broadened during the JRA to include underwater photogrammetry expertise and sub-tidal temperature logging arrays.

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Technological advances: 3D photogrammetry is an emerging technology being applied in many areas of subtidal aquatic research that are supported by scientific diving. It is a method of generating three-dimensional computer models from standard forms of image. Imagery can be captured using many types of camera, from high-end digital stills cameras to time-lapse stills from action video cameras. Examples of how the resultant models have been used include detailed underwater mapping of complex habitats, surveys of biofouling on subtidal structures, and measuring changes in degraded or recovering reefs. Further associated advances are occurring whereby photogrammetry models can be accurately georeferenced on the seabed using combinations of low-cost ultra-short baseline acoustic positioning systems with doppler velocity logs.

Sub-tidal temperature logging arrays are providing depth-resolved measurements that demonstrate the limitations of remote satellite sensing in shallow coastal waters.

Gaps and Hurdles: in practical terms, difficulties for scientific diving-based transnational access can arise in some countries where there is little or no guidance on what diving certification and medical surveillance evidence is needed to support the occupational scientific diving operations of visiting researchers. European standards do exist that credit previous training or diving experience but they are not always recognised. There are no standards for diving medicals.

Quality benchmarks, recommended policies, procedures, best-practices: There is currently an EU-funded programme that is crating ISO-standards that recognise levels of scientific diver training. Groups such as the European Panel for Scientific Diving publishes and disseminates criteria that increase the transparency of types and levels of certification required support diving-based TNA. This JRA has successfully developed, tested and published a SOP for underwater 3D photogrammetry.

User feedback: Transnational Access Users who have made use of the experimental facilities offered at Operators in ASSEMBLE+ Consortium have been satisfied as shown by following feedback.

> *" The photogrammetry was successful in generating high-resolution orthomosaic and digital elevation models of the study site covering 133 m^2 with the lander located at its centre."*

> *" Originally the plan was to use the research vessel Seol Mara from SAMS, but this was unavailable and we resorted to use a rigid-hull inflatable boat owned by Tritonia Scientific Limited (TSL). It was possible to perform operations from this smaller vessel in a safe manner."*

3. The support to Transnational Access: What Have We Learned from ASSEMBLE Plus TNA

Introduction: WP3 – NA1 activities included two tasks focused on ***enabling*** Access to the facilities, resources and research services offered at marine stations in the ASSEMBLE+ Consortium. The first of these (NA1.1) comprised enabling the **granting, regulation and support** of TNA projects. The second (NA1.2) comprised the **setting up of a single-access point** to the offered facilities, resources and research services. Experiences gained from the results of those activities form a legacy allowing the further refinement of TNA procedures to further improve their User-friendliness and efficiency. In

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addition, the activities comprised a series of tasks to ***improve*** the Access. These tasks comprised the testing of TNA-pipelines through ASSEMBLE+ and cognates in joint calls (NA1.3), the sharing of best practices in the service provision across the partnership of ASSEMBLE+ (NA1.4), and improving the efficiency of service provision (NA1.5).

Drivers: provision of services for marine biological research and training to Users is the raison d'être for the establishment of marine biological research stations. Their business models were tailored to visitors; and their staff knew how to manage visitors programmes. The 1970s saw a change of focus; many stations redirected their service provision onto expanding communities of internal researchers; visitors programs dwindled. Unfortunately, especially in small stations, internal Users form too narrow a basis for affording extensive and expensive research infrastructure[21]; and closing down a small station is tempting in times of budget constraints. Instead, sharing research infrastructure and resources with external Users increases efficiency of use and cost effectiveness of investment. Visitors programs foster external collaboration. Engagement with the private sector increases the economic impact of the station, secures research funding, and improves career opportunities.

