

EVALUATION REPORT OF THE UNIT
LBDV - Laboratoire de Biologie du
développement de Villefranche-sur-Mer

UNDER THE SUPERVISION OF THE
FOLLOWING ESTABLISHMENTS AND
ORGANISMS:

Sorbonne Université – Sorbonne U,
Centre national de la recherche scientifique -
CNRS

EVALUATION CAMPAIGN 2023-2024
GROUP D

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In the name of the expert committee :

Juliette Azimzadeh, Chairwoman of the committee

For the Hcéres :

Stéphane Le Bouler, acting president

Pursuant to 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:

Ms Juliette Azimzadeh, Institut Jacques Monod, Paris

Experts:

Ms Silvia Fre, Institut Curie, Paris (representative of CoNRS)

Mr Grigory Genikhovich, University of Vienna, Vienna

Mr James Hombría Castelli-Gair, Higher Council for Scientific Research - CABD, Sevilla

Mr Abderrahman Khila, CNRS - Centre national de la recherche scientifique, Lyon

Ms Emmanuelle Renard, Aix-Marseille Université - AMU, Marseille

Mr Renaud Vincentelli, CNRS, Marseille (representative of supporting personnel)

HCÉRES REPRESENTATIVE

Mr Yacine Graba

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Patrick Blader, CNRS

Ms Stéphanie Miserey, CNRS

Mr Dominique Pateron, Sorbonne Université

Mr Stéphane Regnier, Sorbonne Université

CHARACTERISATION OF THE UNIT

- Name: Developmental Biology Laboratory of Villefranche-sur-Mer
- Acronym: LBDV
- Label and number: UMR 7009
- Number of teams: 7
- Composition of the executive team: Mr. Alex McDougall

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement

SVE3 Molécules du vivant, biologie intégrative (des gènes et génomes aux systèmes), biologie cellulaire et du développement pour la science animale

THEMES OF THE UNIT

The UMR 7009/Laboratoire de Biologie du Développement de Villefranche (LBDV) is dedicated to developmental biology, evo-devo and embryo cell biology of marine invertebrate organisms.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

LBDV is an UMR co-supervised by CNRS and Sorbonne Université (SU). LBDV is located in Villefranche-sur-Mer within the Institut de la mer de Villefranche (Imev), which besides LBDV hosts another UMR (LOV, Laboratoire d'Océanographie de Villefranche) as well as technological platforms. The unit's seven teams are located on the same site, but in two different buildings.

RESEARCH ENVIRONMENT OF THE UNIT

The LBDV is one of the two research units of Imev, a CNRS research federation (FR3761) created in 2019 and affiliated with CNRS Biology (INSB), CNRS Terre&Univers (INSU) and CNRS Ecologie&Environnement (INEE). Imev is itself a member of the National Marine Biological Resource Centre (EMBRC-France), a national infrastructure integrating the three marine stations operated by SU and the CNRS. LBDV greatly benefits from the Imev infrastructure, in particular its technological platforms. Three of these platforms were first developed within the unit and continue to be highly used by its members: the imaging platform (PIM, led by a member of the unit), the molecular biology platform (BioMol) and the aquarium.

The unit is associated with two PIA funded Equipex awards, AO-EMBRC (for the development of augmented observatories at the three SU/CNRS marine stations within EMBRC-Fr) and MuDiS4LSI (*Projet d'espaces numériques mutualisés pour les sciences du vivant*). The unit is part of the ATLASea PEPR (*Projets et Équipements Prioritaires de Recherche*) steered by CNRS and CEA, which aims to sequence the genomes of thousands of marine species. LBDV is also part of the OSU (*Observatoire des Sciences de l'Univers*) Stamar jointly supervised by SU and CNRS and that brings together the research structures housed in the three SU/CNRS marine stations. Finally, the PIM imaging facility is part of the Mica (*Microscopie Imagerie Cytométrie d'Azur*) multisite platform, which is IBISA-labelled and co-supervised with the Université Côte d'Azur (UCA).

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

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	2
Directeurs de recherche et assimilés	7
Chargés de recherche et assimilés	8
Personnels d'appui à la recherche	18
Sous-total personnels permanents en activité	36
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	11
Sous-total personnels non permanents en activité	12
Total personnels	48

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	15	14
SORBONNE UNIVERSITÉ	3	0	3
AUTRES	0	0	1
Total personnels	3	15	18

GLOBAL ASSESSMENT

As part of a marine station with a long and rich history, the Laboratory of Developmental Biology of Villefranche-sur-Mer (LBDV) occupies a distinctive position in the French biology research landscape. The research carried out nowadays continues the tradition of exploring poorly characterised marine species, using state-of-the-art imaging, genomics and transcriptomics methods and functional approaches when possible. Over the past term, the unit has continued to develop its scientific project, focusing mainly on developmental biology, cell biology and evo-devo, using marine invertebrates as model organisms. This defines well focused and excellent scientific objectives. The unit's scientific cohesion is evident from the numerous interactions between teams.

The unit's resources are very good to excellent. Recurrent funding from the CNRS and SU average 175k€/year, excluding permanent staff salaries and exceptional credits. The teams have succeeded in funding their work through competitive national and international calls for projects in an excellent manner (1 ANR [9 coordinated], 1 HFSP, 1 Feder and 1 ITN) with a constant and important increase, raising the annual budget of the unit from 900 k€ in 2017 to 2.3 M€ in 2022. Furthermore, the involvement of the unit's members, in particular the current and previous directors, directly and via the research federation, in the setting up and implementation of EMBR-Fr, has provided a tremendous opportunity to upgrade its infrastructure and acquire new state-of-the-art equipment. The unit benefits greatly from the platforms it has set up and which are now administered by the Imev, in particular the imaging platform which is crucial to the unit. Human resources are declining, especially with respect to permanent support personnel, but for the time being remains at a level broadly in line with the previous mandate. The proportion of research professors remains low (1 MCF and 1 Ater). The unit's main and major problem remains the state of its infrastructure. SU has made considerable financial efforts over recent years, which together with funding obtained by EMBR-Fr has enabled the construction of new buildings for the future Aquagen aquarium and for hosting visitors, and the renovation of several buildings,

including those housing the LBDV. However, this work has taken a long time and has had a major impact on the activity of the teams, three of whom have had to move and are now housed in the premises of other teams. In addition, the aquarium in the Galériens building is decrepit, and the funds required for its renovation, in the order of five million euros, have yet to be secured.

