Research evaluation

EVALUATION REPORT OF THE UNIT

AD2M - Adaptation et Diversité en Milieu Marin

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 January, 26 2024

High Council for evaluation of research and hignter education

In the name of the expert committee[1] :

Dominique De Vienne, Chairman of the committee

For the Hcéres[2] :

Stéphane Le Bouler, acting president

Under the decree n° 2021-1536 of 29th November 2021:
[1] The evaluation reports "are signed by the chairperson of the expert committee". (Article 11, paragraph 2);
[2] The president of the Hcéres "countersigns the evaluation reports established by the expert committee and signed by their chairperson." (Article 8, paragraph 5).

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 Dominique De Vienne, Professeur émérite, Université Paris-Saclay
Experts:	Mr Lionel Denis, Université de Lille Mr Mohamed Jebbar, Université de Bretagne Occidentale (representative of CoNRS) Mr Johann Joets, Inrae, Gif-sur-Yvette (supporting personnel) Mr Peter Kroth, Universitaet Konstanz, Germany Ms Purificación López-García, CNRS, Gif-sur-Yvette Mr Miroslav Obornik, Biology Centre CAS, Czech Republic Ms Morgane Ollivier, Université de Rennes 1 (representative of CNU) Mr Xavier Vekemans, Université de Lille

HCÉRES REPRESENTATIVE

Mr Steven Ball

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Philippe Agard, Sorbonne Université
Ms Agnès Mignot, CNRS Écologie & Environnement

CHARACTERISATION OF THE UNIT

- Name: Adaptation et Diversité en Milieu Marin
- Acronym: AD2M
- Label and number: UMR7144
- Composition of the executive team: Unit director: Mr Fabrice Not, deputy directors: Mr Dominique Davout and Mr Jean Mary

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 Adaptation and Diversity in Marine Environment (AD2M) research unit conducts research on marine organisms and ecosystems using descriptive, functional and evolutionary ecology approaches. The studied organisms are highly diverse, from photosynthetic prokaryotes to planktonic protists and multicellular eucaryotes (mostly macroalgae and benthic invertebrates), as well as the type of marine ecosystems investigated (from littoral and coastal ecosystems to deep oceanic hydrothermal vents). The scientific project of the unit is built around three strategic axes: (i) Characterizing the functioning of coastal ecosystems and their dynamics in relation to human impact; (ii) Promoting integrated coastal and marine observatories with sampling expeditions and application of high-throughput sequencing technologies; (iii) Developing the use of the marine holobiont concept to study the acclimatization and adaptation processes in response to global change.

The unit is organized into three teams: Ecogeochemistry and dynamics of coastal ecosystems (EDYCO), Ecology of marine plankton (ECOMAP), and Dynamics of the marine diversity (DYDIV).

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The AD2M unit is located at the Station Biologique de Roscoff (SBR). It has been founded in 2005 and is associated with two supervisory institutions: CNRS Ecology and Environment and Sorbonne University (SU). The financial administration, technological platforms and observation facilities are shared with two other units (IRL 3614 Evolutionary Biology and Ecology of Algae, and UMR 8227 Laboratory of Integrative Biology of Marine Models) and managed collectively by the Research structure SBR (FR2424).

RESEARCH ENVIRONMENT OF THE UNIT

At the local, national and European scales, AD2M maintains multiple links with its research environment and assumes various responsibilities.

First, it contributes to the functioning of the SBR (FR2424), through its implication in platforms such as Merimage, Metabomer, Recyf (Roscoff Environmental Cytometry and Fluidics), ABIMS, but also in the communication service (Comedis). Regarding teaching, the professors and associate professors teach in more than 35 courses, at all levels, from L1 to M2.

Second, at the regional level, AD2M staff are members of the steering committee of Biogenouest, a network of six analytical (MerImage, Génomer, CristallO, Métabomer & KissF) and bioinformatics (ABIMS) platforms intended to serve nearly 70 research units from various research bodies and universities from Brittany and Pays de la Loire, covering the fields of marine, agricultural, health, and bioinformatics research. AD2M also coordinates the CPER project GEN4BIO (2022-2027) for the development of genomic observatories.

Third, at the national and international levels, AD2M is involved in the coordination of the National and European infrastructures EMBRC-France and EMBRC-ERIC, notably through the operational committee of EMO-BON, a European initiative to coordinate genomic observation along the European coastlines. Several members of AD2M are leaders of work packages of the PIA3 Equipex+ program AO-EMBRC dedicated to implement Augmented-Observatories in France. AD2M scientists are also scientific coordinators of the project Future-Obs – Augmented Observatory for coastal socio-ecosystems (2022-2028) of the PPR Ocean & Climate. AD2M members holds director positions or are member of the executive boards in several structures such as the Network of French Marine Universities (RUM), the Thematic Ocean Institute at Sorbonne University, the FR2022 GOSEE and the *Obersvatoire des Sciences de l'Univers* (OSU) STAMAR. Finally, members of AD2M are involved in several national GDR collaborative networks (*Groupements De Recherche*): GRET *Ecologie Trophique*, IBCO2 *Integrative Biologie of CO2 capture* and OMER *Océans et Mers*.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	3
Maîtres de conférences et assimilés	11
Directeurs de recherche et assimilés	9
Chargés de recherche et assimilés	8
Personnels d'appui à la recherche	18
Sous-total personnels permanents en activité	**49**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	6
Doctorants	12
Sous-total personnels non permanents en activité	**19**
Total personnels	**68**

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	16	17
SORBONNE UNIVERSITÉ	13	1	1
AUTRE	1	0	0
Total personnels	**14**	**17**	**18**

GLOBAL ASSESSMENT

The Adaptation and Diversity in the Marine Environment (AD2M) research unit under the supervision of SU and CNRS Ecology and Environment (INEE) brings together three PRs, 11 MCFs, eight researchers, nine CNRS research directors, and 18 ITAs). This unit conducts research on marine organisms and ecosystems using descriptive, functional and evolutionary ecology approaches.

The three research axes of AD2M, *i.e.* the functioning of coastal ecosystems, the integrated coastal time series/observatories and the marine holobiont concept, are crucial issues in the context of environmental disturbance. The projects on these axes benefit from the staff's very diversified skills and of the outstanding scientific environment of the SBR. In addition, AD2M has relevant collaborations at the regional and European levels. The lab's resources appear to be significant and well balanced between teams, covering complementary disciplinary fields and contributing to the functioning of the SBR's platforms. The policy that AD2M has implemented for encouraging CNRS recruitment for postdocs hosted in the unit or for selected visitors represents a good initiative, even if it still does not seem to be fully effective. Regarding human resources management, AD2M brings support for continuing education, follows up career development, makes efforts for clarifying job descriptions and searches for optimal distribution of human resources among teams and between SBR platforms and AD2M teams, with a good management of risk prevention. The unit is also concerned with maintaining a good human atmosphere.

