

EVALUATION REPORT OF THE UNIT

LBI2M - Laboratoire de Biologie Intégrative des
Modèles Marins

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Sorbonne Université

Centre national de la recherche scientifique -
CNRS

EVALUATION CAMPAIGN 2023-2024
GROUP D

Report published on February, 16 2024



In the name of the expert committee :

Miroslav Obornik, chairman of the committee

For the Hcéres :

Stéphane Le Bouler, acting president

In accordance with articles R. 114-15 and R. 114-10 of the Research Code, the evaluation reports drawn up by the expert committees are signed by the chairmen of these committees and countersigned by the president of Hcéres.

To make the document easier to read, the names used in this report to designate functions, professions or responsibilities (expert, researcher, teacher-researcher, professor, lecturer, engineer, technician, director, doctoral student, etc.) are used in a generic sense and have a neutral value.

This report is the result of the unit's evaluation by the expert committee, the composition of which is specified below. The appreciations it contains are the expression of the independent and collegial deliberation of this committee. The numbers in this report are the certified exact data extracted from the deposited files by the supervising body on behalf of the unit.

MEMBERS OF THE EXPERT COMMITTEE

Chairperson:

Mr Miroslav Obornik, Biology Centre CAS, Czech Republic

Experts:

Mr Ugo Cenci, Université de Lille (representative of CoNRS)

Mr Marcelo Guerin, IIS Biocruces Bizkaia, Spain

Ms Juliette Jouhet, CNRS, Grenoble

Mr Peter Kroth, Universitaet Konstanz, Germany

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Mr Xavier Vekemans, Université de Lille

Mr Renaud Vincentelli, CNRS, Marseille (supporting personnel)

HCÉRES REPRESENTATIVE

Mr Steven Ball

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Philippe Agard, Sorbonne Université

Mrs Cecile Bousquet Antonelli, CNRS Biologie

CHARACTERISATION OF THE UNIT

- Name: Laboratoire de Biologie Intégrative des Modèles Marins
- Acronym: LBI2M
- Label and number: UMR 8227
- Composition of the executive team: Mr Stéphane Egée (director) & Ms Mirjam Czjzek (vice director)

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement

SVE2 Productions végétales et animales (agronomie), biologie végétale et animale, biotechnologie et ingénierie des biosystèmes

THEMES OF THE UNIT

The LBI2M research unit conducts interdisciplinary basic research and research supervision in integrative marine biology, particularly on model organisms that have proven to be useful tools for deciphering the complexity of life. The unit focused on three main scientific themes: 1) Investigating the concept of the holobiont in marine microbiology through high-throughput genomic/transcriptomic sequencing, proteomics, and metabolomics. 2) To gain insight into cell fate by studying the mechanisms of biological processes at the molecular and cellular levels 3) To develop systems biology as a complex approach to marine biology involving mathematical modelling of morphogenesis, cell shape, development, etc. and reconstruction of metabolic networks using multi-omics data. The unit also handles the mentoring and supervision of students at all academic levels.

The unit is divided into 7 teams:

Team 1: Algal Biology and Interactions with the Environment (ABIE)

Team 2: Algal Genetics (AG)

Team 3: Marine Glycobiology (MG)

Team 4: Genomics of Vibrios (GV)

Team 5: Morphogenesis of Microalgae (MMA)

Team 6: Physiology and Cell Fate (PCF)

Team 7: Translation, Cell Cycle and Development (TCCD)

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The 'Integrative Biology of Marine Models Laboratory' (LBI2M) is a joint research Unit between the Sorbonne University (SU) and the French National Centre for Scientific Research (CNRS Biologie), UMR 8227. The LBI2M was created in January 2014 and is located at the Roscoff Marine Biological Station (SBR), Roscoff, France.

RESEARCH ENVIRONMENT OF THE UNIT

Through its two supervisory institutions (CNRS and SU), the LBI2M unit is involved in numerous local and national coordination and research structures. The main CNRS affiliation of UMR 8227 is the CNRS Biologie institute (former INSB), with two secondary affiliations, the ICNRS Ecologie et Environnement Institute (former INEE) and the Institute of Chemistry (INC). The UMR 8227 CNRS researchers belong to one of the six following CNRS National Committee sections, including the primary section 23 (Integrative biology of photosynthetic organisms and associated microorganisms) and two secondary sections, 16 (Chemistry and life) and 29 (Biodiversity, evolution and biological adaptations: from macromolecules to communities). Other relevant auxiliary sections are sections 20 (Molecular and structural biology, biochemistry), 21 (Organization, expression, evolution of genomes) and 22 (Cell biology, development, evolution-development). For SU, the unit is affiliated with the 'Living Earth and Environment' Division, with two doctoral schools (Complexity of Life and Natural and Human Sciences) and is involved in the network "Réseau André Picard" grouping forces in developmental biology at SU, including the three Marine Stations, and partially funded by the SU Initiative of Excellence SUPER ("Sorbonne Universités à Paris pour l'Enseignement et la Recherche"). SU researchers-lecturers belong to one of four National University Council (CNU) sections: sections 65 (Cell Biology), 66 (Physiology), 68 (Organism biology) and 26 (Applied mathematics). Locally, the unit is hosted within the research structure FR2424, Roscoff Biological Station (SBR), in association with IRL 3614 (International research laboratory Biologie évolutive et écologie des algues, which will close at the end of 2023) and UMR7144 (AD2M research unit, Adaptation et diversité en milieu marin). At a regional level, LBI2M has been coordinating large projects on seaweed domestication and production (Idealg project, funded by PIA BTBR call, Biotechnology-Bioresources; Contrat de Plan Etat-Région, CPER GEN4BIO project) and is involved in the Biogenouest network of regional technology platforms. It is also strongly collaborating with the Société d'accélération du transfert de technologies (SATT) "Ouest valorisation", for its activities of translational research.

At the national level, LBI2M is member of the Laboratory of Excellence (Labex) GR-EX (The red blood cell: from genesis to death) and involved in the Programme et équipement prioritaire de recherche (PEPR) ATLASea, devoted to produce genome sequences of 4500 marine species. It is also involved in the Centre national de ressources biologiques marines, EMBRC-FRANCE, dedicated to offering services to private or public institutions for accessing and studying marine biodiversity. At the international level, LBI2M is leading the Safe seaweed coalition, funded by the Lloyd's Register Foundation, which brings scientific expertise to initiatives of industrial development of the seaweed sector, and coordinating a CNRS International Research Network (IRN DABMA, Diversity and Biotechnology of Marine Algae, with institutions from Chile and Brazil).

UNIT WORKFORCE: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	2
Maîtres de conférences et assimilés	9
Directeurs de recherche et assimilés	9
Chargés de recherche et assimilés	8
Personnels d'appui à la recherche	27
Sous-total personnels permanents en activité	55
Enseignants-chercheurs et chercheurs non permanents et assimilés	3
Personnels d'appui non permanents	8
Post-doctorants	3
Doctorants	18
Sous-total personnels non permanents en activité	32
Total personnels	87

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: in physical persons at 31/12/2022. Non-tutorship employers are grouped under the heading "others".

Nom de l'employeur	EC	C	PAR
CNRS	0	14	26
SORBONNE UNIVERSITÉ	11	0	0
AUTRES	0	3	1
Total personnels	11	17	27

GLOBAL ASSESSMENT

The Laboratory of Integrative Biology of Marine Models (LBI2M) under the supervision of Sorbonne University and CNRS Biologie is made up of 31 researchers and teacher-researchers and 26 ITA). The unit develops multi-scale approaches from molecules to organisms to communities of organisms. During the last mandate, the approaches carried out included animal cell biology, the biology of brown and red macrophyte algae, developmental biology, macroalgae-microbial interactions, the microbiology of Vibrios, the biophysics of walls and marine glycobiology in the broad sense. This work is carried out by approaches of cell biology, genetics of unconventional systems (brown algae), biochemistry, structural biology and population and developmental biology. The unit was structured into 7 teams including algal genetics, macroalgae morphogenesis, algal biology and interactions with the environment, marine glycobiology, vibrio genomics, physiology and cell fate and cell cycle translation and development.

The unit has acquired an international reputation in two complementary fields: genomics, genetics and the study of the development of brown algae on the one hand and marine glycobiology in the broad sense on the other. The major contributions of the unit relate to the establishment by the Algal Genetics team of CRISPR/cas9 mutagenesis in the model brown alga *Ectocarpus* (Badis et al., *New Phytol*, 2021), the coordination by this same team of the comparative genomics of brown algae (Phaeoexplorer project) and the discovery by the marine glycobiology team of the first regulator of PUL (polysaccharide usage loci) functions in marine bacteria (Dudek et al. *Nucleic Acids Res.*, 2020). In addition to these contributions to the heart of the unit's historical studies themes, the *Vibrio* Genomics team produced very original results focused on an eco-evolutionary perspective of phage-bacteria (*vibrio*) dynamics in the marine environment (results published in *Nature Microbiology*). All this work can be considered as highlights of the scientific activity of the LBI2M over the last period. The unit of 87 scientists (including research technicians and permanent ECs as well as doctoral students and post-docs) published 333 articles during the period 2017-2022, including 35 reviews and 16 book chapters. A number of these articles (52) have been published in leading journals such as *Nature communications* or *PNAS* as coordinators or *Nature* and *Science* as collaborators.