The unit's functioning is excellent. All staff members are generally very satisfied with working conditions in terms of human relations, supervision and career advancement. The only downside is the state of infrastructure and the impact of renovation work on working conditions.

LBDV's attractiveness and visibility is excellent. The unit benefits from an excellent visibility thanks to the quality of its work, from the development of original marine models, some of which have been adopted by laboratories around the world, and from its long-standing involvement in welcoming and training scientists and students in the study of marine invertebrates. The unit regularly attracts foreign students (21 PhDs including 9 from abroad) as well as a number of visiting scientists. Members of the unit develop numerous collaborations, many of them international, and are regularly invited to (88 meeting invitations including to prestigious Gordon, EMBO and Woods Hole) or organise (15 and including Conferences Jacques Monod and Woods Hole) national international conferences. Unit members largely participate to institutional steering bodies (ITMA, CoNRS, Institut Jacques Monod SAB, European MSCA panel) and have received national (Cristal collectif CNRS) or international recognition (EMBO member election). Attractiveness for postdoctoral students has been low (5) and the unit did not succeed in recruiting a new team during the mandate.

The LBDV's scientific output is very good to excellent, and has been maintained compared with the previous mandate, in line with the achievements of the previous period. A total of 87 scientific articles and 24 reviews or book chapters were published, including as lead authors in high-profile journals (Science advances, Nature Ecology & Evolution, Elife, Nature Communications, Developmental Cell, Plos Biology, Development, Development Biology...). A major contribution during the mandate, in line with the mission of marine stations imbedded units, has been the development of technologies (culture, transgenesis, gene inactivation strategies) and resources (genome sequencing and annotation) for the new marine model organism *Clytia haemispherica* (Nature Ecology & Evolution, Science Advances, PLoS Biology), largely promoting the emergence of a novel research community focusing on *Clytia*-based research. Another strong contribution was to link cell geometry to cellular behaviour including unequal cell division and transcriptional responses (Elife, Developmental Cell).

Finally, involvement in non-academic activities is excellent, particularly in terms of interaction with the general public, with all teams participating in numerous outreach initiatives. Actions included TV and radio broadcasts, press release, organisation or participation to multiple events: Imev's 'Adopt a float' program, Fête de la science, Pint of science, Café des Sciences Côte d'Azur, Journées Santé-Environnement, World Ocean Day, artist-in-residence and exhibition at the Bassin des Lumières museum in Bordeaux.

DETAILED EVALUATION OF THE UNIT

A – CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Previous recommendations are highlighted in italics.

—*Organise a collective reflection on how to publish in journals with the broadest audience to increase visibility and their chances of securing external funding.*

The members of the unit have engaged in this reflection and succeeded in obtaining external funding during the past contract.

—*Hire a public relations person to disseminate their research to the general public and attract more prospective PhD students.*

Such recruitment has not been possible given the limited possibilities of obtaining CNRS or SU positions.

—*Move the issue of the aquarium renovation forward.*

A new seawater pumping system has been installed to improve the performance of the aquarium. Apart from this, renovation of the building has not yet begun, as the necessary funds (around 5 million euros) have not been raised. A request for funding via the CPER 21–27 (Contrat Plan Etat-Régions) was made but was unsuccessful. A new application under the fourth PIA (Plan d'Investissement d'Avenir) is currently being evaluated.

—*Constitute a Scientific Advisory Board.*

A SAB was formed with the members from Crick Institute, London, UK, Uconn Medical School, USA, Univ. Oxford, UK and ENS, Paris. The first meeting had to be delayed because of Covid but was finally held in March 2023. The SAB report, which emphasises the quality of the research carried out at the LBDV, its important role in the development and promotion of marine invertebrate models, and the need to continue upgrading its infrastructure, is provided in the unit's portfolio.

B – EVALUATION AREAS

Considering the references defined in the unit's evaluation guidelines, the committee ensures that a distinction is made on the outstanding elements for strengths or weaknesses. Each point is documented by observable facts including the elements from the portfolio. The committee assesses if the unit's results are consistent with its activity profile.

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

Assessment on the scientific objectives of the unit

The unit's scientific objectives are excellent. These are centred on the study of development from an evolutionary perspective and using marine models, fully in line with the possibilities offered by the site and the expertise of the unit's members.

Assessment on the unit's resources

Overall, the unit's resources are very good to excellent. Financial resources are excellent, thanks to the success of the teams in obtaining funding and to the establishment of the EMBRC-Fr national infrastructure, to which LBDV members have largely contributed. This has enabled the imaging and molecular biology platforms to benefit from state-of-the-art equipment. The main weakness remains the state of the infrastructure which, despite the very substantial investments made by SU in recent years, still requires efforts that will be spread over several years, particularly for the old aquarium.

Assessment on the functioning of the unit

The unit's functioning is excellent. Staff are generally very satisfied with their working conditions, with the way their needs in terms of promotion and training are taken into account, and with the recognition of their work. The main drawback is linked to the state of the premises and their renovation, which has severely impacted their daily lives in recent years. Safety, environmental and data protection issues are adequately addressed.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

The LBDV's scientific policy is excellent. The unit's work focuses on the study of development in the context of evolution, using marine species as models, and combining cellular and molecular biology, genomics and bioinformatics approaches. One of the unit's strengths is the development of new models, some of which, such as the jellyfish *Clytia* and the ascidian *Phallusia*, are now used by groups at MIT, EMBL and MPI, among others. These objectives are perfectly in line with the potential offered by the Villefranche site, the expertise of its members and its historic missions. With the emergence of powerful new tools to accelerate the development of new models and the urgent need to better understand and protect marine biodiversity, the unit's objectives are more relevant than ever. Reflecting this, the projects developed within the unit also place increasing emphasis on ecology, developing in particular numerous interactions with the LOV (5 of the 7 LBDV teams collaborate with LOV teams).

Following the recommendation of the previous Hcéres committee, the unit has gathered leading scientists to constitute its SAB, whose first meeting took place virtually in March 2022. In its report, the SAB underlined the quality and originality of the research carried out at the LBDV, as well as the importance of the models developed. The SAB will be an important asset in continuing to develop the unit's scientific policy.