Progress: ASSEMBLE Marine (FP7, GA227799), EMBRIC (H2020, GA654008) and ASSEMBLE+ enabled rebooting visitors' programs at its partner stations, sharing of expertise across the consortia. Partners could adapt to new regulations and requirements, as well as to modern means of communication among all involved. The advance of ASSEMBLE+ above ASSEMBLE Marine is that ASSEMBLE+ enables a far larger community of stations -the majority of these in EMBRC-member states- to gain experience with the TNA.

To aid the applicants, Users, access providers and User selection panel members, ASSEMBLE+ published a Transnational Access Policy guide[22]. The objectives of this document were to specify principles and procedures for service provision, taking into the account European Commission and partners' regulations. Applicants need to know how to apply; Users and Access Providers need to be clear about what to expect from one another; fair and transparent procedures need to be in place to determine the eligibility and feasibility of the applications and to select them based on scientific merit; Access Providers need to know how to establish a User Access Contract, how to charge the costs of TNA to ASSEMBLE Plus, what is considered eligible costs, and how to reimburse Users for their expenses. For general questions, proposal submitters and Users could consult a "frequently asked questions" page[23] or contact the access officer (assembleplus_ta@embrc.eu). For specific questions regarding access to facilities at access providers a list of liaison officers at the partner institutes was available[24]. Moreover, the access officer was available to help resolve any emergent problems. Tools for proposal submission as well as screening for feasibility, eligibility and scientific quality were all on-line by means of the User-friendly ARIA web-based system of INSTRUCT-ERIC. The system allows for

[21] National Research Council 2014. Enhancing the Value and Sustainability of Field Stations and Marine Laboratories in the 21st Century. Washington, DC: The National Academies Press. https://doi.org/10.17226/18806.
[22] https://drive.google.com/file/d/1rvlgMWI53lSOGymDpjATpnnWlCN4QtOj/view
[23] https://drive.google.com/file/d/1wX1lbvomCYFqHzcXMxA0ss23W2S4-coI/view
[24] http://www.assembleplus.eu/access/access-providers

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flexibility and adaptation to the exigencies of individual TNA programs. It is deployed in the access programmes developed by EMBRC-ERIC.

Experiences: to obtain feedback from the Users following the execution of their TNA projects ASSEMBLE+ Users were asked to fill out a short User questionnaire[25]. From the feedback it is clear that ASSEMBLE+ TNA projects are particularly well-adapted to early career scientists as they foster career development in multiple ways. The young scientists gain experience with proposal writing and submission, are pulled out of their comfort zone and go abroad, to learn to work with foreign scientists in different work environments. Also, the access providers and the consortium management learned from the feedback.

An issue was a clear preference of Users in ASSEMBLE+ for access to the well-known marine stations in the partnership. At the start of the project, a budget for TNA to research infrastructure and for the accompanying travel and subsistence of the Users was distributed over the various partner stations providing access. Distribution of the budget for TNA to the stations' research infrastructure took into the account the diversity of research services offered and space available, whereas the budget for travel and sustenance of the Users took into the account the costs of travel to the site and of daily living (B&B, food). Of course this was a model based on expectations. In reality, Users had a strong preference to marine stations that are famous, have a strong scientific in-house community with whom collaboration was sought, have had previous experience with access provision (in ASSEMBLE Marine) and have a clear separation between service provision and scientific departments. This meant that for instance the SBR-Roscoff, SZN-Naples, IUI-Eilat, CCMAR-Faro and KMRS- Fiskebäckskil obtained far more applications than comparable, but less well known institutes. So, a tension emerged between "funding the best research projects at their places of choice by the User to do the research" and "distributing the funds such that also less requested partners could use up their TNA budget."