Among the contracts obtained, we note the successful submission of 3 ERCs including one consolidator and two advanced grants. Obtaining two of these ERCs was followed by the recruitment of their holder in Canada and or at the Max Planck Institute, thus attesting to the attractiveness of LBI2M scientists. The LBI2M has benefited from 11 ANR contracts including 10 in coordination and has, in addition to the ERCs, 5 other European projects (1 COST Action, 2 MSCA ITN, 2 collaborative projects) as well as funding via 4 PIAs (IDEALG, OCEANOMICS, the GREx labex and Blue Train).

The LBI2M has numerous collaborations with manufacturers (Cargill, Amadeite, Roullier, Goëmar) leading to research contracts, particularly relating to the use of algal biomass, and regularly provides training to the industrial sector (ERYTECH Pharma, Nanion Technologies, Phagos). 5 patents have been filed. Two start-ups were created, SeaBeLife (2019) and Aber Actives (2022), generating three and two permanent jobs respectively. SeaBeLife Biotech is developing a line of drugs designed to block cellular necrosis to treat acute liver and kidney disorders. Aber Actives is developing an enzymatic macroalgae biomass biorefinery to produce bioactive ingredients for the cosmetic and nutraceutical markets. In addition, the LBI2M has a person dedicated to communication and mediation with the general public, facilitating their access to the scientific knowledge generated by the unit.

Victim of its own success, departure of the three ERC laureates entails a drastic recompositing of the LBI2M team architecture. Three teams are to remain in their current form (AG, TCCD, PCF). The ABIE team will have two new leaders. In marine glycobiology, three new teams will be created, Brown Algal Glycans (BAG), Molecular interactions with red alga matrices (IMMAR) and Bacterial Bioconversion of Macroalgae (BABIM). In addition, the brand new team "Tidal Rhythms of Brown Algae" (TIDALG) is being established in LBI2M. The project of TIDALG team on tidal/lunar rhythms involving chronobiology approaches and using methods from -omics to genetics is timely and fits perfectly in the LBI2M.

The trajectory of the unit thus involves a fragmentation of the research teams, in contradiction with the current strategy at the CNRS. However, taking into account all the advantages and disadvantages of this direction, and given the quality of the newly established teams, our assessment of trajectory is excellent which is in line with the excellence of the unit as a whole.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The former report stated that "The unit has already become a leader in various aspects of marine biology from community structure to the establishment of model bacterial and macroalgal systems", which surely is valid also for this evaluation term. The previous report mentioned a low number of top journal (PNAS, Nature, Science) with LBI2M members as first /last authors, even though there is a high output of publications, the mentioned issue in the current round has only slightly improved. In the self assessment document, several further issues have been mentioned that had been put forward by the previous evaluation committee. A stronger orientation towards physiology/biochemistry to improve functional studies has been recommended. Here new positions are mentioned that have been filled to lead research in this direction. Weak industrial partnerships. In their response, LBI2M describes a number of partnerships with companies, however, it is unclear how deep these partnerships are, and whether they lasted longer than the period of the respective projects. Integration of aims and goals of the respective teams. Here LBI2M responds that "...each researcher or research group develops its own projects". Here more strategic planning of overall directions that lead to collaboration would be desirable. A further recommendation included considerations regarding the balance between basic and translational projects. LBI2M indicates that there are also translational efforts, that led to start-ups. The involvement of a mathematician was also recommended. While LBI2M responds that recruitment was not possible, they are hosting a senior mathematician. The previous panel furthermore suggested a focus on brown algae and bacteria, however, while several teams study these organisms individually, there is only team 1 and 4 that study interactions between bacteria and macroalgae, having a certain number of shared publications. Finally, the panel recommended to revisit leadership decision, an issue which according to the response by LBI2M was not sufficiently discussed during the last evaluation. The frequency of meetings of the "conseil d'unité" (one per year) suggests that no major change in this respect has been introduced.

B - EVALUATION AREAS

EVALUATION AREA 1: PROFILE, RESOURCES AND ORGANISATION OF THE UNIT

Assessment on the scientific objectives of the unit

LBI2M covers a broad area of research, including molecular aspects of algae in their environment, algal genetics, glycobiology, Vibrio genomics, macroalgae morphogenesis, blood cell biology, cell cycle. Given the extraordinary location, the available resources in Roscoff and the success of the unit, such an orientation towards molecular aspects of marine biology is fully appropriate.

Assessment on the unit's resources

LBI2M resources are excellent. The unit is part of the SBR, actively interacting with its environment. Two main institutions/sources cover infrastructure fees and all salaries of LBI2M permanent staff which contributes significantly to the stability of the structure. In addition, LBI2M is also very active and successful in securing internal/external funding from academic and non-academic sectors.

Assessment on the functioning of the unit

The human resources management of the unit is excellent, with strong support for career-long training, and very good training in health and safety for newcomers. Risk prevention is very well managed, including risks associated with the use of GMOs and non-native species, but no strategy has been set up for data protection. The unit has not been involved in activities to reduce its carbon footprint, besides initiatives led by the SBR.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

LBI2M represents an excellent unit with worldwide reputation. Being located at a marine station along the coast, the focus on marine biology is self-evident and a great strength of LBI2M, allowing to develop programs on a larger number of model systems. Furthermore, the composition of excellent scientists focused on different areas of biology allows a strong exchange of expertise, methods, and approaches, as well as the development of joint projects fruitful for all teams participating.

Weaknesses and risks linked to the context

The unit declares three main directions in the research. While two of them (1/ marine microbiology and holobiont concept and 3/ systems biology as a new paradigm for marine biology) fit well with what can be studied at the Marine Research Station in relative geographic isolation on the ocean coast, the third one concerning the cell fate biology being done at LBI2M is partially focused on medical research and the biology of non-marine models (human erythrocytes, malaria parasites) within the Team 6 and 7, PCF and TCCD).

The scientific strategy of the unit is discussed at the FR level mainly and not really at the unit level.

2/ The unit has resources that are suited to its activity profile and research environment and mobilises them.

Strengths and possibilities linked to the context

LBI2M benefits of the SBR location/structure/resources, interacting with its environment at all levels, regional, national or international. The two supervisory institutions provide for infrastructure fees and for salaries of all LBI2M permanent staff (ca. 70% of 80 members) representing 3,500 k€/year and 700 k€/year, for CNRS and SU, respectively. This contributes significantly to the stability of the unit, with respect to research personnel, also considering recruitment/retirement/mobility. LBI2M has been very successful in securing external funding (10,500 k€, 2017-2022) for research and personnel expenses at all levels, regional, national or international. LBI2M also performed contractual collaborations with industrial partners, maintaining a balance between these partnerships and fundamental research work.

Weaknesses and risks linked to the context

A broad focus on highly different model systems generates the risk that the achieved new knowledge and experimental expertise on one organism cannot be easily transferred to other organisms, possibly limiting the chances for successful collaborations within the unit. Although the technical resources including financial support by grant funding is excellent, the report shows that the number of staff is still below that of the time before the pandemic (2019), while the basic staff remained on similar numbers the number of Post-Docs and supported FTC staff have declined.

3/ The unit's practices comply with the rules and directives laid down by its supervisory bodies in terms of human resources management, safety, environment, ethical protocols and protection of data and scientific heritage.

Strengths and possibilities linked to the context

The human resources management of the unit is excellent, with strong support for career-long training (funded by the supervisory institutions and internal funds), optimization of office space allowing very good conditions for hosting newcomers, training in health and safety for newcomers, information about psychosocial-risk in collaboration with a dedicated cell at the SBR hosting structure. Gender-balance is heterogeneous across categories of personnel but, in an unusual manner, women are predominating at the highest career levels in the PR/DR category (6 women and 5 men) and 5 out of 7 teams are led by women.

Risks associated with experiments with GMO's and non-native species are well identified and prevention measures are supervised by a dedicated member of the supporting staff.

Weaknesses and risks linked to the context

The unit seems to have all the referents for psychosocial risk, except for one of the doctoral school, but the information seems to be not easily accessible to the newcomers.

The unit has not been involved in assessment of carbon footprint associated with its research activities and has not set up rules to reduce its carbon footprint.

The unit has not developed strategies for data management and for securing data.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The overall attractiveness of the unit is excellent. LBI2M conducts attractive multidisciplinary research of high quality, publishes in high impact journals, organizes international conferences, participates in international and national projects and consortia, researchers are members of the editorial boards of respected journals, and frequently give invited talks at prestigious scientific conferences due to their high scientific reputation. LBI2M has successfully attracted national funding for research initiatives and have also been successful in EU and international calls.

- 1/ *The unit has an attractive scientific reputation and is part of the European research area.*
- 2/ *The unit is attractive because for the quality of its staff support policy.*
- 3/ *The unit is attractive through its success in competitive calls for projects.*
- 4/ *The unit is attractive for the quality of its major equipment and technical skills.*

Strengths and possibilities linked to the context for the four references above

1) The unit has an excellent publication record. It has published more than 300 articles, including those in high-ranking journals, 13 book chapters and 4 patents during the evaluation period. Members of the unit organized or participated in the organization of national and international conferences, including European innovation and science initiatives (e.g. COST, Phycological Congress), coordinated major national and international projects (e.g. IDEAL, GENIALG, „Safe Seaweed Coalition“). The scientists of the unit gave at least 64 invited talks at international conferences (e.g. European Phycological Congress, Croatia; 12th International Phycological Congress, Chile; 24th International Seaweed Symposium, Tasmania). All this indicates their high scientific reputation and strong commitment to the European research area.

2) Despite the geographical isolation of the SBR, the LBI2M has shown a high activity in hosting PhD students, postgraduates, young researchers and visiting scientists. 40 PhD students have been (or are still being) trained in the unit (24 have graduated), 29 postdocs have been working at the LBI2M for a year or more, the LBI2M has recruited 5 young researchers during the evaluated period, about 25 researchers (PhD students, visiting professors and collaborators) have visited the unit for a shorter period of time.