The unit's scientific strategy is adequately discussed at meetings held every four weeks between the unit director and the team leaders. Scientific exchanges with all the unit's members also take place during the unit's seminars. LBDV members also take part in meetings of a network that brings together SU's three marine stations and researchers from SU and the Muséum National d'Histoire Naturelle (Réseau André Picard).

Weaknesses and risks linked to the context

No real weakness identified.

2/ The unit has resources adapted to its activity profile and research environment, and makes use of them.

Strengths and possibilities linked to the context

The unit has demonstrated an excellent ability to mobilise its own financial resources over the period under review, to some 75% of its total budget. This increase has been particularly marked over the last 4 years, with the 2022 budget more than three times greater than the 2017 budget. These resources come from national funding (mainly ANR, with six ANR grants obtained since 2019, but also CNRS, SU, ARC, Cancéropôle and Département 06) and international funding (HFSP, ITN, Feder).

The LBDV also benefits strongly from its integration within the Imev, and from the Imev's integration into the EMBRC-France national infrastructure, to which LBDV members and in particular its last two directors have greatly contributed. The funding thus obtained has made it possible to undertake renovation work throughout the Villefranche site. EMBRC-France funding, supplemented by funding from the Provence-Alpes-Côte d'Azur region (obtained by the PIM platform) and LBDV teams, also enabled the recent purchase of a SPIM microscope.

Significant progress was made in terms of infrastructure during the evaluation period. A new seawater pumping system was installed to improve the performance of the aquariums. The building for the new Aquagen aquarium, which will house exogenous species and transgenic animals, was completed, as was a new building for visitor accommodation. Premises were renovated to create a new laboratory and a shared equipment laboratory, as well as a shared office for students. Renovation work has been undertaken to improve the quality of life and energy efficiency of all the premises.

Weaknesses and risks linked to the context

The unit's main problems are still linked to the state of its infrastructure. The aquarium requires complete renovation, for which funds have not yet been secured. Part of the sum required (around 5 million euros) has been requested under PIA4 (via EMBR-Fr), but the outcome is not yet known and the bulk of the budget will still have to be found. Furthermore, while the building to house the new Aquagen aquarium has been completed, the internal fittings (at a cost of around 800 K euros) have not yet been installed, so Aquagen will not be operational until 2024.

Renovation work on the laboratory buildings, while essential, is also having a very negative impact on work organisation, particularly in terms of space. Renovation work on the Jean Maetz building has forced 3 teams to relocate, and the reintegration of their premises is not yet in sight.

The unit's staff also deplore the lack of a quiet space in which to write. The library originally fulfilled this function, but is no longer accessible since the librarian's retirement, due to the presence of rare works which must first be secured.

In terms of human resources, the proportion of lecturers remains low, with one MCF and one Ater for fourteen CNRS researchers. This is all the more problematic given that the teaching load on site (as part of SU's BMC and BIP Master programs) must be fully covered by these two people, in addition to the 35% of their teaching time that they must do in Paris.

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

Strengths and possibilities linked to the context

The unit functions well and in a collegial atmosphere. Questions relating to laboratory organisation (equipment purchases, health and safety, budget, responsibilities within the unit) are discussed at the three general assembly meetings held each year. The agenda for these meetings is discussed in advance by the unit director individually with team leaders, researchers/lecturers, students/postdoctoral students/temporary staff and technical personnel. The head of the unit also meets every two weeks with the team leaders and the administrative manager to discuss unit issues and separately with the support personnel not affiliated to a team to ensure the transfer of relevant information.

A first doctoral day allowing students to present their work was recently organised, which will be repeated in the future. In addition, regular social events are organized for all members of the unit (monthly breakfast, annual event). Staff generally expressed satisfaction at working in the unit. The atmosphere and communication seem to be excellent. Overall, the personnel are very positive about the support they receive from team leaders and the unit director, whose availability was emphasised by all. Technical and administrative staff are in particular satisfied with the help they receive from the unit with requests for career advancement and training.

The unit is attentive to the issue of parity, which is generally very satisfactory.

Health and safety practices are also adequate. New members receive training from the health and safety officer and reminders are given to all unit members at general meetings.

Data is stored on dedicated servers managed by IT specialists in charge of bioinformatics. Computer security is also properly handled.

Renovation work on the buildings occupied by the unit has been carried out to increase energy efficiency.

A PCA (*Plan continuité d'activité*) was developed during the COVID pandemic.

Weaknesses and risks linked to the context

The main source of dissatisfaction for personnel is the state of the infrastructure. Firstly, because the renovation work is having a very negative impact on the overall quality of life at work. Also, the state of the aquarium building complicates their daily activities.

While CNRS support personnel are satisfied with their career advancement, this is not the case for SU personnel, for whom career development is very limited and, once outside the unit, takes place under conditions that appear to lack transparency.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The unit's attractiveness is very good to excellent. The LBDV enjoys excellent visibility thanks to its strong basic research and the development of original marine models, as illustrated by the regular participation of unit members in international conferences and scientific committees. The unit has demonstrated an excellent ability to raise funds, both through national and international calls and through its involvement in EMBRC-Fr. However, the work continues to be affected by delays in aquarium construction and renovation. The current state of the aquarium is also a major drawback for the recruitment of new teams in a context of international competition with better-endowed institutions.

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

The unit has an excellent scientific reputation, with numerous communications (88) in national and international conferences. Members of the unit contributed to the organisation of 10 national and international conferences (International Oocyte Meeting, International Tunicate Meeting, EvoCell Marie-Curie ITN workshop, Meeting of the European Society for Evolutionary Developmental Biology, Jacques Monod Conference" ..). LBDV members also hold positions of responsibility on various committees and scientific societies (ITMO 'Biology Cellulaire, Développement & Evolution'; CNRS section 22 ; SAB of the Institut Jacques Monod; Council and Executive Committee of the European Society for Evolutionary Developmental Biology; Fundação para a Ciência e a Tecnologia, Hcéres committee and International Call for Individual Support 'Stimulus of Scientific Employment'; European Marie Skłodowska-Curie Actions – MSCA – ; and scientific coordinator of EMBRC-Fr). Four members of the unit received awards or distinctions during this period (election as EMBO member in 2021; Cristal collectif from CNRS in 2020; City of Nice award in 2017, and departmental council's Santé call in 2017).