Regarding sustainability, the unit has an excellent strategy to reduce of energy waste and increase sample traceability.

In terms of attractiveness and scientific production, the unit AD2M meets clearly the main criteria. It has acquired a qualitatively and quantitatively excellent scientific publication record with over 450 items. Around 40% of production is driven by the unit, the rest being collaborative. Many articles are published in high-level specialist journals (for example 16 articles in ISME J). Several articles have appeared in leading biology journals (e.g. three Cell (in collaboration), eight Nature Ecol Evol, one Nature Microbiol, eight Nature Comms, three Ecol Lett, two Curr Biol, four eLIFE and four PLoS Biol) and some in renowned multidisciplinary journals (two Science, three Sci Adv, five PNAS, Boosting its attractivity AD2M displays a large diversity of skills, the access to performant equipments and frequent success in competitive calls for projects.

The AD2M teams communicate frequently their research results in congresses, often upon invitation. It is committed to consolidate open access practices, including data and protocol accessibility, and maintains several curated databases for the scientific community. Finally, the unit is heavily involved in raising awareness among the general public, with many non-academic interactions that have visibility in major national media.

In conclusion, AD2M is an excellent highly dynamic and successful unit, with large international projection. The committee is highly pleased to see this quality level and encourages every effort of the supervising bodies to sustain it.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Regarding scientific production and activities, recommendations from the previous committee were to maintain the high scientific output and expand work into genetic model systems and functional analyses to test hypotheses about adaptation. The AD2M unit has maintained, and even slightly increased, its number of publications (from 420 to 468). Some advances in using functional analyses have been reached, with the introduction of CRISPR-CAS9 technologies and functional genomics analyses of photosynthesis processes in cyanobacteria models, but, according to the unit, the overall focus of the research activities on non-model species with important ecological roles still precludes the development of functional approaches.

As recommended, the unit increased its PhD supervising potential with four members obtaining their HDR during the period.

In response to the recommendation to improve support to foreign PhDs and postdocs for administrative duties upon arrival and to search for opportunities for them to have teaching experience, the unit has only partly adapted its practice by encouraging seminars given in English, but relies on the SBR for administrative support and has not taken into account the suggestion for teaching experience of foreign PhDs.

In response to the recommendation to ensure that big data and bioinformatic needs are filled by future staff hires, the unit obtained a CNRS recruitment for a bioinformatic engineer that interacts with most scientists of the unit and provides some training upon request.

Regarding scientific strategy, the committee recommended to explore opportunities for better integrating the chemical oceanography work with other research activities on biological models. In response to this recommendation, the unit directed some of its incentive funds for initiatives to integrate chemical oceanography and biology. Also, some oceanographic campaigns organized by the unit were directly associating observations in chemical oceanography with ecological and evolutionary studies.

B - EVALUATION AREAS

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

Assessment on the scientific objectives of the unit

Beyond the specific scientific priorities of the teams of AD2M, the three common research axes, *i.e.* the functioning of coastal ecosystems, the integrated coastal time series/observatories and the marine holobiont concept, are crucial issues in the context of environmental disturbance. Given the unit's expertise in these fields, the unique scientific environment of SBR and the many interactions AD2M has forged at regional and European levels, these scientific objectives are excellent.

Assessment on the unit's resources

The lab's resources appear to be adequate and well balanced between AD2M's teams, covering complementary disciplinary fields in order to achieve the scientific objectives and contributing to the functioning of the SBR's platforms. However, there are still some possible improvements towards a better transversality of the activities and fundings. Even though AD2M has implemented a policy for encouraging postdoc recruitment, the number of PhD students seems quite modest. Overall, the resources of the unit are assessed as being very good to excellent.

Assessment on the functioning of the unit

The human resources management of the unit is excellent, with strong support for career-long training, close follow-up of career development, efforts for clarifying job descriptions and search for optimal distribution of human resources among teams and between SBR platforms and AD2M teams. The management of risk prevention, including psychosocial-risks (RPS) is very good.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

Beyond the specific scientific priorities of the teams of AD2M, the three common research axes, *i.e.* the functioning of coastal ecosystems, the integrated coastal time series/observatories and the marine holobiont concept, are crucial issues in the context of environmental disturbance. Given the unit's expertise in these fields, the unique scientific environment of SBR and the many interactions AD2M has forged at regional and European levels, these scientific objectives are clearly achievable.

The fact that the unit has a high rate of success in obtaining grants (more than 1.5M€ per year on average) also testifies to the quality and feasibility of their projects.

Weaknesses and risks linked to the context

One focus of the unit is the investigation of the functioning of the marine costal ecosystem with respect to disturbances. Regarding the enormous and overwhelming amount of data that potentially could be collected to achieve this goal, efforts have to be taken both to store the data physically and in databases, and to develop software to curate and analyse the data, but also to make it publically available. A problem here is the limited human resources, as well as the unclear national strategy for regional data storage.

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

The AD2M unit encompasses various disciplinary fields and a wide range of subjects related to coastal oceanography, with complementarities between the members and teams of the AD2M unit and within the SBR, with a workforce of around 71 people, 40% of whom are full-time, and a balanced sex ratio. Excluding the payroll, research contracts account for more than 85% of the unit's financial resources, reflecting a very good dynamic and the success of several project proposals. Across all disciplines and tasks, the unit benefits from very good research support from its technical staff, who account for 28% of the unit's total workforce (2/3 of whom are permanent staff) and who have contributed to the setting up of the analytical platform bringing together technical and analytical skills. The unit ensured that PhD funding was allocated more evenly between the teams than simply on the basis of supervisory capacity (number of researchers or number of HDRs). The unit handles 1/3 of the recurring budget to promote cross-team incentive and collaborative actions to support joint master's internships and provide extra funding for post-docs. Although these actions have made it possible to reorganize the unit and encourage inter-team collaboration, it is still limited and more incentive actions are needed, such as setting up more inter-team projects, particularly for theses.

Weaknesses and risks linked to the context

The restructuring of the unit has reduced the number of teams from seven to three, and an effort has been made through more sharing, transversality and inter-team collaborative projects. However, this effort needs to be strengthened further to achieve the objectives of the five transversal thematic axes with joint projects and publications. Even if the number of PIs is similar between the teams (eight to ten PIs, but larger differences are expected in the project, with five to 12 PIs per team), the marked imbalance between CNRS and University staff (from 0% to 83% in future teams), as well as between HDRs (from 29% to 83% in future teams) could lead to an imbalance in terms of research contracts. The splitting of one team (DYDIV) into two (DISEEM & ECOPHY), although logical in view of the research themes, will accentuate the 'quantitative' imbalance between the teams, with one team consisting of five research professor PIs, while the others have seven, eight and twelve PIs, with a "full-time researcher" ratio of between 42% and 83%, resulting in a time devoted to research ranging from

2.5 PI ETP (ECOPHY) to five (EDYMAR), 6.5 (DISEEM) and 11 PI ETP (ECOMAP). Moreover, several members of the technical and PI staff are retiring and it will be difficult to maintain the equilibrium without recruitment and thus balancing the technical support by reallocating resources, diversifying and/or improving skills.