3) The LBI2M is successful in competitive calls for national and international projects. The funding of the unit is composed of national and international sources. During the evaluation period, the sum of own resources varied between 700 and 1500 thousand euros for running experiments and 300 to 900 thousand euros for salaries related to grants, plus PhD contracts in the amount of 100-150 thousand euros per year. These funds were obtained from national and international sources. Some LBI2M teams were very successful in ERC calls. In total, 3 individual ERCs (two Advanced, one Consolidator) were submitted and granted. In addition, 5 other European projects were approved (1 COST Action, 2 MSCA ITN, 2 collaborative projects). The unit is also very successful in national funding: 11 ANR projects (10 were led by members of the unit) were approved during the evaluation period.

4) First, the unit benefits from its geographic location and hosting facilities provided by the SBR. For example, there is specialized equipment for the cultivation of marine organisms that can hardly be operated elsewhere. In addition, the unit has access to various platforms of the Biogenouest network. The LBI2M also benefits from the infrastructure offered by EMBRC-France and the experimental space for marine models. Last but not least, the unit benefits from highly qualified technical staff from both the SBR federation and the unit. For example, the unit offers an algae culture service, protein expression and purification, biochemical analyzes, crystallography, CRISPR-Cas gene editing and much more. All this further enhances the attractiveness of the unit.

Weaknesses and risks linked to the context for the four references above

1. Access to university students is limited by the unit's geographic isolation. Recruitment of PhD students, postdocs, and visiting scientists could be improved, perhaps with a stronger focus on foreign students, emphasizing the long tradition of marine research at Roscoff Station and the uniqueness of its geographic location.
2. The unit is facing the retirement of several key researchers and needs to find means to recruit people for their replacements.
3. One of the ERC grantees - Advanced - stayed at the LBI2M during the all granted period. However, the other two ERC grantees - Advanced/Consolidator - moved to other Institutions to develop their project.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The publication activity of the unit is excellent. The unit of 80 members (comprising 28 permanent researchers and academics) has published 333 papers in the period of 2017-2022, including 35 reviews, and 16 book chapters. A number of these papers (52) appeared in leading journals such as Nature communications or PNAS (as leaders) or Nature and Science (as collaborators). 30% of the publications included authors from different teams of the unit.

- 1/ The scientific production of the unit meets quality criteria.*
- 2/ The unit's scientific production is proportionate to its research potential and properly shared out between its personnel.*
- 3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science. It complies with the directives applicable in this field.*

Strengths and possibilities linked to the context for the three references above

Overall, the scientific production of the LBI2M unit meets the quality criteria. Researches of the unit publish primary research articles, reviews, and opinion articles in highly respected journals such as Nature, Science, Nature Microbiology, Nature Ecology and Evolution, Nature Communications, Nature Chemical Biology, Nucleic Acids Research, and other journals with high reputation and visibility in the field. LBI2M scientists are the major contributors for most of these articles. The best publishing team are AG, GV and MG teams. The other teams (ABIE, PCF, TCCD, MMA) are about equal in their production. Three teams are also involved in applied research leading to patents (MG, PCF, TCCD). All scientific production of the unit complies with the principles of research integrity, ethics, and open science.

Weaknesses and risks linked to the context for the three references above

Publication activity is not evenly distributed among LBI2M teams. The most productive team, considering the size of the teams, measured by all criteria (number of articles, number of articles in standard scientific journals) number of articles in the most respected is the Algal Genetics team (AG). The less productive team in terms of number of articles and number of articles standard journals is the Morphogenesis and Macro Algae (MMA) team. In terms of number of highly visible journals, the less productive team is the Translation Cell Cycle and

Development (TCCD) team. The production (number per person of standard scientific) of the best team (AG) is almost 5 times higher than that of the team with the lowest scientific production (MMA).

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

Assessment on the inclusion of the unit's research in society

LBI2M is excellent at attracting funding from non-academic sources while also participating in an organization interested in the oversight/safety/sustainability of the algae industry. LBI2M is actively participating in public outreach activities.

- 1/ The unit stands out for the quality and the amount of its interactions with the non-academic world.*
- 2/ The unit develops products for the cultural, economic and social world.*
- 3/ The unit shares its knowledge with the general public and takes part in debates in society.*

Strengths and possibilities linked to the context for the three references above

1. LBI2M regularly collaborates with the industrial sector (e.g. Cargill, Amadeite, Roullier, Goëmar), generating signed contracts. LBI2M regularly provide training to the industrial sector (ERYTECH Pharma, Nanion Technologies, Phagos). These collaborations introduce important fundamental knowledge and research-based notions of eco-responsibility in the use of algal biomass.

LBI2M is part of the Safe Seaweed Coalition (www.safeseaweedcoalition.org), with the objective of raising awareness of the seaweed sector, at the global level, of the numerous actors involved and to create international norms and standards that respond to the United Nations' Sustainable Development Goals.

2. 5 patents were deposited. Two start-ups were created, SeaBeLife (2019) and Aber Actives (2022), generating three and two permanent jobs, respectively. SeaBeLife Biotech develops a range of drugs designed to block cell necrosis to treat liver and kidney acute disorders. Aber Actives develops enzymatic biorefinery of macroalgal biomass to produce bioactive ingredients for cosmetics and nutraceutical markets.

3. LBI2M has a person dedicated to communication and mediation with the general public, facilitating their access to the scientific knowledge generated by the unit (e.g. workshops/meetings/training/hosting/teaching activities).

Weaknesses and risks linked to the context for the three references above

Activities dedicated to valorisation and related administration could give less time for basic research.

ANALYSIS OF THE UNIT'S TRAJECTORY

The overall scientific orientation of the LBI2M unit remains the same: to focus on fundamental knowledge in the biology of marine models and develop integrative approaches by building a research continuum from molecules to organisms and their interactions. The structure of the LBI2M unit is scheduled to change drastically in 2024. Three teams are to remain in their current form (AG, TCCD, PCF). The ABIE team will have two new leaders. In marine glycobiology, three new teams will be created, Brown Algal Glycans (BAG), Molecular interactions with red alga matrices (IMMAR) and BActerial Bloconversion of Macroalgae (BABIM). In addition, the brand new team "Tidal Rhythms of Brown Algae" (TIDALG) is being established in LBI2M. The project of TIDALG team on tidal/lunar rhythms involving chronobiology approaches and using methods from -omics to genetics is timely, and fits perfectly in the LBI2M, where collaborations with ABIE, MG and AG teams should be natural. The integrative approach developed should lead to important biological answers. In addition, skills from other units in the Roscoff station would be of putative great interest for this project.

The trajectory of LBI2M reflects this significant change in the structure of the unit. The unit will explore molecular and cellular processes involved in cell fate (algal and mammalian models), evolution of marine organisms with respect to physiological responses (Ectocarpus model), and microbial interactions of macroalgae. This important change in the structure of the LBI2M and the formation of new teams will enable the unit to conduct highly integrative multidisciplinary research combining physiology, biochemistry, genomics, multi-omics, functional genetics (reverse genetics), structural biology, bioinformatics, and marine organism biology into an integrative network that can trigger a synergistic effect and help address the challenges posed by the changing marine environment.

The trajectory of the unit involves a fragmentation of the research teams, in contradiction with the current strategy at the CNRS. However, considering all the advantages and disadvantages of this direction, and given the quality of the newly established teams, we rate the trajectory as excellent.

RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, Resources and Organisation of the Unit

Since the structure of the LBI2M unit is fundamentally changing (three teams will be retained, five others will either be modified or completely reconstituted), there are unique opportunities to develop the unit further. It is recommended to consolidate the excellence of the 2 major topics developed by the LBI2M, namely marine glycobiology and macroalga biology and genetics.

With regard to financial procedures, the committee would recommend to reconsider the procedure for expenses between the unit and the SBR financial administration, as it seems to lead to delays and overload for the administrative staff of the unit.

The initiative of the technical staff to organize the different technical services as a unified structure, CMAR, seems to be well appreciated by members of the unit and this initiative should be encouraged.

Recommendations regarding the Evaluation Area 2: Attractiveness

1. The LBI2M unit will undergo a fundamental reconstruction in 2024. This reconstruction will result in a rejuvenation of the teams in the unit. This move may affect attractiveness in two ways: 1) Younger PIs are more attractive to postdocs and graduate students because they are closer intellectually. 2) Less experienced supervisors are less attractive to postdocs and graduate students because their labs are less established and sustainable and less likely to fulfill their scientific mission. Our recommendation is to support the new groups at LBI2M to reduce their handicap from point 2.

2. Two of the three ERC grantees moved to other Institutions for developing their projects. This can happen due to the strong competition between Institutions over Europe to attract these scientists/projects. Based on this experience, it is a good opportunity for LBI2M to improve the policies not only on attracting external ERC grantees - e.g. ERC Starting grants - to work at the Unit, but also promoting/supporting young personnel to apply for such funding schemes and for permanent CNRS positions.

3. The unit should seek for local representatives of both doctoral schools operating at the unit. Regarding teaching opportunities for PhD students, the unit should try to assist motivated students to find ways to acquire experience in teaching and for being paid for such activities. Also, for newcomers, the unit should plan to provide detailed information on the different technical and administrative services available within CMAR and at the station.

4. Given the outstanding science of some young researchers the committee recommends to be more active on asking delegation to the CNRS and/or IUF, which could strengthen the development of various scientific questions.