The unit has demonstrated an excellent capacity to mobilise financial resources, with an increase over the past 4 years (11 ANR grants including 6 obtained since 2019, and grants from HFSP, ITN, Feder, CNRS, SU, ARC, Cancéropôle, Département O6). In addition, members of the unit have been actively involved in the operating of the Imev and the EMBRC-Fr network, providing substantial resources for the renovation/construction of premises and the purchase of state-of-the-art equipment for the platforms. In return, the unit benefits greatly from this environment, and in particular from the PIM, Biomol and CRB platforms, despite the limited number of technical staff on these platforms and the problematic state of the aquarium.

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

The unit has not recruited any new teams due to an overall limited amount of space exacerbated by the renovation works. However, some spaces have now been renovated to enable the recruitment of a new team during the next contract. The state of the aquarium is, however, a hindrance to attracting potential new team leaders.

The unit is located far from its affiliated university, which complicates student recruitment. Interactions with the neighbouring UCA do exist, but are not always productive, in part because UCA's Master's courses are more focused on biomedical research. The distance from SU also poses a problem for PhD students who have to take compulsory courses in Paris.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The LBDV's scientific output is very good to excellent, and has been maintained compared with the previous mandate, in both quantity and quality. A total of 87 scientific articles and 24 reviews or book chapters were published, including as lead authors in high-profile journals such as Science Advances, Nature Ecology & Evolution, Elife, Nature Communications, Developmental Cell, Plos Biology, Development and Development Biology.

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 scientific output of the LBDV's groups is very good to excellent, in line with that of the previous term, with a total of 111 publications including 87 original research articles in peer-reviewed journals. Most of the groups have succeeded in publishing their results in top-level journals, including as senior authors (Science advances; Nature Ecol. Evol.; Elife x4; Nature Communications; Developmental Cell; Plos Biology; Development x2). The work is on the whole published in reliable peer-reviewed journals.

The scientific output is generally consistent across the different teams. PhD students and postdoctoral students sign publications as the first author, and staff scientists within teams publish as last or corresponding author. Technical staff are also included as authors in publications.

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

Some of the teams have encountered difficulties, either in terms of the number of publications or the visibility of the work. Given the originality of the LBDV's research, there is clearly still room for improvement in terms of publication impact. This is partly due to the fact that the techniques needed to carry out mechanistic studies are not always available for the emerging models developed in the unit.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The unit's contribution to society is excellent due to the numerous initiatives aimed at the general public and, to a lesser extent, at the socio-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

Interaction with the non-academic world is excellent. Members of the unit have made numerous appearances on television and have taken part in broadcasts or given interviews for radio and the press on several occasions (Houliston/Momose, Tiozzo, McDougall/Dumollard, Schubert/Croce teams). The various teams also took part in a large number of events aimed at the general public (Imev's 'Adopt a float' program, Fête de la science, Pint of science, Café des Sciences Côte d'Azur, Journées Santé-Environnement, World Ocean Day, Life through the looking glass virtual exhibition as part of ITN EvoCell, etc.). The Tiozzo team also hosted an artist-in-residence, and the McDougall/Dumollard team took part in an exhibition at the Bassin des Lumières museum in Bordeaux.

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

None identified.

ANALYSIS OF THE UNIT'S TRAJECTORY

The trajectory of the LBDV for the next contract is in line with the work carried out in previous years, which is fully consistent with the unit's past achievements, its resources and the expertise of its members. The project will continue to focus on the study of embryonic and non-embryonic development and associated cellular mechanisms through the lens of evolutionary biology and evo-devo. The development of marine 'non-model organisms' and corresponding approaches of transcriptomics, imaging and functional inactivation will continue to be a strong feature of the unit's activity. To this end, the unit will benefit from the new Aquagen aquarium, due to be operational in 2024, which will house both transgenic animals and non-native species. The unit will continue to develop international and national collaborations, including at local level (with LOV but also with institutes hosted by UCA such as IRCAN or IBV), which this committee can only encourage. The new infrastructure, including Aquagen and the new accommodation building, will be an asset for developing these collaborations.

The members of the LBDV will continue to contribute to the modernisation of infrastructure and the development of technological platforms through their participation in the management of the Imev and EMBRC-Fr. With the renovation work on the laboratory buildings nearing completion, and the Aquagen aquarium due to open in the near future, the main remaining project will be the renovation of the aquarium. For this, funding of 1.5 million euros has been requested under the 4th PIA (France 2030), which is currently being evaluated for a start in 2024. A further application will be made in 2024 under the Horizon Europe Infradev call. Substantial funds still have to be found as the total renovation of the aquarium is estimated to cost around five million euros. This work is of critical importance for the LBDV, as the current state of the infrastructure impacts its users and significantly affects the unit's attractiveness, particularly when it comes to recruiting junior teams. Also, Aquagen will have to be operational at the start of the renovation project, because the animals will have to be moved during the works.

Another major goal will be the recruitment and integration of a new team. A junior professor's chair was awarded to the LBDV in 2023 by the CNRS, but at the end of the selection process, the successful candidates all declined the offer in favour of other institutions. The quality of the institutions in question (e.g. Stanford University) shows that the LBDV has the potential to attract junior researchers with excellent profiles, but that it is disadvantaged by the difficulty of offering equivalent conditions, both in financial terms and in terms of infrastructure. This call will be renewed in 2024, and hopefully the experience gained from this first attempt will enable them to adapt the selection process to increase its chances of success.

The unit has lost one of its most dynamic researchers in 2022, but has hired a CNRS researcher in 2023. The challenge now will be to increase the number of research professors, which will also enable the teaching offer to be expanded at the Villefranche site. To this end, an Ater position has been obtained for 2022, with the aim of subsequently applying for an MCF position with the same profile. One very interesting avenue is an agreement to organise joint programs, on which SU and UCA are currently working. This could help strengthen the teaching staff and would facilitate work organisation for both lecturers and students.

The unit will also seek to replace the two PAR positions lost in 2022 and 2023 (one reconversion and one retirement).

RECOMMENDATIONS TO THE UNIT

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

Renovation of the aquarium is a priority for the next contract. The members of the LBDV have spared no effort during previous contracts to push this issue forward, and the committee can unfortunately advise them no better than to continue to invest in resolving this issue, which will depend primarily on the funds that can be obtained by the Imev from European/national/regional funding programs and supervising bodies.