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 (40-45% of AD2M personnel trained each year), close follow-up of career development (10 out of 14 technical staff got a promotion during the period), efforts for clarifying job descriptions and search for optimal distribution of human resources among teams and between SBR platforms and AD2M teams, and yearly meetings of the technical staff with the management team.

The management of risk prevention is very good, with standard procedures including setup of training sessions for newcomers, but including in particular prevention of psychosocial-risks (RPS), with a global RPS evaluation performed in 2019 in collaboration with a dedicated cell at the SBR hosting structure, and an initiative to eliminate old stocks of chemical products.

With respect to sustainability, the unit has developed an excellent strategy to centralize and optimize cold storage facilities for samples, for reduction of energy waste and increase sample traceability (using Lab Collector LIMS software), and participates to the Lab 1.5 initiative for carbon footprint assessment as pilot lab, through dedicated staffs at SBR.

Weaknesses and risks linked to the context

The unit has a laboratory council that enables all staff to be represented and involved in the running of the laboratory. This council meets every three months. For day-to-day organisation and especially for coordination of activities when an agent works for several teams, it is not clear if a unique referent can help manage priorities.

PhD students suffer from the distance with Paris where they need to go for periodic training at SU which is not easy to organize and entails high costs.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The unit AD2M meets almost all the criteria of an excellent attractiveness. Its scientific production is qualitatively and quantitatively excellent, the staff has a large diversity of skills and has access to performant equipments. Its success in competitive calls for projects is remarkable. Last but not the least, the unit makes every possible effort to maintain a nice working atmosphere.

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

AD2M meets all the attractiveness criteria. The unit's scientific reputation is evidenced by the fairly high number of invitations to conferences (40 over the period) and by editorial responsibilities in five international journals. The unit has an active policy of attracting young scientists. Even though it did not succeed for hiring CNRS researchers during the period, the rate of success for post-doc, PhD and fixed term PIs was high (15 people), and they have set up an active policy to search for potential CNRS researcher candidates and invite them for seminars. As far as calls for projects are concerned, AD2M has been selected for 102 projects (75% as coordinator), contributing an average of more than €1.5 million per year.

The unit relies on technological platforms managed by the research federation FR2424, as part of the national infrastructure EMBRC involving a high number of AD2M staff in the functioning of this platform**.** Members of AD2M staff are largely involved in the functioning of this platform and contributes to research fund for equipment maintenance and upgrade requiring strong technical expertise.

The mutualization of resources from AD2M contributed to fund lab re-organization to better mutualize space and equipment, but also to improve health and safety procedures. It has been a major strategic action in the evolution of the unit.

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

The unit will experiment the retirement of several staff members highly qualified and involved in the functioning of platforms, which could lead to a loss of scientific and technical skills and overload of work for the remaining members.

Some work overload of technical staff may arise due to the large number of funded projects. The resulting risk would be a loss of involvement of technical staff and a loss of motivation, and therefore of innovation. The unit should continue to pay attention to the positioning of the ITAs on shared platforms of the FR2424 and/or between teams to maintain the existing equilibrium.

The international attractiveness through projects remains unevenly distributed among teams, as evidenced through the percentage of funding obtained from international projects during the period (from 22 to 232 k€/year in average, representing 11% to 67% of global funding).

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The scientific production of the AD2M unit is excellent, in terms of quality and quantity, and proportionally balanced across teams. This includes many research articles in good-to-excellent disciplinary journals, some in top-ranking multidisciplinary journals, as well as reviews and conceptual articles. AD2M teams are active in communicating their research in congresses, often upon invitation. The unit is committed to consolidate open access practices, including data and protocol accessibility, and maintains several curated databases for the scientific community.

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

The AD2M unit has an excellent record of publications for the period under evaluation, which is similar to the previous evaluation period, even slightly higher. This includes 468 items, mostly peer-reviewed articles (445, including some reviews and 20 conceptual papers), 9 books and 18 book chapters. Around 40% of published articles involved first or last authorship, ~30% involve PhD students and ~25% members of other SBR teams.
A considerable number of publications (98%) include external collaborators, showing the dynamism of the unit and its active role in the SBR networking at international level. Many of the articles are published in good-to-excellent disciplinary journals (e.g. 16 articles in ISME J), several in top-ranking biology journals (e.g. 3 Cell, 8 Nature Ecol Evol, one Nature Microbiol, eight Nature Comms, three Ecol Lett, two Curr Biol, four eLIFE, four PLoS Biol) and some in top multidisciplinary journals (two Science, three Sci Adv and five PNAS). The topics covered by published AD2M work on marine ecosystems are diverse and deal essentially with fundamental research on biogeochemistry and the ecology of coastal ecosystems, with a special focus in the cycling of climate-change active gases such as CO2 and CH4, plankton ecology both in coastal and pelagic ecosystems, the latter largely in connection with TARA, and speciation and species hybridization in model multicellular organisms, including from the deep-sea. Research was also communicated, albeit comparatively slightly less actively, via national and/or international conferences. Around 160 communications to congresses were done in the period under evaluation, of which roughly 25% were invited. Finally, the development, maintenance and update of expert-curated reference databases is another form of scientific production of broad long-term impact in the international scientific community. Several databases were created (e.g. metaPR2, CyanoRak) or received the contribution (e.g. UniEuk, EukRef) of AD2M members and are widely used.

The scientific production is excellent (~2.8 published articles per year and per PI – either researcher or teaching personnel) and exhibits a reasonable proportionality among teams. Thus, although ECOMAP performs better in terms of publications per permanent research staff member per year (4.4) and has approximately the double of publications (243) than DYDIV and EDYCO (respectively, 2.9 and 1.8 publications per permanent research staff member per year, and 116 and 103 publications), it has more permanent researchers and a higher proportion of CNRS personnel as compared to the two other teams. If technical personnel (IE, IR) and non-permanent members (postdocs, PhD students, technicians) are included, the number of publications per team member per year converge (1.1 EDYCO, 1.5 ECOMAP, 0.85 DYDIV).