The issue was solved internally partially by asking Users if their research could be accommodated by an alternative station, often even better equipped to fulfil their needs. In many cases, this was accepted gladly and Users were happy about the fact that they had been alerted to the opportunity. In future projects, the issue can be solved by allotting more TNA funds to partner stations in high demand so as to enable best projects to be carried out at their places of choice, but then eliminate these partner stations from the TNA calls as soon as their budget runs out. Other marine stations are not by definition of lesser scientific standing or impact; their access opportunities are simply less well-known. This latter factor needs to be overcome by more vigorous outreach and promotion efforts of the partner stations in conjunction with the ASSEMBLE+ wide activities announcing calls and promoting the individual partner stations on the ASSEMBLE+ website.

Another issue was the existence of unnecessary duplication between existing in-house procedures regulating access and ASSEMBLE+ wide procedures; in-house forms in parallel with ASSEMBLE+ documents dealing with the same issues. This issue was resolved by including local requirements in ASSEMBLE+ templates of User Access Contracts. A related issue was the post access reimbursement of the Users for their costs of travel sustenance and lodging. Details regarding reimbursement of these

[25] https://docs.google.com/forms/d/e/1FAIpQLSe4sB94b80KIWseKHdtZDhE4nrjvc_SjwAlkW7eukWF_dvlmQ/viewform

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User costs were defined in the User Access Contract. User complaints about reimbursement arose because a few Access Providers were tardy, or Users delivering incorrect receipts. Tardiness was resolved by explaining the importance of speedy processing to administrators and by reiterating clearly reimbursement requirements to Users immediately upon arrival.

Regarding the meaning of service provision versus collaboration, a few access providers were not entirely familiar with the concept of scientific service provision. Services are provided by staff operating experimental facilities and technology platforms. The staff deploys SOPs available through open access. Results are owned solely by the Users as they (or in the case of ASSEMBLE+ TNA, the EU) pay for these services. Several stations have researchers operating their "own" facilities, and other Users can access these only if they are willing to collaborate and share ownership of results. A 'service offer' in which resident researchers demand 'collaboration' upfront as a sine-qua-non for access, is not a service. This issue must be solved through an access policy charter which describes the organisational aspects and rules the offers have to comply with in order to be considered a service. Access should be open, the User knows the costs of the services provided and has sole owner rights of the obtained results as agreed upon in the User Access Contract and its annexes.

Regarding the presentation of the ASSEMBLE+ service offer, initially, we used a web-based system under development within EMBRC-ERIC. Its interface focused on instruments rather than on services. A Scanning Electron Microscope (SEM) is useless if not within a well-equipped service laboratory with expert, dedicated staff assisting the User in preparing and examining the samples. Its interface turned out to be User-unfriendly, with overly detailed technical information on instruments. This made searching cumbersome. A search for microscopy *services* should have a clear set of choices, e.g., SEM, and then show where it is offered, what the specialties are at each site, with a few key-details of what the offer includes; fine-details need to be discussed with service staff, anyway. So, the Project Implementation Committee decided to make use of the INSTRUCT-ERIC based ARIA access system, which is ideally tailored to this new of presentation. This system functioned to full satisfaction and is also recommended for future use.

Redundancies: a perceived need at the start of the ASSEMBLE+ project was linking TNA in ASSEMBLE+ to TNA in sister projects. We assumed that Users were interested in submitting single projects to combined calls for projects by multiple RIs. The idea was that Users could conduct complex research workflows glitch-free through research infrastructure pipelines spanning multiple ERICs. So, WP3 Task NA1.3 called for "Testing TA-pipelines through ASSEMBLE Plus and other INFRAIA consortia and ESFRI RIs in joint calls."

A short survey was launched to all TNA Users to explore possible glitches in the interoperability of the results produced in ASSEMBE+ with other RIs and INFRAIA projects. The result of the survey show that ca. 14% of the ASSEMBE+ TNA Users used results, data, or material obtained from ASSEMBLE+ visits to carry out subsequent research in other Research Infrastructure Initiatives. The list included SYNTHESIS+, LifeWatch ERIC, ELIXIR, FNR Project ALBINA and ASSEMBLE Plus itself. None of the Users encountered any incompatibility issues.