With regard to the decline in support staff, the committee encourages the unit to request a replacement for the two positions lost. Unfortunately, however, this is a global trend, and in this respect the LBDV is rather less impacted than many other units. It will therefore be necessary to initiate a discussion within the unit on the strategy to be adopted if these positions are not replaced. In the event of the unit taking on the funding of these positions, a strategy for the pooling of financial resources by the teams should be considered.

Recommendations regarding the Evaluation Area 2: Attractiveness

Recruiting a new team will be one of the highlights of the next contract. The junior professor chair is a great opportunity, and hopefully the next call will be a success. However, in view of the international competition for the top candidates, it would be opportune to consider ways of making the offer more attractive through a contribution from the unit to the starting package. Here again, a financial contribution from the teams could be envisaged.

The renovation of the aquarium will also be a key factor in enhancing the LBDV's attractiveness.

Unit members will also be able to take advantage of the new accommodation building to organise courses along the lines of what is done at Woods Hole, which will enable it to raise its visibility even more – provided that the unit has sufficient access to such accommodation.

Recommendations regarding Evaluation Area 3: Scientific Production

There were some great successes in terms of publications during the previous term. And given the interest and originality of the models developed in the unit, there is clearly still room to increase the impact of this research. The development of tools for mechanistic studies on the models developed in the unit must continue to be a priority.

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

The unit must continue its excellent communication work with the general public and social-economic players.

TEAM-BY-TEAM OR THEME ASSESSMENT

Team 1: Cnidarian developmental mechanisms
 Name of the supervisor: Mrs. Evelyn Houliston/Mr. Tsuyoshi Momose

THEMES OF THE TEAM

The research in the Houliston/Momose team focuses on the analysis of the oocyte maturation, axial patterning and germ layer formation in the hydroid *Clytia hemisphaerica*. The team also ventures out into other topics such as medusa regeneration and DNA repair mechanisms. The team also expand the repertoire of the molecular instruments available for *Clytia* as well as of the genomic and transcriptomic resources.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous recommendations, it has been suggested that the team should attract more PhD students, foster its outreach activities, and not to dissipate efforts across various projects. The team acted upon the first two recommendations, but not on the third, proving that they were perfectly capable of following several unconnected lines of research while maintaining a very high standard in all of them.

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	0
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	5
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	1
Post-doctorants	1
Doctorants	2
Sous-total personnels non permanents en activité	5
Total personnels	10

EVALUATION

Overall assessment of the team

The output of the Houliston/Momose team during the evaluation period has been excellent to outstanding. They published several important methods papers, a genome, the transcriptomes of the medusa cell types, an excellent description of the embryology of *Clytia*, and more. Especially noteworthy is a series of papers dissecting the mechanism of light-dependent oocyte maturation and spawning in *Clytia*. The visibility of the team is outstanding, recognised as the leading *Clytia* lab in the world, and accepted as such among cnidarian developmental biologists.

Strengths and possibilities linked to the context

The visibility of the team is outstanding. The Houliston/Momose team is the leading *Clytia* lab in the world, and is universally accepted as such among cnidarian developmental biologists. Team members are regularly invited to national and international conferences (30), and have contributed to the organisation of five scientific meetings. The team secured high level of third-party funding including five ANR (3 coordinated), 1 DFG/ANR, 1 ITN and 1 Horizon 2020 contract. Scientific recognition is also attested by the election of E. Houliston as an EMBO member in 2021, and the writing of four review articles. Team members are also involved in institutional steering bodies (ITMO Biologie cellulaire, développement et évolution, CoNRS 22, Institut Jacques Monod SAB). The team's visibility translates in numerous national and international collaborations that resulted in >10 publications, among which an excellent publication in which GCaMP expressing transgenic *Clytia* jellyfish were used to analyse the role of the RF+ neurons in several behaviours.

The scientific production of the team is excellent to outstanding. The team publishes very well, with 22 original articles, half of them as leading authors including in high-profile journals (PLoS Biology, 2x ELife, Development). The work is traditionally of a very high quality, and their publication record clearly shows that they are highly attractive for international collaborators. In addition to their own expertise in molecular manipulation of *Clytia* development, they benefit from in-house collaboration with the Copley group, which enables bioinformatic studies to be carried out. Another strength is access to imaging, aquarial and molecular biology platforms. Once the new aquarium facility is finally fully operational, animal culture – especially of transgenic lines – will also be simplified.

The Leclère/Sinigaglia group, which established a holopelagic scyphozoan, *Pelagia noctiluca*, as a new Evo/Devo cnidarian model, and moved to the Banyuls-sur-Mer marine station, sprouted from the team.

Weaknesses and risks linked to the context

A significant fraction of the team's publications and several grants in the reported period were driven by Lucas Leclère, who has now established his own group in Banyuls-sur-Mer.

Another problem is the interruption of the collaboration with Dr. Yulia Kraus (Moscow State University), who was doing much of the morphology work for the Houliston/Momose team, especially at the electron microscopy level. Since the start of the Russo-Ukrainian war, this important collaboration is no longer possible.

Finally, the team's success depends directly on the technical state of the laboratories and, first and foremost, of the animal facilities. Delays with the renovation due to funding issues or other reasons may significantly complicate the team's progress.

Analysis of the team's trajectory

The team plans to follow three main research directions: i) analysis of oogenesis in *Clytia* (mechanisms of meiosis, generation of the oocyte polarity, etc.), ii) analysis of the larval settlement (using several cnidarians), and iii) analysis of the role of fluid dynamics in the morphogenesis of the *Clytia* polyp. Additionally, the team wants to determine whether or not the endodermal cells of the polyp contribute to the formation of the epidermis of the medusa subumbrella (i.e. potentially, 'cross the germ layer boundary'). Funding and personnel have been secured for the first three projects, while the last project still appears to be in the conceptualisation/pilot experiments stage. The description of how exactly the team wants to address their research questions (especially, in the fluid dynamics project) was not very detailed, and in their presentation during the on-site visit, the group leaders only had the time for the most general overview. Nevertheless, all projects are clearly interesting and worth investing into.