AD2M has a strong commitment towards open access, fair and transparent accessibility of publications and underlying data. The unit encourages the submission of preprints in webservers such as bioRxiv. All scientific productions are freely available on "HAL Open Science" and, in addition, around 88% of the 441 scientific articles published during the evaluated period are freely available on the respective publishers' websites. AD2M has also an active policy encouraging the submission of protocols and raw data to open repositories and databases (e.g. protocols.io, GenBank, GitHub, InDores). Besides the benefit for the broader community, the involvement of several AD2M staff in open access policy at all levels including, notably, data and protocols (for instance, through incentive to share protocols through the protocols.io initiative), constitutes an added value and opportunity for know-how transfer and team cohesion. Finally, having a high reputation, curated reference databases and long-term monitoring, the expressed AD2M's wish to move to Diamond open access publication schemes seems feasible and commendable. This may result in keeping the recognition and the number of citations high while decreasing publication costs, with money reverting to research investment (rather than to increasingly greedy private editorial companies).

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

The AD2M unit has been able to keep its high-quality publication record stable over time. Given the high number of publications and the high reputation of the researchers involved, a higher proportion of truly outstanding articles might perhaps have been expected. Some of the articles published in high profile journals have many authors (over 40) and the AD2M researchers are not first or corresponding authors. Of the 445 articles, less than 41% were by a first author or corresponding author of AD2M. This means that nearly 60% of the articles resulted from collaborations. While this level of collaboration is good, keeping and/or enhancing the leadership of AD2M will be important.

Keeping the quantity of publications stable without diminishing, or even increasing, the quality is a challenge that will be important for the next five years, especially as many PIs will retire. Also, if the AD2M teams progress towards more diamond open-access publications, there is a risk to publish in journals with a priori less visibility. However, DORA-inspired, quality-based evaluation policies are being implemented and international recognition should come from the number of citations for specific works rather than generic journal metrics. Given that, among others, A2DM keeps a number of curated databases for the community, citations will be guaranteed. In addition, although AD2M' production is largely collaborative and this is a large benefit for all the parts, there is the associated risk of delegating the leadership to collaborative partners. AD2M teams should minimize the risk and try to maintain the leadership position stable over time.

Another important challenge of the AD2M unit will be to maintain the balance of publications across teams. There is already some imbalance among teams, partly explained by differences between teaching personnel and full researchers. The unit should develop strategies that prevent that imbalance to increase. Possibly, fomenting interactions between teams, and among PIs, may help to consolidate a research environment prone to high-quality scientific production.

The way to open science policy is still fragile and needs to be encouraged and consolidated. However, this needs to be carried out within reason and without falling in the trap of (pseudo)predatory journals, especially when those journals disregard the quality in favor of the quantity (and associated financial benefits). In this regard, pursuing the goal of increasing the diamond open access publications is commendable and will align with the objective to reduce the budget allocated to publications. Trying to diminish the number of publications in journals like Nature Communications, which assure the quality to the cost of excessive publication fees and, most especially, in journals often acceptable yet heterogenous and sometimes suboptimal quality standards (mdpi journals, Scientific Reports and the like), should be seriously considered. Favoring diamond access or society journals, which are scientist-for-scientist journals, should assure quality stability over time and some control upon the budget. In the long run, these types of publications may be more recognized and rewarding.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

Research activities have an excellent contribution to society, as the unit is heavily involved in raising awareness among the general public and non-academic interactions are highly positive and can be seen in the main national media, but the involvement of team members seems to be somewhat unbalanced. Also, the AD2M has the potential to increase and empower the interaction with the economic world.

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

The unit has established partnerships with socio-economic stakeholders and foundations (Gordon, Betty Moore, Tara, regional fisheries committee, etc.), representing 10% of funded projects. The AD2M is also involved in activities relating to the observation of marine biodiversity (metabarcoding), understanding the population dynamics of crustaceans of commercial interest, expert missions to assist decision-making, and projects relating to fisheries and aquaculture in collaboration with oyster breeding and reproduction companies. The unit has also been involved in the development of a patent on the use of antimicrobial agents derived from certain marine animals. Some members of the unit are actively involved in events dedicated to the general public, such as conferences for the general public (Espace des Sciences, Oceanopolis), "Fête de la Science", "Nuit Européenne des Chercheurs", the Brest International Maritime Festival and the "Year of Biology 2021-22-From the lab to the classroom" events, the development of educational tools on plankton using virtual reality (Planktomania initiative) and interviews in various written (*Science Ouest, La Recherche, Science et Avenir*) and audiovisual media (Arte, France Inter, France culture, etc.). Lab members have participated in the writing of the book on the history of the station Biologique and have contributed to online media such as "The Conversation" and YouTube videos and dissemination *via* social network. This demonstrates the excellent outreach activity of the lab and a very good interaction with the economic world.

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

The research unit AD2M has established partnerships with non-academic actors, but the effort appears not to be distributed evenly between teams and members of the laboratory. While partnerships with non-academic partners represents nearly 10% of the project funded, scientific works or PhD grants are hardly funded by non-academic or private partners.

The research fields developed in the laboratory are rather fundamental. But several topics also have close links with applied research (fisheries, shellfish and seaweed farming, genomics…), and developing or co-developing final products, either for making them freely available to the community of end-users, or even patenting should be considered as very significant objectives.

Even if communication with the general public and society seems important for the AD2M unit, this activity is unequally shared between the different teams and members. A further involvement of a larger number of members would make it possible to better distribute the tasks, thus reducing the effort linked to such an individual investment, which sometimes occurs outside of usual working hours. Moreover, highlighting and promoting projects *via* new digital means of communication (Website, social networks) could be considered more systematically.

ANALYSIS OF THE UNIT'S TRAJECTORY

The past and future unit's project is to understand the functioning and dynamics of the coastal marine eco-systems – and the socio-ecosystems/socio-economic/environmental systems that rely on them – to achieve a more comprehensive understanding of human-induced effects of ongoing changes. Even though no major change is proposed regarding the scientific topics, the unit's trajectory seems to have been carefully thought out, both scientifically and organizationally.

For the coming contract, the unit proposes to split the Dydiv team into two teams, DISEEM (Dispersion, Speciation, and Evolution of Marine species) and ECOPHY (Ecophysiology of Marine Invertebrates), thus defining specific areas of expertise: evolution and population genetics for DISEEM and physiology and adaptation for ECOPHY. The other teams, ECOMAP and EDYMAR (formerly EDYCO), are maintained, with their respective themes and disciplines: biology and dynamics of planktonic organisms for ECOMAP and response of marine biodiversity to the effects of anthropization for EDYMAR.

Anticipating a possible decrease in expertise and working forces in the coming years, the unit proposes various actions to attract and retain scientists (hiring, mobility, ERCs) and support emerging projects.

To encourage the synergies within and between the four teams, the unit has defined five cross-cutting thematic axes:

1- Comprehensive understanding of the evolution of marine life.

2- Biological interactions that shape the dynamics of ecosystems.

3- Physiological plasticity as a key factor for an organism's ability to respond to environmental stressors.