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When asked about the possibilities of applying to joint calls with ASSEMBLE+ and other RI-initiatives, interviewees expressed worries about adding a layer of complexity to the proposal submission process. "*why not simply apply independently to both*?" Joint TNA-calls were hard to organise across sister RIs because of issues with timing of calls and independent selection procedures. Bilateral agreements between just a few RI's do not capture the potential diversity of User requests. What Users did appreciate was advice and contact information regarding sister RIs for follow-up research so that possible incompatibility issues could be addressed upfront.

Gaps and Hurdles: TNA projects were typically small, involved one or two Users from academia or university, and were of limited duration (one month max). They do not encompass the wider spectrum of project possibilities the marine stations can accommodate. Complex scientific projects often require larger budgets and longer access periods. Access providers tested a few larger collaborative projects involving interaction of Users from multiple institutes with in-house staff and services at the Access Provider. Such projects had high scientific impact. In addition a few TNA projects were conducted over a longer period than one month, co-finances by the User and the Access Provider and also these projects had a high impact.

The private sector seemed not to engage in the TNA program. Initially it was believed that the private sector had little interest in TNA. Yet, several of the scientists or PhD students engaging in TNA had links with private companies, i.e., spin-out or spin-off enterprises, and their project results helped towards the companies' aims. Nonetheless, take-home-lessons were:

- ASSEMBLE+ presented cycles of half-yearly calls for project proposals; companies want to be serviced hassle-free when it suits them;
- ASSEMBLE+ Access is Transnational. Especially the SMEs, which usually lack in-house research facilities and human resources, are interested in the first place in research connections in their direct environment, i.e., regionally, for easy access;
- ASSEMBLE+ TNA projects which are of short duration, are not ideal for company needs. Companies wish to engage discretely with researchers to probe the quality and usefulness of the advice and to assess their discretion regarding IPR. This takes time.
- ASSEMBLE+ TNA projects are financed by the EU. Companies are perfectly willing to pay for the provided services because this guarantees their exclusive ownership of results. The EUs publicly funded TNA program comes with an obvious set of rules, among which features the obligation that the results of the TNA should be made publicly available. Obviously, private companies guard their IPR.

None of this goes against the spirit of European-wide efficient access to marine biological research infrastructure. Once companies have established relationships of trust and mutual confidence with researchers and research services at local stations, then they are happy to be guided by those local, trusted research contacts to the most appropriate research services for their specific purposes elsewhere in the EMBRC-ERIC. Company representatives are keenly aware of the extensive international connections the marine stations maintain and of the benefits those connections bring Further information on how marine stations can best serve companies, what companies expect from service provision at marine stations and what access schemes would be ideally adapted to company needs can be found in ASSEMBLE+ Deliverable 5.2 **Stakeholder Consultation Report**.

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Since the types of access to EMBRC-ERIC are more diversified than those feasible in the ASSEMBLE+ TNA program, the ARIA-system as used by ASSEMBLE+ will need modifications to handle a wider spectrum of projects. Behind the ARIA system is a network of local access officers and other contact points in order to provide efficient, personalised solutions upfront. Documentation regulating the access will need to be adapted to this wider spectrum of Users.

Quality benchmarks, recommended policies, procedures, best-practices: For the User access programs to marine stations, in particular to EMBRC-ERIC partner facilities, the efficient way forward is to define a series of overarching types of User Access, and then define for each of these an ERIC-wide shared procedure, and an accompanying set of forms and document templates available for perusal on the www.embrc.eu. The access providers can adapt the appropriate templates to the specificities of each access project, and the User knows upfront what is required. Documents must be screened by the partner's legal staff. Proposals for major changes should be adopted across the ERIC. The www front-page should contain brief, crystal-clear explanations of each of these types of User Access, as well as contacts for further questions to HQ and to each of the partners.