RECOMMENDATIONS TO THE TEAM

1. It is important that the team recruits a junior project leader level researcher with an independent research agenda to compensate for the departure of Lucas Leclère. In this respect, hiring Dr. Catriona Munro as a CNRS researcher is excellent news. It seems highly advisable that Dr Munro applies for her own grants and gets her own students to keep the research momentum in the group.

2. The fluid dynamics project appears to be the most unconventional for the team and may go beyond its area of expertise. It may be advisable that the team considers a collaboration with physicists specialising in fluid dynamics in order to achieve a more quantitative understanding of the role of forces generated by the peristaltic movements in the process of *Clytia* polyp morphogenesis.

Team 2: Ascidian Bio Cell
 Name of the supervisor: Mr. Alex McDougall/Mr. Remi Dumollard

THEMES OF THE TEAM

The team's historical theme is the study of the mechanisms underlying embryo morphogenesis in ascidians using quantitative live imaging. A second project has been initiated more recently, using similar approaches to develop ascidians and a bivalve as toxicological models to study the impact of endocrine disruptors on neurodevelopment.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous committee recommended that the transition from very good to excellent scientific production over the evaluation period be maintained, which has been done judging by the team's scientific production over the last evaluation period.

The committee also recommended that, despite the inherent difficulties, efforts should be made to attract more early-career researchers. Five doctoral students and two post-doctoral students (funded by ANR grants obtained by the team) were involved during the past period, which, given the local context and the size of the team, is fully satisfactory.

Finally, it was recommended that efforts should not be dispersed between relatively separate projects, and that the team leader should ensure that each project receives appropriate support. This recommendation was only partially followed, as a new project involving a second, distantly related model organisation was developed. It should be noted, however, that substantial funding has been secured to support both the historical research theme and the new project. In addition, the project diversification seems to have a positive impact on attracting funding and students.

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	2
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	1
Doctorants	3
Sous-total personnels non permanents en activité	4
Total personnels	8

EVALUATION

Overall assessment of the team

The scientific production of the team over the evaluation period is excellent to outstanding, with 21 original research papers including nine as senior authors. The attractiveness is excellent, with ample funding obtained via the ANR and other sources, including salary for two postdoctoral students over the evaluation period, five PhD students hired, and regular invitations to international conferences. The team's interaction with the non-academic environment is excellent, with significant involvement in events aimed at the general public and the economic and social sectors.

Strengths and possibilities linked to the context

The team's visibility and attractiveness is excellent, with two grants supported by ANR as coordinator obtained during the evaluation period, plus several additional grants. five PhD students and two postdoctoral students (funded by ANR grants to the team) were hired during this period. The team members also regularly participated to international conferences, with a total of thirteen oral communications and were involved in the organisation of three international meetings. Six reviews/book chapters were published and the team leader coordinates EMBRC-France.

The team has an excellent to outstanding scientific output over the past evaluation period, with 15 original research publications with members of the team as first or senior authors, including nine papers as senior authors (Nature communications 2017; Elife 2017, 2021; Reproduction 2017; Molecular Reproduction and Development 2019; Aquatic Toxicology 2019, 2021; Proceedings of the Royal Society B: Biological Sciences 2019; Genes 2020; iScience 2022). In addition, six collaborative papers were published. All three PhD students who defended over the reviewed period have first author publications (2 students with 2 or 3 published 1st author papers and 1 with a 1st author manuscript currently on Biorxiv). A postdoctoral student also left the lab with a 1st author paper. The team also developed the Toxicosis software for semi-automated quantitative analysis of ascidian larval phenotypes. In general, the team developed original models and established highly relevant tools and collaborations, particularly with physicists, and continuation of the two projects over the next term is already assured thanks to two recent ANR grants (one in 2022 and one in 2023) and the recruitment of two PhD students for the period 2022–2025.

The team has many non-academic interactions, with regular participation in events dedicated to biotechnology (Rencontre SU-L'Oréal, Journées Biotech marines SU, Frontiers in Marine Biotechnology in Oman) and events aimed at the general public (exhibition at the Bassin des lumières museum in Bordeaux, Fête de la science, Café des sciences) and other events (Journée Santé-Environnement, Institut de la transition environnementale de l'Alliance SU, journalism students).

Weaknesses and risks linked to the context

The introduction of a second model organism that is distantly related to ascidians risks diluting the team's capabilities.

Analysis of the team's trajectory

The trajectory proposed for the next term is consistent with the work previously developed by the team.

The first project will aim to elucidate the mechanisms underlying the invariant cleavage of ascidians by combining imaging, mechanical measurements and physical modelling. In particular, it will attempt to test the very interesting hypothesis of a link between invariant cleavage and the fact that an embryo is compact at the blastula stage, as is the case with ascidians. A PhD student (2022–2025) has already initiated this work, and a postdoctoral student is to be recruited. The model will also be tested in jellyfish, which unlike ascidians form a hollow blastula, as part of a collaboration. This is highly relevant from a scientific point of view and will also contribute to strengthening interactions within the unit.

The second project will aim to determine whether NR receptors are involved in the toxicity of endocrine disruptors in ascidians and Mediterranean mussels, in collaboration with a specialist in the evolution of NRs, and an expert in environmental toxicology. A postdoctoral student (previously a PhD student in the team) has already initiated this work, involving the characterisation of NR expression profiles at different stages of

development and transcriptomic analyses to identify associated gene networks. A PhD student will use these resources to study the development of the nervous system and the effects of endocrine disruptors.

RECOMMENDATIONS TO THE TEAM

The strategy of dealing with two projects in parallel seems to so far have had a positive impact in the attractiveness of the team for funding and students. The team nevertheless has to be careful to keep the appropriate equilibrium between diversity of projects and cohesiveness/consistency of the team. To do so studies on ascidian models should remain the priority. The (side) study of *Mytilus* should be the opportunity to strengthen internal collaborations with the Schubert/Croce team.