4- Differentiation and regulation at the tissue, cellular and subcellular levels.

5- Anthropization of marine ecosystems.

Regular events will be organized to discuss ongoing research and identify areas of collaborations. The unit identifies in particular three possible federative objectives: long-term observation series in connection with the OSU STAMAR and the local observation services (Research Infrastructure ILICO), multi-scale integration of ecological, evolutionary, physiological and biological approaches, and finally the development of expert databases.

Regarding the scientific policy, the unit commits to follow the FAIR principles, with the goal of promoting open science, collaboration and transparency, and supports the SBR participation to the national program "Labo 1.5".

As far as human resources are concerned, the unit plans to set up a "life committee" – made up of representatives of all categories of staff – to identify the needs and concerns of unit members with a view to improving the working environment and general well-being.

Finally, the unit does not remain in the ivory tower of fundamental research. Not only it communicates with the general public on various occasions ("Fête de la Science", "Nuit européenne des chercheurs", public conferences, partnership with Oceanopolis, etc.), but also It has clear connections with societal issues and practical applications in environmental and biodiversity management. Notably there is a partnership with the "Comité régional de la conchyliculture de Bretagne Nord", and several members of the unit have expertise activities and are involved in scientific councils related to the management of coastal ecosystems.

In conclusion, the committee considers that the unit's trajectory is coherent, with realistic objectives given the strengths and skills of the staff and the unit's exceptional scientific environment.

RECOMMENDATIONS TO THE UNIT

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

The unit has a clear profile with a focus on marine organisms and ecosystems using descriptive, functional and evolutionary ecology approaches. The three teams (EDYCO, DYDIV and ECOMAP) are very productive and each team has a clear focus. As the teams are large with respect to members, care should be taken to keep a clear focus within the teams, which requires regular definition of aims and the inherent structure of the teams.

Mutualization of part of the technical staff has proved highly successful. The versatility of the staff has been an important factor of success, but care must be taken to ensure that this does not lead to a reduction in their expertise in their field. Future contracts will have to ensure that sufficient engineers are recruited alongside PhDs and postdocs in order to optimize the workload of the permanent staff.

In order to sustain interactions between teams, whenever relevant, the unit could encourage new cross-functional projects, for example by using specific funding or considering transversality as a key parameter in grant application.

Recommendations regarding the Evaluation Area 2: Attractiveness

The committee encourages efforts to invite external researchers and attract new talents.

The unit should maintain ITA level of commitment and training to stay at the forefront of new technologies and maintain the level of excellence.

The unit could be more involved in the national committees/national bodies.

The unit should improve support for international students and postdocs, especially non-French speaking members, in terms of administrative issues at installation, and in terms of participation to scientific animation.

Recommendations regarding Evaluation Area 3: Scientific Production

The scientific production of AD2M is excellent, largely collaborative and relatively well-balanced between teams, despite differences in the number and type of permanent staff. This evaluation committee trusts AD2M will keep its publication record, recommends to favor quality over quantity standards, and encourages the expressed AD2M objective to move towards diamond open access journals and/or limit the budget allocated to publications in benefit of the research itself. The panel also recommends to encourage and maintain an active leadership in collaborative work. Finally, the maintenance of high-quality, curated, reference databases and associated resources (e.g. culture collections) is an invaluable resource for the scientific community that should be reinforced and/or exploited further.

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

AD2M has already a very good interactions with many socio-economic partners, foundations and companies. The committee encourages the unit to maintain these interactions and, potentially, diversify them (specific grants, Cifre fellowships, etc.).

Also, the committee encourages all the teams to continue sharing their knowledge actively with the general public and to ensure that participative science is being introduced whenever possible.

We also encourage them to continue efforts to work and develop projets with policy decision makers.

TEAM-BY-TEAM OR THEME ASSESSMENT

Team 1: EDYCO - Eco-geochemistry and DYnamics of COastal ecosystems

Name of the supervisors: Mr Pascal Riera and Mr Dominique Davoult

THEMES OF THE TEAM

The team EDYCO focus its work on two main connected themes: A) Diversity and functioning of coastal benthic ecosystems : (1) Functional diversity of benthic communities (2) Structural and functional properties of trophic networks and ecosystem production (3) impacts of global and local environmental changes on coastal ecosystems diversity and functioning (4) dynamics of marine and coastal ecosystems, due to global changes and impact on their ecosystem services; B) Climate-active gases and the effects of global changes on coastal ecosystems : (1) impacts of climate-active gas fluxes at the marine interfaces on the ocean's ability to store or emit greenhouse gases, (2) combined effects of ocean acidification, warming, and local impacts on benthic communities and biotic interactions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Based on the qualities of the workforce, the ratio of HDR diploma in the team remains quite low, with 3/8 in the present (April 2023) and 2/7 in the proposed (future) composition of the team, whereas this point was mentioned in the previous evaluation report as a way for the team to increase its PhD supervising capacity.

If the team is better involved in interactions with the society, through studies on ecosystem services, communication with the public and participation to committees with decision makers, the involvement remains unevenly distributed among members, and attracting funding from the private sector remains a challenge.

The previous scientific committee held in 2018 (period 2012-2017) pointed out the need for a better scientific integration between the two major themes (relic from the former CHIM & EFEB teams). Significant efforts were made on the form of the project (with four main axes) with more integrative words, topics and aims, but integrative research works resulting in common publications remain very scarce (only 9/93 of the production list can be considered as 'transversal' between the 'former teams' CHIM, EFEB and DIVCO, mainly through engineer and technician implication and are rather recent), so this aspect can still be largely improved.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	2
Maîtres de conférences et assimilés	3
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	**13**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	3
Sous-total personnels non permanents en activité	**4**
Total personnels	**17**

EVALUATION

Overall assessment of the team

Deeply implied in the structure of national 'research communities' the publication list clearly evidences a large implication in training through research, with a key role of PhD and Postdoc students. On the contrary, transversal studies (within the EDYCO team, between axes) remain relatively scarce, while synergies might be developed. Passing HDR diploma should be a priority, as well as keeping the overall manpower of the team throughout the retirements coming quite soon. Based on these elements, the assessment of the team is considered very good.

Strengths and possibilities linked to the context

The EDYCO team has strong national roots and high implications in the research topics developed, dealing with the diversity and functioning of (mainly benthic) coastal ecosystems and the effects of global changes on such ecosystems. Consequently, this team has a wide visibility in the corresponding national communities, by itself, but also through the overall and long-standing influence of the research teams from the Station Biologique de Roscoff. Consequently, the attractiveness of the team, based on its national recognition, corresponding equipment, technical and analytical support and expertise constitutes a very good basis for strengthening the team on cross-cutting topics, as was the case with the recent recruitment of an associate professor. Collaborative work with other teams of the Laboratory might also be a good opportunity to develop international networking (such as EMBRC networks) and projects and might help recruit foreign students (PhD or Post-Docs), by the way enhancing attractiveness at the international scale. Moreover, it is important to notice that the capacity of the team to raise external funds (4,8 M€ in total) is excelllent.