The second issue is a crystal-clear classification of services, in such a way that they are intuitively understandable and findable. The classification used in ASSEMBLE+ is as follows:

Ecosystem access

- Coastal research vessels;
- Sampling equipment;
- SCUBA diving facilities;
- Submersibles;
- Other ecosystem access.

Biological resources:

- Biobanks;
- Culture collections (microalgae, cyanobacteria, bacteria, seaweeds, viruses, zooplankton, and fish);
- Marine model organisms;
- Species collected upon request (strain/organism isolation from the wild, shipping).

Experimental facilities:

- Aquaria and tanks;
- Mesocosms (land-based and sea-based);
- Climate controlled rooms;
- Wet laboratories;
- Dry laboratories;
- Other experimental facilities.

Technology platforms:

- Bioassays (phenotypic assays, protein assays, (anti-) microbial assays, quality control of materials, bio-activity assays, protein structure, protein interaction & biochemistry, recombinant protein expression);
- Imaging (fluorescence microscopy, TEM and SEM imaging, confocal microscopy, flow cytometry, micro-CT, bio-imaging);
- Molecular biology and –omics (genotyping, sequence analysis, qPCR, High Throughput sequencing);
- Remote sensing and telemetry;

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- Structural and chemical analysis (HPLC, mass spectrometry, metabolomics profiling, structural elucidation);
- Other technology platforms.

E-services:

- Data sets (retrieval, access to data repositories);
- Data analysis tools and software;
- Computing and storage infrastructure.

Expert advice:

- Experiment design;
- Biological sample identification;
- Other advice.

In addition to the specific services listed above, the access includes such basic facilities as desk-space, general laboratory space, libraries highspeed internet, as well as lodging and catering facilities, the latter either external, near the Access Provider's premises, or internal, in remote places where such facilities are unavailable or limited externally.

In addition to this upfront information, there is a need for contact information, i.e., who can be reached (E-mail, tel. etc.) for detailed information on the delivered services and possible timing of access. The access providers have to ensure that these contacts are reachable because there is nothing as irritating as non-responsiveness.

Suggested quality benchmarks for access management should take into the account User satisfaction with pre-access, access and post access procedures. Procedures should be crystal clear and concise. Fine details of what is exactly agreed upon by the User and Access provider can be sorted out with local liaison officers at the access providers, specified in User Access Contracts. EMBRC should continue to improve and adapt access procedures to new exigencies, share experiences with other ERICs and foreign organisations with similar objectives and continue sharing experiences among the ERIC partnership. HQ should set up a system requesting feedback and experiences of Users who have made use of the access provision at the ERIC's partners. It should also react immediately upon notice of troubles because the name of the ERIC depends on the performance of the partnership.

Two workshops **(Annex I)** have been organised at which administrative and managerial staff involved in the organisation of the TNA at the ASSEMBLE+ partners attended and during which procedures were explained, experiences with previous TNA projects shared, and any emergent issues resolved. In addition, exchange of best practices was fostered through short sabbaticals of staff involved in the TNA management (**see Annex II**).

User feedback: Transnational Access Users who have made use of the experimental facilities offered at Operators in ASSEMBLE+ Consortium have been satisfied as shown by following selection of feedback statements:

"The service provided was highly efficient in every way, i.e. in the: i) preparation of our access; ii) administrative, logistics, and technical support." "Assemble+ TNA offers a great chance for young

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researchers to move to different institutes to use important facilities. Services and assistance are very well organised." "I really appreciate the help of the scientific diving staff, and also the support provided by the research staff of the genetic and benthos laboratories." "The diving facilities and people involved are highly efficient and recommendable." "The facilities were very good and equipped with everything I needed to perform the laboratory work. I had a great experience and was able to do all the planned work." "Staff and facilities were very welcoming and extremely helpful." "Our collaboration will continue in the future." "Everybody very helpful. Excellent information. Great opportunity for interaction." "The quality of the service was excellent." "The host institution and their research and administrative team were always available to support us, providing all necessary infrastructure and always being at our disposal for any inquiries." "The hosts were incredible and made my experience with ASSEMBLE Plus really enjoyable."