Team 3: Cell fate
 Name of the supervisor: Mr. Hitoyoshi Yasuo

THEMES OF THE TEAM

The team research is focused on understanding cell fate decisions in early embryonic development. Taking full advantage of well-documented cell lineages and the highly stereotypical nature of ascidian embryogenesis, the team addresses how cell lineage bifurcations take place in an *in vivo* multicellular context, in *Ciona intestinalis*. Projects focus on the control of cell fate at the origin of the notochord, the ventral part of the neural tube and the anterior endoderm, with studies centred on the role of cell-cell interactions, the signalling pathways involved and the transcriptional control underlying these decisions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendations from the previous report (in italics) have been addressed as follows:

a) Public engagement activities

This point has been addressed through the participation to the LBDV stands for the 'Fête de la Science' every year. Also, C. Hudson was featured by the CNRS in 2021: Les métiers de la science and H. Yasuo was interviewed in 2022 by Licence 3 students from the Université Côte d'Azur about: Work as a researcher and scientist. One roadblock to outreach activities could be linked to the fact that the two team research scientists are not native in French, impairing interactions with the general public.

b) No postdoctoral student in the lab

This point does not seem to have been addressed. It is unclear if the team has not succeeded in attracting and recruit a post-doc or if there was also a lack of willingness to hire and supervise young researchers (see also point below).

c) The team is small so there may not be enough critical mass for exchange of diverse ideas and methods of working.

The size of the team has been small since its creation (around 3–5 personnel). The team members pointed out that this organisation works well for them and allows the group leader to actively conduct experiments. However, the recruitment of one or two PhD as well as Master students (no Master 2 students have been trained in the past 5 years) should be encouraged, not only because it would stabilise the team and make it more dynamic, but also because training is one of scientists' important missions.

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

EVALUATION

Overall assessment of the team

The team's original experimental system and their main research focus on quantitative approaches to understand cell fate decisions are very interesting and cutting-edge, with very good visibility and very good to excellent scientific production. The team's involvement in research supervision, non-academic activities and outreach activities is limited. The workforce of the team is low.

Strengths and possibilities linked to the context

The team has a very good visibility and recognition in the field and has a strong capacity to lead cutting-edge projects, with two full-time tenured researchers (one of them being the team director) that have hands-on experimental activity and perform experiments themselves. Also, the IE has been working within the same team since 2011, so there is clearly a good work atmosphere, allowing efficient data production. The team has proven capable of obtaining grants from national agencies (1 ANR, 1 SU emergence grant and 1 PhD contract). The international visibility of the team is attested by numerous invitations to scientific meetings (8), and by the organisation of one scientific event in 2019: the International Tunicate Meeting at Imev, Villefranche-sur-Mer.

The team has a very good to excellent scientific production with a long-lasting and recognised expertise in deciphering cell fate decisions in ascidian embryogenesis. The work of their PhD student on quantitative measurements and modelling of ERK activation levels during lineage segregation, published in *Developmental Cell* in 2021, was featured in *Science* in the section 'In other journals'. The team has recently successfully implemented imaging-based quantitative approaches, expanding their expertise in embryology, molecular biology, and gene function studies. Collectively their work led to five team publications as first/last/corresponding co-authors, often published in high-profile journals, three reviews or book chapters and one collaborative research article. In addition, collaboration with an international team of theoretical physicists has been very productive (*PLoS Computational Biology* in 2023).

Weaknesses and risks linked to the context

The team has not been attractive for students or postdoctoral students. During the past five years they have supervised only one PhD student and no postdoctoral students, and the situation does not seem to be improved, since currently the team is still lacking early career researchers at all levels.

The team did not apply to or obtain European grants, which should be possible because of the international reputation of the team and the level of science they produce.

Although all axes developed by the team are productive, there is a risk to lose capacity of remaining at the cutting edge on each topic, given the small size of the team and the limited funding they dispose of.

There is little science popularisation/interaction with the general public, possibly due to the lack of native French speakers in the team.

Analysis of the team's trajectory

The team will further investigate the important fundamental question of how gradients of signals are translated by cells into binary fate choices, benefiting from the originality of their simple, in vivo, totally deterministic model. The project involves a collaboration with modelling experts that has already proven successful and resulted in two high-impact publications (*Developmental Cell*, 2021 and *Plos Computational Biology*, 2023). They also propose to establish a genetically amenable ascidian model, *Ascidiella aspersa*, in order to conduct quantitative gene enhancer analyses. For this project, collaborations are in place, and the creation of a new aquarium space (Aquagen) that will be dedicated specifically as a platform to host genetically modified marine invertebrates will be essential for this aspect of the team's projects.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team seek to increase its visibility by capitalising on their recent achievements to attract more funding and recruit more people. The committee believes that the excellent

output and the quantitative approaches as well as the new genetically amenable ascidian model that they are implementing, places the team in a good position to attract better funding, in spite of difficulties in the past. The team should thus apply to more national and European grants, by exploiting the implementation of the genetically amenable ascidian model *Ascidella aspersa* to generate new ERK sensors and mutants. In addition, the presence of two researchers in the team allows them to apply to the same call (i.e. ANR) with two projects.

The group is very small and needs to grow. It would benefit from recruitment of PhD students and postdoctoral students as a small team may not be sustainable in the face of competition by bigger labs. The team has established efficient collaborations, but new people are needed to bring in new skills and ways of thinking. It is recommended that they are more proactive in recruiting Master students, by submitting projects to different doctoral schools.

Notwithstanding its size, the team has performed well and is commendably efficient at converting its restricted financial and human means into a steady output of high-quality science. The existing collaborations are appropriate to approach the new image-based quantitative studies and to set up statistical frameworks to model the bimodal transcriptional output downstream of the graded ERK signal and they are highly encouraged. Likewise, the proposed direction of setting up *Ascidella aspersa* as an alternative genetically amenable ascidian model with transparent eggs is appropriate and endorsed by the committee.

Team 4: Evolution of Intercellular signalling in development

Name of the supervisor: Mr. Michael Schubert/Mrs. Jenifer Croce

THEMES OF THE TEAM

The Schubert/Croce team is interested in the development and evolution of the neural system in non-canonical organisms using models like the sea urchin *Paracentrotus lividus*, the cephalochordate *Branchiostoma lanceolatum*, and the annelid *Platynereis dumerilii*.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Previous recommendations were:

a- that the team concentrate in one topic that could be stronger for high impact publications.

The team has focused on the development and evolution of the central nervous system.

b- that the team leaders should make strong efforts to increase the size of the group and add bioinformatics expertise for high-throughput data analysis at the postdoctoral student level.

The team has not succeeded at recruiting an expert bioinformatician, and the group remains small.

c- to pursue ambitious funding applications.

The team has been able to obtain an ANR grant in the current period.

d- that the group should aim to complement their quantitatively strong output with high-profile publications that will raise the impact of the work.