EDYCO's scientific production is very good, with 93 publications (1.93/y/researcher), with almost half as corresponding author, while a majority of the researchers of EDYCO is constituted with assistant professors or professors (5/8), hence dedicating part of their time to teaching and teaching organization. The quality of publications is evidenced by the standard journals used for publication (Mar. Ecol. Prog. Ser., Mar. Environ. Res., Limnol. Oceanogr., Front. Mar. Sci.), but several papers are also published in topmost journals (Nat. Comm., ISME Journal, Ecol. Monogr.). With The scientific production (as first author) of several PhD students during the period 2017-22 is high, with five out of seven students with three or more (up to six) peer-reviewed papers during this period. This evidences a high efficiency in PhD supervision (also evidenced for supervised postdocs), resulting in a high ratio of publications including the PhD students (38% of the papers involve PhD students). More generally, there is also a large proportion of publications with members of other teams from the Station Biologique de Roscoff (38% of the papers), which evidences the connections between the EDYCO team and other teams of SBR.

Inclusion in society is already evidenced through several research projects including the economical and societal aspects, implication in committees with decision-makers and policy-makers, communication towards the public. Hence, the team has the necessary links to become a major player in decision-making on a regional scale and to get larger financial supports in connection with the private sector.
Due to their research field, the future EDYMAR team should clearly benefit from the acquisition of a new isotopic mass spectrometer (platform Metabomer-FR2424), as well as the start of new transversal (EC2CO) or European (EMBRC) projects, that might also help building integrative studies.

Weaknesses and risks linked to the context

The team presents a little less publication (93 indexed papers & three book chapters) than during the previous evaluation, and we note that the permanent full professor implied (or co-implied) in the higher publication number during the period (28 peer reviewed articles or book chapters) at the scale of the team will not be member of the future team (retirement). Moreover, papers published in top-most journals are not as 1st author. Despite strong implication in national communities, further turning towards international funding might give an opportunity to integrate new networks for future projects. At the international scale, even if the team has organized a scientific workshop, one invited conference in St Brieuc, and recently two H2020 Post-Doc were funded or co-funded *via* EU Grant (Project IMACES under Marie Curie grant, Post-Doc via H2020MSCA cofund), international funding effort must be continued and improved to secure major funding. The size of the team has not changed since 2019 and the workforce will be expected to decrease in the coming years due to planned retirements. Also, the ratio of HDR diploma in the team is low, with 3/8 in the present (April 2023) and 2/7 in the future composition of the team, which compromises the supervision and research development capacities of the team.

Analysis of the team's trajectory

The recognition of EDYCO researchers at the regional or national scale is evident. Nevertheless, the opening towards international projects and funding might give a better recognition through international networks and give an opening to foreign students and young researchers (PhD, Postdoc) for the near future. These are key elements for attractiveness, but also participation to European or international networks, stirring committees and working groups, that constitute the keystone for future implication in large projects. The recent recruitment of an Assistant Professor demonstrates this trajectory that should be pursued in the team EDYMAR (CNRS candidates). Maybe the emerging thematic in relation with marine parasite ecology might help develop transversal projects between diversity/functioning of ecosystems and biogeochemical cycles subject to the impact of global and local changes. In the same way, the third axis created in the frame of the project of the team EDYMAR (namely: Impact of global and local changes on the functioning of the marine ecosystems and their services'), can and must be used as a mean of increasing collaborative studies within the team rather than dispersing onto a third front, while workforce might remain limited.

With the soon retirement of a full professor, the teaching activity for others teachers/researchers might be higher, while this part is already mentioned as largely time-consuming, and responsibilities listed in the project remain numerous. Concomitantly some permanent members of the EDYCO team are not present in the EDYMAR project. In this context, the percentage of time spent individually on support for the team EDYMAR is of course of prime importance, but is not mentioned in the project. Anyway, the overall capacity of the team to supervise (HDR...), and manage (technical and analytical support) research projects will be reduced in the near future, which accentuates the need for collaborative projects while taking care not to disperse activities and to take responsibilities (internal/external) in a balanced manner.

RECOMMENDATIONS TO THE TEAM

Several researchers of EDYCO/EDYMAR team clearly have enough seniority, international/national recognition, and have published enough works of high relevance, to pass their HDR diploma, so that the ratio of HDR/total workforce is not so low (29% in the proposed team), specifically in comparison with other proposed teams, for which the HDR/Total is between 75% and 83%. For the period 2017-2022, this point had limited influence on PhD grant attributions among the teams, but for the near future, such a difference might have an impact on PhD supervision possibilities. Favoring 'transversal' PhD attribution within the team, for instance integrating several of the 3-axis identified for the project of the EDYMAR team might help develop joint studies and temporary compensate the deficit in term of management. Although the overall publication number at the level of the team is quite high, this should not hide strong discrepancies between permanent staff members. Administrative responsibilities might also be better distributed between members of the team.

The team manage numerous high quality projects but it's not evident to identify clear research questions and common and well defined hypothesis that federate the team. Regarding the risks towards reducing capacity of the team (management and demography), we recommand to define common perspectives. Also, it is recommended that the team attempts to recruit additional researchers, and postdocs, to enhance its potential future sustainability. We recommend to increase interactions within the SBR and the unit in terms of publication and collaborative projects to support the team in view of future reductions in overall capacity.

Team 2: ECOMAP - ECOlogy of MArine Plankton

Name of the supervisors: Ms Laure Guillou and Mr Christian Jeanthon

THEMES OF THE TEAM

The ECOMAP team focused successfully on the characterization of the marine plankton diversity, ecology, and evolution, performing regular surveys of marine ecosystem diversity. ECOMAP particularly focuses on global and local community compositions as well as on specific species interactions, including symbioses. The latter area also includes taxonomic re-evaluations of host/symbiont systematics. A further aspect includes adaptations and acclimation of marine plankton species to diverse environmental conditions. The team is also involved in the management of the Roscoff Culture collection as well as in teaching marine biology in national and international programs.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The first recommendation by the previous evaluation committee was to incorporate research strategies that could more clearly link biological processes and ecosystem function with the massive production of sequence data. While some improvement has been made, for instance on specific adaptations by marine cyanobacteria or understanding particular symbiotic interactions, there is still some effort to do to improve the link between massive sequence data and biological/ecological processes.

The second recommendation was developing more physiological/biochemical/genetic approaches that would better allow understanding function. This could be done by reducing or rationalizing the number of model organisms under study to get deeper insights into their function. There has been some effort along this line, which is to be further encouraged. However, the team also focuses on large-scale plankton diversity and keeping a more global approach to whole communities and their variation over time is also of importance to tackle broad ecological aspects.