Users expressed remarks regarding the lengthiness of administrative procedures, such as the signature of the "User access contract" and those related to the reimbursement of travel and accommodation expenses (at times overly long for early career researchers) as for the following comments:

"It took a long time until we received the signed contract." "The reimbursement of the expenses should be faster." "I think it would be best if we could have a per daily allowance. Keeping all the receipts for meals, etc. Is really burdensome (mostly for long stays)." "The administrative support to the User should be improved."

4. In-house service provision versus outsourcing

To avoid the Consortium from spreading too thinly, it must keep its activities firmly within the perimeter around its Objectives. A well-defined perimeter guides strategic choices regarding what needs to be included in the service offer of ASSEMBLE+. Key tasks of marine biological research stations include access to marine ecosystems and the use of marine biological resources away from the sea. Most of the Users in ASSEMBLE+ requested access to marine biological resources for follow up research in their home institutes. Therefore, special attention need to be focused on securing access to biological and genetic resources following ethical rules and ABS-friendly ways and to help the Users in ascertaining the taxonomic identity of what has been collected. Users need to be sure that the marine biological and genetic resources can be accessed and that they will be able to exercise their due diligence in utilizing these resources.

Technology platforms such as those for bio-imaging (LM, TEM, SEM); biochemical, elemental, and structural analysis; molecular biology, and bioinformatics are integral parts of the service provision to research at marine biological stations. Numerous Users in ASSEMBLE+ requested access to these technology platforms and their integrated services and expertise. Hence, such platforms are needed on the spot. Local service staff can assist the Users with sample preparation and observation. However, these platforms are not unique for marine biological research. Technological development and innovation of such platforms is typically in the portfolio of dedicated RIs (EU-BI, EU-OpenScreen-ERIC, INSTRUCT-ERIC, EMBL). The role of marine biological stations is to adapt the innovations and

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developments for marine biological research. Access to such platforms should be focused onto support of marine biological research on site.

Regarding "data", Users require open access to data. Several ASSEMBLE+ Users requested access to data in conjunction with access to marine organisms. For instance, long-term ecological research time series data provide information when organisms of interest can be found or perform activities the User wants to study. This means that encouraging the FAIR-ification of data is within the Consortium's core activities. However, linking data across operators, linking different types of data, and developing sophisticated algorithms to query data are within the core activities of e-RIs (e.g., LifeWatch-ERIC, ELIXIR). Moreover, data produced by or for a User are owned by the User, who is responsible for their

5. Conclusions and outlook

Several of the recommendations can be implemented easily across the ASSEMBLE+ Consortium during its remaining lifetime. Others will need significant time and effort (human resources, funds) and their preparation and implementation reach beyond that time window. Fortunately, the deliverables of ASSEMBLE+ will form a legacy for the EMBRC-ERIC as well as for all the non-EMBRC partners in ASSEMBLE+ and their implementation will continue there. In its recent Scientific Strategy Document, EMBRC-ERIC has performed a similar assessment of its needs and has come to comparable conclusions about what needs to be done. Operators in ASSEMBLE+ outside the ERIC who decide to remain outside the ERIC, can follow the recommendations but cannot benefit from the network activities and other collaborations that connect the ERIC Operators.

All of the recommendations are by definition voluntarily; Operators are not obliged to have a quality management system implemented in their scientific services. Yet, Users -especially commercial ones- of the research services may wish quality guarantees; auto-declaration of excellence usually will not do, and free market competition will weed out Operators that fail to deliver at the highest standards. These are ambitious goals and will require full support of the operators' hierarchies as well as the stakeholder community. If realised, these achievements will ensure the ability of researchers to push the frontiers of science, the RIs ability so support companies in innovation, and Europe's leadership in marine biological research.