Recommendations regarding Evaluation Area 3: Scientific Production

In 2024, four new teams are scheduled to appear in LBI2M. In line with the trajectory and themes of the unit, in particular the application of multidisciplinary and systems biology approaches, close collaboration between the teams is essential to achieve a synergistic effect. To ensure this, we recommend that joint meetings of the relevant teams be organized on a regular basis, at least once a month. It is important to maintain the balance of collaborations between the groups and independency in terms of projects, funding and publications. These steps have the potential to increase publication output and enhance the role of LBI2M in collaborative projects.

Due to the change of the structure, it is important to keep the quality level of the publication of the unit. To promote the development of new scientific challenge, it is important to have strategic reflection at the level of the unit in terms of human resources, instrumentation, technology and scientific questions.

Recommendations regarding Evaluation Area 4: Contribution of Research Activities to Society

The LBI2M is taking several appropriate actions in this area 1) close contractual collaborations with industrial partners, including the creation of two start-ups 2) raising awareness among partners, including producers, industrialists, researchers, governments and non-governmental associations, on the importance of creating international norms and standards to support the safety and sustainability of the seaweed industry for consumers, workers and the environment, and 3) communicating the results of their work to the society. It is recommended to preserve these dynamics/actions while maintaining a balance with the generation of fundamental knowledge/research, which should be the main focus/responsibility of the unit to the society.

TEAM-BY-TEAM ASSESSMENT

Team 1: Algal Biology and Interactions with the Environment (ABIE)
 Name of the supervisor: Ms Catherine Leblanc

THEMES OF THE TEAM

The team "Algal Biology and Interactions with the Environment" is interested in better understanding how macroalgae respond to environmental challenges in the marine environment by integrating the holobiont concept into their research strategy, i.e. considering the alga and its associated microbiome as a functional unit. Their strategy is to investigate three main areas:

- 1) the molecular mechanisms involved in the physiological responses of macroalgae in response to biotic and abiotic stress,
- 2) the role and evolution of key metabolic and signalling pathways, with a focus on halogen metabolism,
- 3) the associated microflora and metabolic interactions within algal holobionts, with the development of *in silico* analyses.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

A – Recommendations on scientific production and activities (criterion 1)

The team's work paves the way for the holobiont concept; in this case for studies of the brown and red macroalgal models with their microbiomes. The group should continue in this direction and establish algalbacterial networks. Perhaps the holobiont, concept for macroalgae should also include the eukaryotic 'microbial' partners.

B – Recommendations on the team's organization and life (criterion 2)

Not assessed.

C – Recommendations on scientific strategy and projects (criterion 3)

The team should also focus on developing a better understanding of genotype-phenotype relationships by establishing genetic and transformation systems for their model species, the generation and analyses of mutant strains and the use of more sophisticated biochemical/physiological methods. The team has to strengthen its bioinformatic capacities

As requested, the team continued to study the holobionts of macroalgae after the end of the IDEALG funding and successfully validated the predicted bacterial communities that can enhance algal growth based on metabolic complementarities for different macroalgae. The recommendation of the previous HCERES was to focus on the development of genetic transformation of the studied strains to gain a better understanding of genotype-phenotype relationships. The acquisition of the Crispr/Cas9 tool developed by the Algal genetics team for *Ectocarpus* could be a good opportunity to achieve this goal. The team has also strengthened its bioinformatics capacities by recruiting Gabriel Markov (CRCN CNRS) and by collaborating with the Dyliss team (IRISA, Rennes).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	8
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	4

Sous-total personnels non permanents en activité	6
Total personnels	14

EVALUATION

Overall assessment of the team

The ABIE team was in a transition phase during this contract as two long-term projects (IDEALG and ALFF) were completed. The team focused on studying molecular mechanisms evolved by macroalgae holobiont in response to their environment and deciphering the role and metabolic pathways of these macroalgae holobiont. To achieve this goal, the team has strengthened its bioinformatics capacities by recruiting a new CRCN CNRS and by collaborating with the Dyliss team (IRISA, Rennes). They have also successfully trained contractual staff (PhD students, post-docs and technicians) who have subsequently found permanent position afterwards. In this respect, the team is outstanding. However, in terms of scientific production, the team has published 76 peer-reviewed articles, and although the team has improved the quality of the journals in which it publishes, it lags somewhat behind in the production of articles in top journals. For that matter, the production of the team's production is very good to excellent. The trajectory of the team is also very good to excellent, with the integration much more pronounced of the holobiont and integration to the aquaculture. However, the new organisation of the team, the lack of some crucial expertise (ecology and genetics) and the part of the projects supported by secured funding is not very clear, so it is difficult to see how the team will lead and achieve each axis. Finally, the members of the team are highly involved in the collective task at laboratory and national level. They have organised symposia and are strongly promoting the use of seaweed to the general public and industry. In this respect, the team is outstanding. The overall assessment of the team is excellent.

Strengths and possibilities linked to the context

The team has a strong expertise in the study of physiology, metabolism and genomics, applied to the abiotic and biotic interactions of algae, which has helped to secure funding over these 5 years, at different levels, local, national and european, and from the public and private sectors. Its multidisciplinary and multi-scale approach is original for understanding the functioning of macroalgal holobiont in its marine environment and their potential applications in algoculture. The development of the CRISPR/CAS9 tool for *Ectocarpus* developed by the algal genetics team is an opportunity to deepen the development of a holobiont model system in the coming years to produce an integrative study.

Weaknesses and risks linked to the context

Although ABIE is the second most productive team in the LBI2M unit in terms of number of articles and number of articles in quality journals, the strategy of publication is targeted to highly specialized journal and lags somewhat producing articles in top journals. Since ABIE researchers often publish in very good journals just below the threshold (BMC Biology, Molecular Ecology, PloS Genetics), this is not a major problem. It is interesting to note the trend of slightly decreasing numbers of publications in high visibility journals over time.

Analysis of the team's trajectory

The team's goal is to understand the function and evolution of algal holobionts in their environment. Several model systems studied at different levels will answer questions related to algal holobionts. ABIE will focus on the complex study of brown algae metabolism, by studying their genetic background, evolution, and metabolic interactions, as well as holobiont regulation and their reflection in algal biology under natural and aquaculture conditions. Due to the complexity of the studied topic, ABIE will follow the collaborative network, i.e. internal collaborations (AG, BABIM and BAG, SBR platforms including CRBM, ABiMS, MetaboMer, GenoMer and MerImage) and collaborations outside the station, such as the IRISA for system biology, all supported by network funding (MITI, HaloGene, CIFRE, Seamark), including international collaborations outside the EU (University of Chicago, Sydney, Chile). Such collaborative projects usually end up with articles in the best and most visible journals, from which ABIE can benefit.

ABIE trajectory follows the latest trends of a multidisciplinary approach to the study of biological objects. A multidisciplinary view allows a comprehensive assessment of the environmental and metabolic relationships of the studied algal holobionts in the natural environment and in aquaculture.

It is difficult to predict the future development of the team's publication activity, as it will undergo a fundamental rebuilding with the two new leaders. However, since both leaders are already established in the team, the change is unlikely to have a negative impact on the scientific production of ABIE.

RECOMMENDATIONS TO THE TEAM

The ABIE team will have two new leaders starting in 2024. For the smooth functioning of the unit, it is necessary to clearly define the responsibilities of each leader. We recommend writing a specific division of authority between the two leaders of the team, clearly defining procedures related to their roles in the team, decision-making authority, rules for corresponding authorship for publications, and distribution of resources to avoid potential problems in the future.

The ABIE team had the highest number of highly to very highly specialized journal publications at LBI2M. We recommend to change the publication output in favour of visibility, clarity and quality, although we are aware of the fact that sometimes interesting results cannot be published in a better way.

Team 2: Algal Genetics (AG)

Name of the supervisor: Mr Mark Cock

THEMES OF THE TEAM

The Algal Genetics Group aims to characterise and understand novel traits of brown algae at the molecular level, in particular the developmental mechanisms underlying their multicellular complexity. The group focuses its efforts on identifying the players involved in the life cycle of the brown alga *Ectocarpus*. To achieve this goal, the team has invested considerable effort in the development of new tools and resources and has successfully managed to develop the genetic transformation and modification of *Ectocarpus*. The team is also orchestrating a large-scale genome sequencing project to generate reference genomes of other brown algae. Since the recruitment of a new Maître de conférence, the team has initiated a new project aimed at understanding the defences of brown algae against oomycete pathogens.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendations on scientific strategy and projects (criterion 3)

... it may be worth thinking of other aspects of the brown algae that offer research opportunities and that can integrate with other teams in the unit such as ABIE, MG and MMA. And as suggested in the proposal, it would also be worth taking the knowledge generated in the study of Ectocarpus and using it as a springboard to examine economically important brown algae such as Saccharina latissima; It would also be important to consider the analyses of other brown algal systems with life cycles that have diverged from that of Ectocarpus. The Phaeoexplorer project can be an important focus in the future, The team should consider integrating more with other teams within the unit but should also consider developing more interactions with other units such as AD2M

During this mandate, the team had to cope with the departure of two of its members to the University of Tübingen. Therefore, the work now is much more focused on further developing *Ectocarpus* as a model with the study of its life cycle and the interaction with parasite-secreted effectors to investigate algal defences. The PhaeoExplorer project pursued by ATLASea will be published soon and will be a very useful reference for all researchers in the community. In addition, the tools developed by the team also seem to be of interest to other teams in the laboratory such as the ABIE team. The two teams are already partners in various projects.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	4
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	1
Sous-total personnels non permanents en activité	2
Total personnels	6

EVALUATION

Overall assessment of the team

The AG team has a clear focus on *Ectocarpus* genetics and genomics and is internationally highly visible. In addition, the team is coordinating a large international brown algal genome sequencing project that is currently undergoing sequence analysis. The genetic resources of the AG team allow a detailed and state-of-the-art analysis of various aspects of brown algal cell biology. The group has a strong scientific output in excellent journals. The overall scientific output as well as the outreach are outstanding.