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	7
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	6
Sous-total personnels permanents en activité	**17**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	2
Doctorants	7
Sous-total personnels non permanents en activité	**9**
Total personnels	**26**

EVALUATION

Overall assessment of the team

ECOMAP is a highly successful, internationally recognized team. The team carries out high-quality research on marine plankton ecology and evolution, crucial topics in a changing world. Together with the team hosting policy and its active communication to scientific community and broader public, this makes the team very attractive. The team successfully attracts research funds and is committed to maintain the best quality standards, applying also fair and inclusiveness criteria. In conclusion, ECOMAP is an excellent team with some outstanding scientific results.

Strengths and possibilities linked to the context

ECOMAP is a key driver of the AD2M unit's success, having an excellent scientific production (268 publications; 24 publications per PI for the evaluation period) along three main axes: 1) structure and dynamics of plankton communities across spatial scales (notably through the emblematic TARA expeditions across the world's oceans) and temporal scales (specifically through the initiation of long-term monitoring off-shore Roscoff); 2) different aspects of symbiotic associations in planktonic species, from mutualistic symbioses (e.g. photosynthetic symbionts in Radiolaria), to parasitic interactions (e.g. alveolate parasites and viral infection in diverse microalgae); and 3) adaptation and acclimation of photosynthetic plankton, both prokaryotic (*Synechococcus* spp.) and eukaryotic (microalgae). In addition of publications in both specialized and general journals, the scientific production involves large-scale spatial (TARA) and long-term monitoring data in repositories as well as the development of expert databases. Very pertinently, the team is making efforts to integrate molecular to cellular to ecological processes, which has led to several outstanding results, such as the understanding of chromatic adaptation of marine picocyanobacteria in the world's ocean or of specific symbiotic interactions. Together with the Roscoff Culture Collection (marine protists, including microalgae, bacteria and viruses), they constitute unique services to the broader scientific community and open opportunities for national and international collaboration. The team has also an important involvement in teaching and outreach combining classical knowledge (morphological characterization, taxonomy) with online tools and even virtual reality approaches (e.g. Planktonmania).

ECOMAP is attractive for students and researchers at different stages of their career (young and senior researchers, foreign visitors). This is due to the relevance of the scientific questions, which are mostly open fundamental questions with potential impact for understanding and coping with a changing world, and the quality of the scientific production. The latter is proportionate to the research potential of the team and inclusive in terms of the type of personnel involved, which is another attractive factor. The research environment is favorable, with access to diverse equipment and expertise (including SBR platforms) and the team attracts considerable funding resources, national and European grants. The internal hosting plan is effective. The team is also actively involved in a diversity of tasks in addition to production, teaching and other dissemination modes that consolidate its reputation, including an important involvement in research administration tasks and expertise. The reputation is manifested and consolidated via numerous invitations to conferences, the organization of scientific meetings, editorial responsibilities and community service (expertise, evaluation committees, society memberships). Early career scientists from the team easily find their way in subsequent steps of their career.

ECOMAP plays also a role in societal aspects. In addition to dissemination and outreach activities, the team entertains partnership with non-academic, private sector partners, providing regular education courses as well as expertise and product oriented help to local economic and other societal activities (e.g. expertise, contribution to societal debates at local and national scales). These activities are opportunities to imprint knowledge-based decisions in the public sphere and positively influence local economic activities and societal exchange.

Weaknesses and risks linked to the context

The ECOMAP team is highly productive, focusing both on general aspects of biodiversity, but also specific model systems. A potential risk is the diversity of research themes at a time when several PIs will be retiring. It will be important that the team reinforces the investigation of functional aspects of species/community interactions, beyond a mere survey approach. Also, the curation of databases might be organized in a way that it does not prevent scientists from doing their actual research, perhaps exploring outsourcing of some tasks or internationalization to the broader scientific community. According to the self-assessment, the attractiveness for

students and postdocs is relatively limited, and strengthening the hosting policy to make it more inclusive, especially for foreign people, will be important.

Analysis of the team's trajectory

The team ECOMAP emerged from the reorganization of three previous groups in the AD2M unit with convergent scientific questions related to the structure, dynamics and evolution of marine plankton. The team has been led by Christian Jeanthon and Laure Guillou during the evaluation period. The team leads a coherent research on these topics and is reinforcing research axes on microbial symbioses and the acclimation and adaptation of marine plankton. The trajectory of the team will be maintained during the next evaluation period. The team direction will rotate, with three new leaders (Anne-Claire Baudoux, Aurélie Chambouvet and Laurence Garczarek).

RECOMMENDATIONS TO THE TEAM

The evaluation committee recommends to maintain and, whenever possible, reinforce the active dynamics of the team, based on high-quality research, open communication to the scientific community and society, and fair and inclusive practices. Beyond global data collection, the committee recommends to pursue ongoing efforts to characterize in more depth the biology, ecology, and function of specific taxa, for instance on specific plankton symbioses (e.g. radiolaria/dinoflagellates). Massive data production should not be an objective *per se* but a means to answer specific questions, for instance about ecological dynamics and/or to identify more functional aspects of the marine ecosystems that can be subsequently characterized.

The committee also recommends to reinforce the maintenance, visibility and durability of expert databases and the culture collection. The importance of this type of resources should be a strong argument to highlight, both as a benefit for the community (a production itself) and to attract funding (and eventually personnel). Given the quality of the team, a more sustained effort to attract European funding should be pursued.

Team 3: DYDIV - DYnamics of the marine DIVersity

Name of the supervisor: Mr Thomas Broquet and Mr Didier Jollivet

THEMES OF THE TEAM

The general theme of the team is the ecological and evolutionary processes that influence the way marine species settle, spread and evolve in a given marine environment. The questions addressed deal with larval dispersal/meroplankton, population connectivity, adaptation to temperature, symbioses and speciation. The approaches rely in particular on environmental (eDNA, metabarcoding), functional (qPCR, transcriptomics) and population (ddRAD, WGS) genomics, with expected spin-offs in aquaculture/fisheries and pharmaceuticals. The assembly of several metazoan genomes (*e.g.* Ostrea edulis) and transcriptomes have been achieved, along with the analysis of genomic data to identify the connectivity and speciation patterns in the deep-sea/coastal fauna.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

- The committee recommends creating a higher level of integration within the team which may allow targeting more generalist journals.
Despite the recommendation, the team could not create the conditions for a higher integration between eco-evolutionary approaches and functional approaches led, respectively, by the two former teams.

- Young researchers have to pass the HDR diploma to maintain the supervising potential of the team.
Four members of the team obtained their HDR diploma during the period which is remarquable.