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Annex I: Workshops

Task NA1.4: Share best practices: In order to foster delivery of top quality scientific services to its TA-Users, the various services at marine stations need to interoperate and share best practices. Therefore, training workshops have been organised for service staff on advances in service provision in the thematic fields of the five JRAs and on the access management (NA1). These meetings were organized in conjunction with JRA workshops to implement JRA deliverables in services across the consortium and beyond. The timing of these workshops has been according to the original planning until the beginning of 2020, but has been disrupted thereafter by the COVID-19 Pandemic. In spite of that, members of the JRA and NA teams have learned to make use of the new e-meeting media to engage in numerous -often more informal- e-meetings. The formal face-to-face meetings have been listed below (see Table 1). Several WPs have kept the possibility open to organise at least one final face-to-face meeting.

Table 1. List of Workshops held in the frame of NA1

Dates	Where	Workshops	Costs	Covered	What about?
13-14/03/2018	CCMAR	JRA1 1st WS	€314,00	CCMAR	Organisation JRA
t.b.d.	SZN	JRA1 2nd WS	€5.000,00	planned	Dissemination results
t.b.d.	UGOT	JRA1 3rd WS ARMS	€3.900,00	planned	Dissemination results
02/10/18	UVIGO	JRA2 1st WS	€1.318,00	UVIGO	Organisation JRA
26-27/06/2019	SAMS	JRA2 2nd WS	€2.404,00	UVIGO	Dissemination results
16-17/04/2018	SZN	JRA3 1st WS	€1.044,13	SZN	Organisation JRA
t.b.d.	e-meeting	JRA3 2nd WS	€ -	planned	Dissemination results
09-10/01/2018	UGOT	JRA4 1st WS	€2.660,00	UGOT	Organisation JRA
t.b.d.	e-meeting	JRA4 2nd WS	€-	SBR	Dissemination results
21-24/05/2018	UGOT	JRA5 1st WS	€5.000,00	UGOT	Organisation JRA
04-05/12/2019	HCMR	JRA5 2nd WS	€5.000,00	HCMR	Dissemination results
07-08/02/2018	SZN	NA1 1st WS	€3.623,52	SZN	train TA procedures
12-13/07/2018	VLIZ	NA1 interim WS	€-	VLIZ	re-organisation TNA portal
07-09/04/2019	SZN	NA1 2nd WS	€1.259,20	SZN	share experiences with TA

Annex II: Short Sabbaticals

Email announcement with information about the staff exchange sent by AQUATT to all in ASSEMBLE+ for each of the three calls

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-------- Forwarded Message --------
Subject: Short-term staff exchange at ASSEMBLE Plus marine stations
Date: Mon, 27 May 2019 12:27:39 +0000
From: Georgia Bayliss-Brown <Georgia@aquatt.ie>
CC: niklas.andersson@loven.gu.se <niklas.andersson@loven.gu.se>

Dear ASSEMBLE Plus partners,

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Its that time of year again where you can apply for a short-term staff exchange at an ASSEMBLE Plus marine station!

As part of the work programme, the University of Gothenburg is offering a further initiative to fund staff exchanges between ASSEMBLE Plus partner organisations. I am contacting you today to consider applying for this programme and/or you share this information to staff within your organisation, please. The next deadline for applications is 16 October 2019 and so it would be great if you can circulate this item soon. The details of the programme follow:

Short-term staff exchange at ASSEMBLE Plus marine stations

* WHY THIS INITIATIVE? Europe's leading marine research service providers are collaborating in the ASSEMBLE+ project. In order to promote capacity building and sharing of best practices on how to improve the provision of research services at a marine research institute, ASSEMBLE+ is offering possibilities for short-term staff exchange in which staff in one partner institute can visit another institute in the ASSEMBLE+ Consortium to learn or share their experience and knowledge. A list of the ASSEMBLE Plus partners and access providers can be found here<http://www.assembleplus.eu/about/consortium> and here<http://www.assembleplus.eu/access/access-providers>, respectively.