Strengths and possibilities linked to the context

The Algal Genetics group has been led by two world-class scientists working in synergy to produce high-quality, original fundamental research based primarily on the *Ectocarpus* model system, the development of which was mainly driven by this group. The development of the CRISPR/cas9-based genome editing in *Ectocarpus* is a great achievement that is highly federative and transposable to most of the LBI2M teams (Badis et al., *New Phytol*, 2021). Although during the last evaluation period, in 2021 one important member left the group to a highly attractive position abroad, the remaining group maintained its high research profile. During the last period, AG was active both in expanding genomic knowledge of brown algae ("Phaeoexplorer") and in researching the cell cycle of *Ectocarpus* as well as epigenetic regulation and immunity systems in brown algae. They have published 36 research articles and 18 reviews/book chapters during the evaluation period. The group has received 22 research grants, including a CNRS International Research Network and an ERC grant (Consolidator, 2019). 28 presentations at various events, including invitations to international conferences, demonstrate the high visibility of the research team.

Weaknesses and risks linked to the context

The team consists of only two permanent researchers and supports a variety of projects. Although a recent grant obtained through ANR JCJC funding opens up a promising new area of research, brown algal defences against oomycete pathogens, which is very attractive, it is unclear whether the current research on genomics and mutagenization of brown algae can be maintained regarding the projected retirement of the current team leader.

Analysis of the team's trajectory

The AG team has a consistently strong trajectory, publishes excellent research papers and successfully attracts a large number of research grants at different levels (22 in the period evaluated). Although a prominent lab member of AG left the team in 2021, the group was able to maintain its high publication output and research activity. The team propose to switch slowly from its main topic, *ectocarpus* life cycle, to *ectocarpus* immunity in perspective of the retirement of the team leader and the recruitment of a new Maitre de conférence. The recent grant obtention (ANR JCJC) secures this trajectory. In the future, the team needs to think how to capitalize the highly visible research of AG when the leader of the group will likely retire during the next contract period.

RECOMMENDATIONS TO THE TEAM

The AG team is very strong in research and publishing, therefore there is no urgent recommendation for a change of the course. As it seems, the team managed well to handle the leave of a prominent member. Currently the genetic work on brown algae including the generation of specific mutants is a unique selling point of the team, however, to explore brown algal biology via functional and developmental mutant lines is far too big for a single team. Therefore, it is recommended to team up with more groups by sharing the knowledge of *Ectocarpus* culture, studies, and genetic modifications. Only a large set of available mutant lines that are accessible to other groups will make the *Ectocarpus* work more attractive to other groups entering the field. This will be essential to ensure that the groundbreaking work of the team will have a broader impact and won't disappear.

Team 3: Genomics of Vibrio (GV)
 Name of the supervisor: Ms Frédérique Le Roux

THEMES OF THE TEAM

The Genomics of Vibrio (GV) team works on the interactions between phages and bacteria, in particular Vibrio. The team's scientific activities rely on genetic tools and microbial systems to better understand the co-evolution of such relationships and to study the evolution of antimicrobial resistance in Vibrio populations.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"The scientific output of the team could be improved if the number of articles published by the different members of the team were less disparate."

The team leader has focused thematically on the interaction between Vibrio and phages, and while the team has maintained several collaborations, their joint work has led to excellent publications (e.g. Piel et al. 2022.)

"The objectives sometimes may be too centered around the skills of the team leader. The project would benefit from closer collaborations with other members of the unit, e.g. function of virulence factor in oyster or mechanism of the host-phage interactions may require biochemical analyses, structural biology, proteomics ... many competences that are already available in the unit, or would be readily acquired through external collaborations."

The team has not established an extensive cooperation network within the LBI2M. However, the team has also not researched any topics related to the proposed area.

"In silico approaches of comparative genomics, phylogenomics and population genetics play a very important role in the team's research. The team should find the means to stabilize this competence through a permanent future position."

The team has secured a permanent position (IR) for *in silico* approaches.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	3
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	3
Post-doctorants	2
Doctorants	1
Sous-total personnels non permanents en activité	6
Total personnels	9

EVALUATION

Overall assessment of the team

The team performed outstanding research and has produced highly original results on the dynamics of interactions between phages and bacteria in the marine environment. The scientific production of the team was of remarkable quality, with important and original results published in general and specialised journals with high visibility. The team has been exceptionally successful in obtaining research funding (one ERC advanced and 2 ANR projects as coordinator) and has hosted 3 PhD students and 3 postdoctoral fellows. The members of the team have an excellent involvement in community outreach, but low levels of interaction with the socio-economic sphere, despite great potential on the oyster model.

Strengths and possibilities linked to the context

The team has produced highly original results focusing on an eco-evolutionary perspective of phage-bacteria dynamics in the marine environment. In particular, they have characterised for the first time a complex infection network of phage isolates and lineages of their host (*Vibrio crassostreae*) collected in natural environments and provided evidence for local adaptation associated with strain-specific defence systems mainly determined by mobile genetic elements (results published in *Nature Microbiology*).

The scientific production of the team is outstanding, with important and original results published both in general scientific journals with high visibility (*Science* x1, *PNAS* x1, *Nature Communications* x2) and in specialised journals with high visibility (*Nature Microbiology* x1, *ISME journal* x2, *Annual Review of Microbiology* x1), and 50% (10 over 20 articles) of the articles with a member of the team as first, last or corresponding author.

The two PhD students who defended their thesis during the contract period published an average of 3.5 publications, which is excellent. One doctoral student won the "Unesco-L'Oréal for Women in Science" award. The team has been exceptionally successful in attracting research funding, with one ERC advanced and 3 ANR projects (two of them led by the unit) totalling 3.8 million euros, which has enabled, among other things, the recruitment of three postdocs.

The team has established a strong collaborative network on phage evolution and phage-bacteria interactions at national (the team chaired the national Conference on phages 2021 in Roscoff with 113 participants) and international level (École Polytechnique de Lausanne, Switzerland; Max Planck Institute, Germany; Alfred Wagner Institute, Austria; Harvard Medical School and Massachusetts Institute of Technology, USA).

The members of the team have an excellent involvement in community outreach, with special emphasis on encouraging young women to choose a career in science.

Weaknesses and risks linked to the context

The team was only composed by two permanent staff for more than half of the time period which was clearly a weakness.

The heterogeneity of publications between the various Ph. D. and post doc is high, especially for first authorship.

While the topic can have a direct impact on oyster industry, no projects have been developed with companies.

Analysis of the team's trajectory

The team consists of two researchers from IFREMER who have been hosted by the SBR since 2010. During the period, the team has been very successful and has increased its collaboration at national and international level, producing original and highly visible collaborative publications on phage-bacteria interaction dynamics, but interactions with other teams at the station have remained scarce. As the leader of the team has been recruited as a professor at the University of Montreal in September 2023, the team will not be part of the next contract.

RECOMMENDATIONS TO THE TEAM

As the team will not be part of the next contract, no recommendations are given.

Team 4: Marine Glycobiology (GM)
 Name of the supervisor: Ms Mirjam Czjzek

THEMES OF THE TEAM

The team works on enzymes involved in the metabolism of macroalgal biomass, in particular carbohydrates, and on links between carbohydrate structures, protein structures and protein functions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"The arrival of new permanent scientists with different research expertise could ... dilute certain efforts."

The team has been particularly productive and of exceptional quality during these 5 years. However, the new research topics and new employees led to the division into 3 different teams.

"The large number of biological models being used by the group, including marine plants, algae and bacteria, may become a weakness...."

The multiple biological models led to the division into 3 different teams, all with putative breakthrough projects.

"The field of macroalgae glycobiology is highly original and the team has to affirm its international leadership in this field. Bioinformatics approaches have to be reinforced ..."

The team has continued its excellent work and has published several excellent articles in excellent journals (ISME, JBC...). Bioinformatics are still to be reinforced, particularly since the IR retired.

"The effort to characterize new cell-wall components such as AGPs using immunological approaches is also of interest ... We also encourage the team to take the opportunity of producing proteins in eukaryotic system to develop eukaryotic recombinant expression systems (HEK, CHO...) ..."

The development of immunological approaches has been maintained, improved and it is available for the community. The team acquired some experience in eukaryotic expression.

"The team should pay attention to the nature of glycobiological interactions between bacteria and algal cell walls and the participation of lectins in the context of the holobiont concept..."

Work on PULs remains central, and the development around Sulfatlas and other tools could lead to a better understanding of holobiont concepts and roles. However, it has not defined a clear axis in the research, which is already full of possibilities. It could be a good opportunity for new teams emerging from the marine glycobiology group.

"Complementary tools such as proteomic approaches or cryomicroscopy for structural analyses may be important for future work."