- The team is very good at applying a broad set of population tools to a variety of marine models to gain interesting broad insights but would benefit from focusing on a smaller number of high-impact systems that are better integrated to advance the field of evolution and biodiversity. A greater effort to conduct translational research and develop novel tools would also be of benefit.
The team has produced valuable resources for the aquaculture industry, such as a reference genomic assembly for the flat oyster and develops activities in partnership with the Centre de Conchiliculture Bretagne Nord. It has also obtained funds from the France Filières Pêche structure to study population dynamics off populations off commercial crustaceans (lobster, edible crab).

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

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	6
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	**17**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	3
Doctorants	2
Sous-total personnels non permanents en activité	**6**
Total personnels	**23**

EVALUATION

Overall assessment of the team

The team has performed very good to excellent research and produced original results on the evolutionary ecology of populations of marine organisms. The scientific production of the team is excellent quantitatively, but the proportion of publications led by members of the team in high visibility general or specialized journals and the degree is somewhat moderate. The team has been highly successful in obtaining research fundings and has attracted 11 PhD students and seven postdoctoral fellows with high contribution to the scientific production of the team.

Strengths and possibilities linked to the context

The unit produced original results on the evolutionary ecology of populations of marine organisms. In particular the unit published (in the journal Evolutionary applications) a chromosome-level genome reference assembly of the flat oyster, *Ostrea edulis*, which paves the way for future basic research on oyster pathogens, but also for programs of genetic breeding in support of aquaculture and natural reef restoration.

The scientific production of the team is excellent quantitatively, with 120 publications (2.85/ETP/year), while a majority of the permanent researchers of DYDIV is constituted with assistant professors or professors (7/10). The scientific production of several PhD students during the period 2017-22 is high, with seven out of 11 students with three or more peer-reviewed papers during this period. This evidences a good efficiency in PhD supervision resulting in a high ratio of publications including the PhD students (25,8% of the papers involve PhD students).

The success of the team to acquire research funds is excellent with a total amount of 2,05 M€ raised from international funds (e.g. one H2020 iAtlantic program on biodiversity of deep-sea vent and seep faunaa in the Northern Atlantic, and two European Maritime and Fisheries Fund projects, PERLE2 and ARCHE, on oyster aquaculture), national funds (three ANR projects, only one being led by members of the unit, corresponding to a young researcher ANR fund), and many regional funds (e.g. Région Bretagne which funded six PhD projects and 2 research projects under the call for Sustainable Attractiveness Strategy). This allowed the unit to host seven postdocs during the period, which is outstanding in the French research environment, and is a strong point for the attractiveness of the team in terms of CNRS applications for permanent research positions. These projects were also successful for generating a large amount of biological and molecular resources on deep sea organisms of the Pacific and Atlantic oceans, which will be exploited during the next contract to infer patterns of dispersal and of adaptation.

Weaknesses and risks linked to the context

In terms of visibility of the scientific output, the unit produced few publications in generalist journals with high audience (two articles in Science and one article in Nature Communications, but none of them with members of the team as first or last authors), and moderate production in specialist journals with high visibility (Ecology Letters x1, Evolutionary applications x6, Mobile DNA x1, Molecular Ecology x3, Nature Ecology and Evolution x1, Science of the Total Environment x3, Philosophical Transactions of Royal Society London B x2, with low rate of articles with first or last authorship, eight over 17).

Despite the excellent success in project calls, the major international fundings rely on a small number of researchers.

The fusion of two teams that gave birth to Dydiv team did not result in a thematic and strategic merger.

Analysis of the team's trajectory

Based on the observation that the fusion of two previous teams did not lead to synergistic interactions, and very low cross-publications, it has been proposed to split again the team in two, while also hosting (within the proposed team DiSEEM - Dispersion, Spéciation et Évolution des Espèces Marines) the members of the International Research Unit (IRL 3614), Evolutionary and Ecology of Algae (EBEA) which closes in December 2023. The DiSEEM team will apply evolutionary and population genomic approaches to the study of evolution of dispersal and reproductive systems, of sex chromosomes, and adaptation and speciation processes in different marine organisms. The ECOPHY team, Ecophysiology of Marine Invertebrates, will use functional genomic approaches to investigate adaptation to environmental change, in relation to abiotic or biotic factors.

The strategy is evaluated by the committee as excellent, although the working forces between the two teams will be heterogenous as all CNRS researchers will be present in team DiSEEM.

RECOMMENDATIONS TO THE TEAM

The team saw the departure of two CNRS researchers and two SU academics during the period but we note that this departure will be compensated by the arrival of three colleagues and that two CNRS candidates have been identified. We recommend that both new teams continue their efforts to secure and then increase its workforce.

We also encourage all members to increase their lead in term of scientific production and of major grant applications.

CONDUCT OF THE INTERVIEWS

Dates

Start: 30 novembre 2023 à 08h30

End: 01 décembre 2023 à 18h00

Interview conducted: on-site

INTERVIEW SCHEDULE

Thursday November 30th

08h45 – 09h00	Foreword and presentation of the Hcéres panel and procedures
09h00 – 10h00	Self-assessment of the AD2M research unit
10h00 – 10h30	Trajectory of the AD2M research unit
10h30 – 11h00	Coffee break
11h00 – 12h00	Self-assessment, highlights of the EDYCO team
12h00 – 12h30	Trajectory of the EDYMAR team (Pascal Riera & Cédric Boulart)
12h30 – 13h30	Lunch
13h30 – 15h30	Self-assessment, highlights of the DYDIV team Self-assessment, highlights of the EBEA IRL (partly online) Trajectory of the DiSEEM team Trajectory of the ECOPHY team
15h30 – 16h00	Coffee break
16h00 – 17h00	Self-assessment, highlights of the ECOMAP team
17h00 – 17h30	Trajectory of the ECOMAP team
17h00 – 19h00	Hcéres Panel closed meeting

Friday December 1st

08h30 – 9h00	Meeting of the committee with technical and administrative staff (in French).
09h00 - 09h30	Meeting of the committee with PhDs and postdocs
09h30 – 10h15	Meeting of the committee with teaching and research staff
10h15 – 10h45	Meeting with the institutions (Sorbonne University & CNRS) (partly online)
10h45 – 11h15	Coffee break
11h15 – 12h00	Meeting of the committee with the head of the research unit
12h00 – 13h30	Lunch
13h30 - 15h30	Final drafting of the Hcéres report (Hcéres closed meeting)
15h30 - 16h00	Coffee break
16h00 - 18h00	Final drafting of the Hcéres report (Hcéres closed meeting)

PARTICULAR POINT TO BE MENTIONED

All meetings and discussions were on site except for the funding bodies meeting and the introduction to the EBEA presentation which were partly online.

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 8 janvier 2024

Objet : Rapport d'évaluation AD2M - Adaptation et diversité en milieu marin

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 « AD2M ».

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

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