* WHAT IS COVERED? The grant contributes to travel costs, meals and accommodation for up to € 1000 per person. The visiting staff member’s salary, and all necessary insurance are to be covered by the home institute.

* FOR WHOM? The grant is intended for staff involved in service provision such as research engineers and technological, technical and administrative staff at any marine institute in the ASSEMBLE+ consortium. The agreement must be between the partner institutes. Any contracts required are also the responsibility of the partner institutes. The visit must be transnational meaning that the sending partner institute and the hosting partner institute have to be in different countries.

* HOW LONG? We envisage visits from 1-3 weeks would be adequate. Longer stays are also possible if financial support from the visitor’s institution are provided.

* HOW? An institute wishing to send a staff member to another institute should first contact the potential hosting institute Liaison Officer. If agreed by the hosting institute, a proposal should then be prepared by the sending institute and sent to niklas.andersson@loven.gu.se<mailto:niklas.andersson@loven.gu.se> with a cc to the hosting institute Liaison Officer. The proposal should be no longer than 5 pages including a 1-page CV of the employee, work plan during the stay, expected objectives/outcomes of the stay, reasons why the particular hosting institute was selected, an explanation why the exchange would be beneficial for scientific service provision in the sending institute, and a provisional budget in € specifying foreseen costs for travel, lodging and subsistence.

* WHEN? The call closes on Wednesday 16 October 2019 at 13.00 CET. A selection committee will select among the submitted proposals and we aim at informing successful applicants by mid-November.
If you have any questions, please do not hesitate to contact Niklas Andersson at niklas.andersson@loven.gu.se<mailto:niklas.andersson@loven.gu.se>

With thanks,
Georgia

Georgia Bayliss-Brown
Senior Knowledge Transfer Officer
AquaTT
>>

Applicants were requested to fill out a form with next to the various personal details requested short descriptions of the reasons for selecting the hosting institute, the objectives for the proposed staff exchange, the activities to be carried out (work plan) and the expected outcomes and impact. The

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submitted proposals were evaluated by two external experts on the management of Marine Stations (members of the Advisory Board: Drs Euan Brown and Michael Thorndyke†) and based on their evaluation results access was granted.

List of successful applicants

- Joanna Norkko from Tvärminne, Finland, to SBR, France (took place virtually due to COVID)
- Kasapidis Panagiotis from HCMR, Greece, to SBR, France
- Davide Caramiello from SZN, Italy, to ECIMAT, Spain
- Jose González Fernández from ECIMAT, Spain, to IRBIM, Italy
- Frederic Verret from HCMR, Greece, to SBR, France
- Jana Šušnjar from NIB, Slovenia, to HCMR, Greece
- Andrea Tarallo from SZN, Italy to SBR, France
- Cecilia Rad-Menéndez from SAMS, UK, to SZN, Italy
- Julie Boeuf, Patricia Fuentes, Claire Strobel from OOB, France, to CCMAR, Portugal (cancelled due to COVID)
- Sarah Reed from SAMS, UK, to Tvärminne, Finland
- Esther Blanco from UPV/EHU, Spain, to SBR, France
- Cécile Cabresin, Sophie Booker, Elodie Bourrigaud from SBR, France, to KMRS, Sweden
- Andrea Norder, Patrick Nord from KMRS, Sweden, to Tvärminne, Finland
- Ursula Schwarz, Hans Olsson from KMRS, Sweden, to Tvärminne, Finland
- Christine Beveridge from SAMS, UK, to ECIMAT, Spain
- Fiz da Costa González from ECIMAT, Spain, to SBR, France
- Julie LeBoeuf, Cecile Cabresin, SBR, France to IUI, Eilat, Israel

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