The MG group started collaborations in the area of Cryo-EM and Cryo-ET, as a first step in order to establish the technique at the Institute.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	9
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	4

Sous-total personnels non permanents en activité	6
Total personnels	15

EVALUATION

Overall assessment of the team

The Marine Glycobiology (MG) group performs outstanding research aimed at understanding (i) the biology and biosynthesis of extracellular matrix polysaccharides of marine macroalgae and (ii) the integrative biology of marine bacteria associated with macroalgae and marine polysaccharide degradation. It is a strong/multidisciplinary/consolidated group with solid/experienced personnel, who have contributed significantly to the development of the field of marine glycobiology. MG has an exceptional scientific output (79 articles/books), including articles in major journals (e.g. Nature, Nat. Chem. Biol. and Proc. Natl. Acad. Sci. USA), in collaboration with renowned national/international partners. MG successfully supports/funds its research program through national/international grants (e.g. ANR and EC). MG makes excellent contributions to society, including regular collaborations with industrial partners, the creation of a start-up company with three deposited/licensed patents. MG has a strong visibility reflected in the numerous participation/invitation/organization in many international conferences as chair/key note speaker. Overall, MG is a world-class research group that not only provides a fundamental mechanistic understanding of marine glycobiology/enzymology, but also the application of this knowledge in areas such as bioengineering and biotechnology.

Strengths and possibilities linked to the context

1. MG is a multidisciplinary group genuinely working at the state-of-art research in marine glycobiology. Highlights include:

- In the context of sulfatases research, MG contributed with three outstanding manuscripts in collaboration with international partners: 1) Luis et al. Sulfated glycan recognition by carbohydrate sulfatases of the human gut microbiota. *Nat. Chem. Biol.* 18(8):841-849 (2022), 2) Luis et al. A single sulfatase is required to access colonic mucin by a gut bacterium. *Nature* 598(7880):332-337 (2021), and Cartmell et al. How members of the human gut microbiota overcome the sulfation problem posed by glycosaminoglycans. *Proc Natl Acad Sci USA*. 114(27):7037-7042 (2017). In addition, MG created/developed/curates/maintains SulfAtlas, a very useful database on sulfatases - <https://sulfatlas.sb-roscoff.fr/sulfatlas>; Stam et al. SulfAtlas, the sulfatase database: state of the art and new developments. *Nucleic Acids Res.*, 51, D647-D653 (2023).

- In the context of the discovery of new cascades and enzymatic activities, MG contributed with three very interesting manuscripts: 1) Reisky et al. A marine bacterial enzymatic cascade degrades the algal polysaccharide ulvan. *Nat. Chem Biol.*, 15, 803-812 (2019), 2) Ficko-Blean et al. Carrageenan catabolism is conferred by a complex regulon in marine heterotrophic bacteria. *Nat. Commun.* 8(1):1685 (2017), 3) Manat et al. Specificity of a β -porphyranase produced by the carrageenophyte red alga *Chondrus crispus* and implications of this unexpected activity on red algal biology. *J. Biol. Chem.* 16:102707 (2022).

- MG successfully developed genetic tools to produce and complement knock-out mutants in the model marine bacterium *Zobellia galactanivorans*. In that context, MG characterized the first PUL regulator in marine bacteria, showing that AusR is a conserved transcriptomic repressor that controls the degradation of alginate; Dudek et al. Regulation of alginate catabolism involves a GntR family repressor in the marine flavobacterium *Zobellia galactanivorans* DsijT. *Nucleic Acids Res.*, 48, 7786–7800 (2020). This is a very important and relatively unexplored area of research.

2. MG successfully support/finance its research program by national ANR grants, 1) Blue Enzymes (2014-2019, 181 k€), 2) ALGAVOR (JCJC 2018-2023, 283 k€), 3) BreakingAlg (2018-2023, 256k€), 4) BrownSugar (2020-2024, 205 k€) and 5) Mirror_Mirror (2022-2027, 182 k€). All members were strongly involved in ANR PIA IDEALG (2011-2020; 10M€). M. Czjzek is partner in several additional ANR projects OCEANIA (2021-2025, 45 k€), RESISTE (2021-2024, 20 k€) and SulfASST (2023-2026, 176 k€); the EU collaborative project GENIALG; regional/internal LBI2M grants.

3. MG shows strong interaction with other LBI2M teams, as well as with national and international academic partners, as evidenced by the numerous co-authorships in major scientific journals.

4. MG regularly interacts with non-academic partners. In this context, members of the MG team and alumni (B. Kloareg, professor emeritus and former SBR director; R. Larocque, former engineer; G. Michel, DR) founded AberActives - <https://www.aberactives.com> - a start-up company developing an enzymatic biorefinery from

macroalgae biomass to produce bioactive ingredients for the cosmetics and nutraceuticals market. In November 2022, two patents of the MG team on algae-specific enzymes (β -porphyranases and ulvan lyases) were licensed to AberActives.

5. MG has a strong visibility reflected in the numerous participation/invitation to many international conferences as chair/key note speaker, including GRC, FASEB, CBM, ECM, IUCr conferences. MG organized the 1st International Congress on Marine Flavobacteria (2018) and the 12th National Conference on Plant Cell Walls (2019).

6. MG provides services to the scientific community/society, including SulfAtlas and SeaProbes, distributing Brown Algae Monoclonal antibodies worldwide with no known competitors - <http://www.sb-roscoff.fr/en/seaprobes>).

Weaknesses and risks linked to the context

1. Low number of technical staffs, PhD students and Post-docs with respect to the number of established researchers.

2. The field of structural biology has not only markedly evolved during recent years, but has also had a strong influence on all areas of biology. The MG group seems to be lagging behind in this respect. The LBI2M as a whole would thus benefit significantly from the inclusion/development of additional techniques, including cryo-electron microscopy, cryo-electron tomography, and artificial intelligence (e.g. omics interpretation/processing and protein design). Recruitment of established researchers in these areas is strongly recommended.

3. The chemical structure determination of marine polysaccharides is often a limitation in the development of biochemical/structural studies on the substrate specificity of CAZymes, which not only affects the advancement of fundamental research, but also the ability to bring such work to industry. The expansion of the "Chemical Analysis" platform is strongly recommended. The LBI2M could consider developing/establishing a Nuclear Magnetic Resonance (NMR) platform and recruiting a team leader in this area to generate this knowledge independently. This would not only benefit the newly created BAG, IMMAR and BABIM teams, but also the entire LBI2M.

Analysis of the team's trajectory

MG developed/covered different themes projects, which led to a certain divergence. LBI2M responded by forming three different teams led by 3 young researchers, which seems to be the natural evolution of the MG team. More specifically,

1. The "Brown Algal Glycans" (BAG) team will focus on the study of polysaccharides from brown algae. BAG will be led by a previous member of the MG group. It is worth mentioning that one of the previous MG PIs will be part of the BAG team.

2. The team "Molecular Interactions with Red Algal Matrices" (IMMAR) will study the interactions with the components of the extracellular matrix (ECM) of red algae to understand the metabolism of the red algal matrix. IMMAR will be led by a previous member of the MG group.

3. The team "Bacterial Bioconversion of Macroalgae" (BABIM) will study the bacterial mechanisms underlying the degradation of macroalgal biomass. BAG will also be led by a previous member of the MG group. It is worth mentioning that other PI of the previous MG structure will be part of the BAG team.

It will be critical for the BAG, IMMAR and BABIM teams to afford/establish/expand truly independent research programs/funding schemes, striking an appropriate balance between the need for collaboration between the groups and maintaining the scientific excellence of the MG team.

RECOMMENDATIONS TO THE TEAM

This team has researched important new questions over the years and is at the forefront of their field, providing tools for the scientific community and industry. Their integration and recognition in the local and national community is excellent. As the team grows in size and scientific staff retire, the question of splitting up and handing over leadership to young researchers arises. The 3 teams state that they will all work together, which is essential given their domains. While splitting into 3 different teams could also lead to dilution of some strengths, the committee believes it is a timely and scientifically appropriate split up.

It should also be important for each of the three teams to include CryoEM/CryoET for protein structures if possible, and it may be of interest to seek out materials and recruit such expertise. As a possible starting model, the Institute might consider incorporating: (i) a semi-automated vitrification system to provide fast, easy, and reproducible sample preparation for cryo-EM - e.g. Vitrobot Mark IV or similar - and (ii) a Workstation to perform CryoEM data processing. The establishment of a close collaboration with main CryoEM facilities for screening

and data collection at high resolution, in France and Europe is strongly recommended. In such context, the hiring of post-doctoral fellows and a young Group Leader in CryoEM is highly desirable. In addition, strengthening teams and or unit in skills such as artificial intelligence (for -omics interpretation) and in click chemistry to explore chemical structures of macroalgae polysaccharides, especially to explore the dynamic of those polysaccharides, is recommended. The expertise of T. Barbeyron should also be replaced as those bioinformatics skills are central for all teams working on glycobiology and beyond.

Team 5: Morphogenesis of Macroalgae (MMA)
 Name of the supervisor: Ms Bénédicte Charrier

THEMES OF THE TEAM

The Morphogenesis of Macroalgae team works on the multicellular development of brown algae and is investigating the mechanisms that lead to three-dimensional organisms, with a focus on the brown algae *Ectocarpus* and *Saccharina*.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"The team is clearly putting considerable efforts into publishing the fruits of their research. They should continue in this direction, as well as considering increasing their investment in outreach activities: the exciting and original results being produced by this team would provide a good basis for public outreach, and the team should consider expending more effort on this activity."

The team still does not have significant activity for public outreach.

"An effort should also be made to analyse the team's lack of success in attracting students to work on these very promising projects."

The number of doctoral students is good in relation to the capacity of the team (3 permanent researchers).

"The team does not seem to be well integrated in the unit, especially with some of the other teams with that it could benefit from, including the algal genetics group and the algal glycobiology group."

The same remark is still valid, but the MMA team is relocating in Lyon.

*"The team should consider the acquisition of "in house" capacity for the production of biophysical models and for making biophysical measurements. They should be wary, given their already heavy and productive investment in the *Ectocarpus* model, of spreading themselves too thinly by initiating poorly defined studies in other systems. This point is particularly important given the current lack of research funding experienced by this team."*

The funding is now outstanding, which solves the remark of studying several models by acquiring methods and people.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	2
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	4
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	1
Total personnels	5

EVALUATION

Overall assessment of the team

The MMA team has a unique selling point by studying the morphogenesis of brown algae in detail. Although the team is rather small compared to other LBI2M teams, it is highly visible and productive internationally and has produced a number of publications in prestigious journals during this evaluation period. The scientific production of the team is very good, while the trajectory is outstanding.

Strengths and possibilities linked to the context

The team has no real competitor because of its highly original thematic, which is a real strength.

In addition, the direct interest for multicellularity in other organisms (plant, fungi, animals...), especially ability to compare different types of 3D development by biophysics in closely related organisms (inside the same clade all 3D growth modes) is particularly relevant to answer big biological questions.

The committee also appreciates the cross-disciplinary character (physics/biology) of the project. All those strengths has led to successfully applying for an ERC advanced grant, which would likely lead to further strength as developing biophysics approaches, and tackle important biological questions.

Weaknesses and risks linked to the context

Detailed studies on development of macroalgae are scarce. Although the MMA team is leading the field, the overall topic is centered mostly on the characterization of cellular properties. Although recently single cell transcriptomics approaches have been developed by the MMA team, the publication efforts may benefit from a stronger affinity to molecular approaches. The publication efforts are appropriate regarding the group size, although publications in highly visible are missing. Two manuscripts of the list have been submitted to BioRxiv two years ago, apparently without a meanwhile verification via full submission to a journal. Sole reliance on doctoral students for practical work is problematic, as it depends not only on funding but also on attracting excellent students to the projects. The low number of permanent staff is a real weakness as is the absence of some skills (e.g. biophysics).

Analysis of the team's trajectory

The MMA team currently has some local funding (Region Bretagne), but also attracted EU funding. Most importantly an ERC advanced project was granted recently (2023-28), that should allow increasing the scientific output in the future. Publication output shows a recent increase. While 2018 only a multi-author genome paper has been published by MMA, in the following years 2-4 research manuscripts have been published plus several reviews and book chapters. The overall trajectory is outstanding. However, the team has relocated to Lyon.

RECOMMENDATIONS TO THE TEAM

The team leader has been very successful in attracting PhD scholarships and European grants based on a thematic niche of great importance. We recommend strengthening this team in biophysics skills, that should be achieved by moving from Roscoff to Lyon.

In addition, we recommend that the acquired recognition of multicellular development should be strengthened by integrating even more scientific communities/society working on the topic in plants, fungi, animals, etc. We also recommend developing the projected comparison inside a same clade of various types of 3D development as this could be a real strength for future work.

Team 6: Physiology and Cell Fate (PCF)

Name of the supervisor: Mr Stéphane Egée

THEMES OF THE TEAM

The Physiology and Cell Fate team has focused on regulated necrosis such as ferroptosis and cell senescence. This fundamental issue is addressed in two independent projects. 1) How does ionic channels activity represent a threat for completion of the normal lifespan of erythrocytes in the circulation, 2) What are the bases of the molecular crosstalk between necroptosis, ferroptosis and extrinsic apoptosis signalling pathways in the frame of regulated cell death? This second topic is developed by a screening approach on epithelial cells and led to the funding of the start-up SeaBeLife Biotech. A third topic is supported by the team "Mathematical Models for Biology Questions" by hosting a mathematician assistant professor from another lab (LJLL).

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

A – Recommendations on scientific production and activities (criterion 1)

The collaboration in networks should enable the team to define more sharply where their work can make an impact with respect to medical needs, novel technology development or valorisation. Could economic-social impact could be made with the help of partners in these consortia? A sharp definition of the research needs may increase the impact of the data. The described science is very good and relevant, but the research could be better focused, or it should be better phrased with respect to why and how their approach will make an impact.

B – Recommendations on the team's organization and life (criterion 2)

To maintain a critical mass, the team needs to increase, particularly in establishing a strong peer group of Master, PhD students and postdocs that can motivate and strengthen each other... in addition to the training by the staff. Also, at the level of PhD students and postdocs it is important to have a peer group that can help and enforce each other.

C – Recommendations on scientific strategy and projects (criterion 3)

The committee requires that the team define the problem that is addressed such that the aim of the studies and key objectives appear as urgent needs to solve this problem. The panel felt the need to judge whether the approach is appropriate to address the key objectives, to reach the aims, to solve the problems being addressed.

The team responded to the socio-economic impact their research could have by depositing a patent and funding a start-up company SeaBeLife Biotech. SeabeLife currently employs six people and has raised €3.9 million in private equity and grants since its creation. Regarding the team's organisation, the recommendation is not assessed in this report and therefore no element to assess this point can be found. The team has taken into account the previous recommendation on scientific strategy by focusing its research and clarifying the scientific question. Therefore, the team received the correct funding during this period with 11 grants supporting both of the team's topics.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	3
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	6
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	2

Sous-total personnels non permanents en activité	5
Total personnels	11

EVALUATION

Overall assessment of the team

The PCF team develops very original research, first, the involvement of ionic channels in human erythrocytes in health and diseases and, second, the role of kinases in cell necrosis. The scientific quality of the work is very good to excellent and meets international standards. The team has successfully funded its research from national and non-academic/private sources and has produced a high number of publications per researcher. The team's expertise is highly visible, with members contributing on the editorial and advisory boards of major general medical and blood-related journals such as *Blood* and *Am. J. Hematology*. The PCF also has a strong scientific reputation, having contributed to a labex and two MCSA ITN European networks. The PCF has made excellent contributions to society, most notably the founding of SeaBeLife Biotech and the development of a diagnostic tool for hematologists. The public outreach is at a very good level through television programs and news.

Strengths and possibilities linked to the context

The PCF's research is original and has high societal relevance. The team expands significantly applied research one would expect for the LBI2M. During the evaluated period, the PCF continued to investigate the deregulation of erythrocyte ion channels upon infection by *Plasmodium falciparum* and identified novel features of New Permeation Pathways along the infection cycle, opening new therapeutic opportunities. In addition, the PCF's expertise in electrophysiology enabled the exploration of the novel role of Piezo1 in red blood cells and its involvement in anemia when mutated, opening also the field of the role of calcium dysregulation in RBCs diseases. This expertise has allowed both to develop a diagnostic tool for the severity of pathologies and to improve channels activity in RBCs. Finally, in both developing cell-based screening for inhibitors of kinases involved in cell death and by participating in the foundation of SeaBeLife Biotech, PCF is fully involved in the development of drugs designed to block cell necrosis to treat liver and kidney acute disorders.

The PCF team has gained visibility in the research community, as shown by 29 publications in the period evaluated, 16 of them as leading and most of them as collaboration at national or international level. The improved visibility of the PCF is also confirmed by a strong international collaborative network with 2 MCSA ITN European networks.

The team is now attractive and has trained a considerable number of young, non-permanent members (4 PhD students, 1 and a senior researcher). In the frame of the two ITNs in which the team has been involved, 9 different PhD students have been hosted.

The PCF team is fully involved in translational research. One member of the PCF is co-founder and member of the scientific advisory board of a start-up biotech company that has a Cifre contract with the PCF and employs 6 people.

PCF also collaborates with 2 companies involved in the MCSA ITN European networks.

Weaknesses and risks linked to the context

Two of the three scientific themes (theme 1 and theme 2) converge to the interest of cellular and molecular processes leading to regulated cell death but with different models (RBCs and epithelial cells) and molecular targets (channels and kinases). There is a risk of divergence of interest between the two themes.

The small size of the team, within 3 professors and associate professors with teaching obligations, could be a potential weakness from a future sustainability standpoint.

Analysis of the team's trajectory

Maintaining the development of themes 1 and 2 with a joint project is relevant.

Theme 1 will focus on Ion channels in human RBCs in health and associated channelopathies in developing methods and techniques to characterize channel activities in healthy and pathological conditions.

Theme 2 will focus on ferroptosis pathway, in developing pharmacological compounds as direct inhibitors or as probes. Applied aims concern the discovery of new compounds that could have therapeutic potential in modulating cell necrosis.

The joint project will focus on interactions between Piezo1 channel and calcium dependant ferroptosis in RBCs. This project, in merging resources from theme 1 and 2, will use a chemical biology-based approach (target fishing and transcriptomic analysis) for studying regulation of cell necrosis in RBCs. This is interesting and promising project but that will deserve a more global approach about the mechanisms that could induce ferroptosis in RBCs, its calcium or monovalent ion dependency and the role of the other channels identified in RBCs, some of them could also be stretch-activated.

RECOMMENDATIONS TO THE TEAM

Even if the two major themes are based on solid expertise, visibility and international scientific recognition, the unity of the team PCF is based on the joint project that should be consolidated with a clearer strategical research approach.

It is recommended that the team attempts to attract additional CNRS or Inserm full time researchers, or young researchers to apply for CNRS recruitment, to implement and consolidate particularly the joint project. The expert committee recommends that the team attempts whenever possible to target publications in the top multidisciplinary journals to increase the citations and visibility of the research work.

Team 7: Translation, Cell Cycle and Development (TCCD)

Name of the supervisor: Ms Julia Morales

THEMES OF THE TEAM

The TCCD team studies post-transcriptional regulatory events controlling major cellular transitions and cell cycle. These include the conversion of an unfertilized egg into a developing embryo (egg-to-embryo transition), the transformation of a quiescent cell into a dividing cell or of an undifferentiated progenitor into a differentiated cell. Their research objectives have focused on two principal events regulating cellular processes: 1/ Translation regulation and orchestration, 2/ Kinases cascades and regulation. They use different kinds of models: the sea urchin for cell cycle progression and early development, the catshark for the mTOR study and human cells for mitosis regulation and cyclin study.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

A – Recommendations on scientific production and activities (criterion 1)

Although the scientific production is good, the team has to engage in national and international collaborations, which may create new publication opportunities. Some of the projects like the role of kinases in cell cycle control are extremely competitive. The team should not underestimate how difficult it may be to pull down RNA binding proteins because these assays tend to have a lot of background. To be original the team has to make clear choices and find a competitive niche. The arrival of new members in the teams could be the occasion in which new experimental approaches could be introduced.

The financial support is currently limited to la Ligue and this represents a risk. Part of the research may be translationally oriented with potential biomedical applications or in marine models to enable the team to reach out to industry.

B – Recommendations on the team's organization and life (criterion 2)

None.

C – Recommendations on scientific strategy and projects (criterion 3)

To be competitive it is important to present a clear aim and key objectives based on unique preliminary data and a well-specified research need. The approach has to be focussed and clear choices need to be made for topic and approach. Study of the translatome is a less studied field and will give the group a competitive edge when properly focussed. The team should develop priorities with respect to the models they want to use. The team should use the contact with students during teaching to motivate potential PhD students for a project that has great potential when presented as a competitive project, with the novelty compared to existing literature well lined out

The team is still mainly fund by charity associations grant but improved their source of funding with local, PIA and CNRS grants. However, the success on ANR and European grant is not there.

The TCCD team has been profoundly restructured at the beginning of the five-year contract in 2019, with the joining of three researchers and 2 ITA. This structuration was a great opportunity to strengthen cell biology competencies through the skills and knowledge of these researchers and bring together complementary expertise. Therefore, the team did not really develop priorities with the model they want to use, each researcher leading one scientific question on the model he (she) thinks is the most appropriate.

Finally, the team has increased the number of PhD students during this contract, going from 1 PhD student to 7.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	11
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0

Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	4
Total personnels	15

EVALUATION

Overall assessment of the team

Much of the work of the TCCD team is devoted to deciphering the mechanisms related to the regulation of cell transition by translation and kinases. The scientific quality of the work is very good and of international standard. The team has successfully funded their research through national and non-academic/private sources, and have produced a high number of publications per researcher. The team's expertise has good visibility as members contribute to reviewing of generalist and specialized journals (Nature Comm., Developmental Biology, Journal of Cell Biology, Marine Biotechnology). TCCD also has an attractive scientific reputation, having contributed to two European networks, one for teaching and the other for marine biology research organisation. TCCD has made good contributions to the society, including involvement in a start-up and a patent on kinase inhibitors. Public outreach is at a very good level through public conferences and books for general audience.

Strengths and possibilities linked to the context

The TCCD has developed very original research aimed at investigating the regulation of cell transition by translation and kinases, using several marine models and vertebrate cells, contributing significantly to the increase of fundamental knowledge. During the evaluated period, the TCCD team has developed an expertise in translation regulation with success, evidenced by the publication of two Nucleic Acids Res: one about the publication of the first translome in sea urchin following fertilization and in the other paper the related method on polysome profiling.

The TCCD has also developed original research on kinases cascades and regulation that regulates cellular and molecular processes through 3 different axes: mTOR kinase and translation in stem cells, mitosis regulation through kinases and the cyclin-dependent kinase CDK10 in development. TCCD collaborates with other teams of LBI2M through transversal axes.

The TCCD has a high visibility in the research community, as demonstrated by 48 publications in medicinal chemistry (J Medicin Chem) and molecular biology (Nucleic acid Res) journals in the evaluated period, 21 as leader and most of them through collaboration at national level, plus 5 review articles, 6 book chapters, 1 book with editorial leadership.

The team has significantly increased its attractiveness and has been training a quite significant set of young, non-permanent members despite the COVID period (7 PhD students and 2 postdocs), making an effort and succeeding in securing ministerial and regional funding to finance theses. Projects were secured during the evaluation period through local and national grants (5 grants) and charity associations (11 grants) allowing to recruit 5 additional staffs (1 postdoc, 4 IE)

TCCD research significantly contributes to society with the participation to the European Project EMBRIC for clustering infrastructures of innovation in marine biotechnologies.

The TCCD team is fully involved in the commercialization of its research discovery as it is involved in valorisation projects (Blue Valley) and structures (Pôle de compétitivité) and in the scientific board committee of the start-up AberActive plus as it has filed a patent on kinases inhibitors. All publications are available in the open access database HAL.

Weaknesses and risks linked to the context

TCCD has developed research on kinases cascades through 3 different axes. Each "kinase" axis is a leader in the field, but scientific production of these axes is heterogeneous due to the heterogeneous number of collaborations.

Each researcher pursued his/her own line of research, and this is the best way to improve personal expertise and international recognition, but the success of each axis strictly relies on few individuals. The different research lines may therefore not seem to be well interconnected.

Despite of international visibility and attractivity, besides bilateral partnerships, the team has not succeeded to collect substantial international research funding involving multiple partners.

Analysis of the team's trajectory

The TCCD research aims will continue to focus on the mechanisms of translational regulation and of kinases activity that regulates cellular and molecular processes. Four main projects are designed in this aim: Translational regulation in egg-to-embryo transition, translation regulation in shark kidney stem cell maintenance, mitotic regulation by Haspin and Nek9 kinases, functional characterization of CDK10/cycQ.

Each project is based on relevant hypotheses, previous expertise and the recognition of researchers in the field.

RECOMMENDATIONS TO THE TEAM

The team is advised to increase the interactions between the projects in order to combine strengths.

The team should target future EU funding programs to strengthen its EU networks and the quality of its research outputs.

The team should, for all the projects, improve its leadership position in general scientific journals whenever possible.

CONDUCT OF THE INTERVIEWS

Dates

Start: 27 November 2023 at 08:30

End: 28 November 2023 at 18:00

Interview conducted: on-site

INTERVIEW SCHEDULE

Monday 27th November 2023

- 8h30-8h40: Foreword and presentation of the Hcéres panel and procedures
- 8h45-9h45: Presentation of results and projects of the research unit
- 9h45-10h05: Coffee break
- 10h05-11h35: Team Marine Glycobiology: highlights and trajectory
- 11h35-11h55: Team Tidal Rhythms of Brown Algae (CPJ CNRS 2022): Trajectory
- 11h55 – 12h25: First panel closed meeting
- 12h30-13h45: Lunch
- 14h00 – 14h30: Team Algal Genetic: highlights and trajectory presentation
- 14h35 – 15h15: Team Algal Biology & Interactions with the Environment: highlights and trajectory
- 15h20 – 16h00: Team Translation Cell Cycle & Development: highlights and trajectory presentation
- 16h05 – 16h20: Coffee break
- 16h20 – 17h10: Second closed panel meeting
- 17h15 – 17h45: Team 4 Physiology & Cell Fate: highlights and trajectory
- 17h50 – 18h15: Team Genomic of Vibrio: highlights (visioconference)
- 18h20 - 18h45: Team Morphogenesis of MacroAlgae: highlights (visioconference)
- 18h45 – 19h45: Third closed panel meeting

Tuesday 28th November 2023

- 8h30 - 9h00: Meeting of the committee with technical and administrative staff (In French)
- 9h00 – 9h30: Meeting of the committee with PhDs and postdocs
- 9h30 – 10h00: Meeting of the committee with researchers
- 10h00 – 10h30: Coffee break
- 10h30 – 11h30: Fourth panel closed meeting
- 11h30 – 12h00: Meeting of the committee with the head of research unit
- 12h00 _ 12h30: Meeting with the funding bodies (Sorbonne University – CNRS)
- 12h30 – 14h00: Lunch
- 14h00 - 16h00: Final drafting of the Hcéres report (closed meeting)
- 16h00 - 16h15: Coffee break
- 16h15 - 18h30: Final drafting of the Hcéres report (closed meeting)

PARTICULAR POINT TO BE MENTIONED

All meetings and discussions were organized on site except for the teams "Genomic of Vibrio" and "Morphogenesis of MacroAlgae" and for the meeting with the funding bodies (CNRS Biologie and Sorbonne Université) which took place through visioconferences.

GENERAL OBSERVATIONS OF THE SUPERVISORS

Marie-Aude Vitrani
Vice-Présidente Vie institutionnelle et démarche
participative
Sorbonne Université

à

Monsieur Eric Saint-Aman
Directeur du Département d'évaluation de la recherche
HCERES – Haut conseil de l'évaluation de la recherche
et de l'enseignement supérieur
2 rue Albert Einstein
75013 Paris

Paris, le 9 février 2024

Objet : Rapport d'évaluation LBI2M - Laboratoire de biologie intégrative des modèles marins

Cher Collègue,

Sorbonne Université vous remercie ainsi que tous les membres du comité HCERES pour le travail d'expertise réalisé sur l'unité de recherche « LBI2M ».

Sorbonne Université n'a aucune observation de portée générale à formuler sur le rapport d'évaluation transmis.

Je vous prie d'agréer, Cher Collègue, l'expression de mes cordiales salutations

Marie-Aude Vitrani
Vice-Présidente Vie institutionnelle
et démarche participative



The Hcéres' evaluation reports are available online:
www.hceres.fr

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Evaluation of the national research organisms
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