The team has managed to publish a couple of high-impact publications, but their publishing strategy still relies more in quantity than quality. This may be due to their effort in developing technical resources in non-animal models.

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	0
Post-doctorants	2
Doctorants	0
Sous-total personnels non permanents en activité	0
Total personnels	5

EVALUATION

Overall assessment of the team

The team works on non-canonical model species, developing novel techniques and approaches for these organisms, which are of high interest to the evolutionary biology and developmental biology community. Despite the moderate impact of their publications, due to the highly specialised research of the team and the small community working on it, the scientific questions analysed are very relevant and interesting, resulting in a research output considered very good to excellent.

Strengths and possibilities linked to the context

The team visibility and attractiveness is excellent. The team was created in 2012 when Dr Schubert moved from IGFL (Lyon) to the LBDV where he merged with Dr Croce's team. They form a small team with broad common interests, composed of two co-PI and two PhD students, an Ater (a non-permanent lecturer position) working on the development of non-model organisms of high evolutionary interest due to their phylogenetic position. Team members contributed to several national and international conferences (10) and were involved in organising meetings (3). The team secured one ANR grant during the reporting period. The importance of the team's work to the specialised research community is reflected in the large number of collaborations the team has established with both French and international groups, resulting in collaborative publications, including in highly visible journals (Nature, PNAS), and by the attractiveness for many colleagues for short visits to their laboratory.

The scientific production of the team has been very good to excellent. The group makes an intense effort in developing specific protocols for the non-canonical organisms in which they work, including husbandry, RNA in situ protocols, high throughput sequencing, transcriptomics, and chromatin structure organisation. These works, although interesting, result in numerous publications (14 as leading authors) mostly in highly specialised journals and have a small impact due to the small size of the relevant community.

During the evaluated period, the team has analysed comparatively the juvenile nervous system of a sea urchin, a sea star and a sea cucumber and found they share the same neural organisation conformed by three main structures: a basiepidermal nerve plexus, five radial nerve cords connected by a circumoral nerve ring, and peripheral nerves innervating the appendages. The team also studied the cephalochordate *Branchiostoma lanceolatum* glial system and found cephalochordate glial lineages express genes typical of vertebrate astroglia and radial glia.

As part of an international collaboration led by one of the PIs, the team studied the role played in cephalochordates by the retinoic acid (RA) lipophilic signalling molecule. They found retinoic acid signalling is involved in the development of both the central and the peripheral nervous system, where it controls the activation of Hox 1 and Hox3. Their findings revealed an important role for retinoic acid signalling in regulating neurogenic niche activity in the larval peripheral nervous system, suggesting this represents a conserved feature of chordate embryonic and adult neural development.

Importantly, the team also analysed the function of RA signalling in non-chordates, focusing on an annelid. They found that retinoic acid controls the motor and interneuron development but does not affect the A-P spatial regulation of Hox genes, indicating RA regulation of Hox gene expression has been acquired in chordates.

Following the advice from the previous committee, the team has focused its research on the nervous system, which has allowed them to complement the high number of publications with some high-impact ones.

Weaknesses and risks linked to the context

The team is relatively small composed of two co-PIs and two PhD students, an Ater and a technician which will be retiring this year (2023). They may not be able to replace this person with a full time technician, and this will affect negatively the team's work in the future. While the team hosted a large number of Master 2 students (9), they only trained a limited number of PhD students (3) and postdoctoral students (1).

The team has a high number of publications (14 papers as first or senior author + 7 papers as collaborators + 7 reviews or book chapters) but most of the publications appear in highly specialised journals due to their descriptive or technical nature and only a few of them published in more general journals (one paper in Science Advances as leading authors and several as collaborators among many authors: Nature, PNAS). The funding levels are discrete, with a single ANR grant obtained in this period. A number of small grants seem to keep the laboratory's activity.

Analysis of the team's trajectory

The team wants to find out if centralised nervous systems arose independently in different animal phyla, or if they were an ancient character that regressed in some lineages. To that purpose they want to continue analysing the development of the neural system in non-classical models in which they have a unique expertise. They propose three lines of work: 1) To analyse the development of the nervous systems of specific key animals to add to what is already known about their adult anatomical structure; 2) To compare at the molecular level in distantly related animals if the genes involved in neurogenesis are conserved, as would be expected if there was a common origin; 3) To find the signalling pathways used during neurogenesis of distantly related animals. These three approaches will show if the process of neurogenesis are similar or have evolved independently. Their main focus on the evolution of the nervous system has the potential to increase the impact of their findings in these little studied species.

RECOMMENDATIONS TO THE TEAM

To attract more funding and make an effort to increase the impact of their publications to a wider scientific community, the team should focus their research on developmental and physiological questions that are relevant to the understanding of the evolution of global animal diversity. These aspects can also be very attractive to the public, increasing the focus on their field.

Team 5: Regeneration and pluripotency
 Name of the supervisor: Mr. Stefano Tiozzo

THEMES OF THE TEAM

The team focuses on the study of non-embryonic development and whole-body regeneration. Non-embryonic development represents a mode of asexual development found in tunicates (a branch of marine invertebrates). The team is also interested in studying the evolution of the mechanisms of non-embryonic development and explores this question through comparative methods involving different species.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendations from the previous report (in italics) have been addressed as follows:

a) Increase the number and impact of publications, attract more collaborators and grants.

In terms of publication, the team has addressed the issue by publishing thirteen articles where the team is leading or in collaboration. The recommendation of targeting higher impact has also partially been addressed as some papers are in good journals (Molecular Biology and Evolution, Proceedings of the Royal Society B: Biological Sciences, Developmental Biology) and others are in respectable journals. The team has also attracted national grants, some running until 2026

b) to attract a full-time researcher to the team.

This has been addressed with the team succeeding to attract permanent CNRS researcher and support staff. Also, the team has grown with the recruitment of two PhD students.

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	2
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	2
Doctorants	0
Sous-total personnels non permanents en activité	0
Total personnels	6

EVALUATION

Overall assessment of the team

The scientific production is very good to excellent. The number of papers produced is excellent, but there is room for increasing the publication impact. The team is working on improving this by optimising functional tools in their models. The funding situation of the team is also very good to excellent, as they have been able to attract national and international grants. The visibility/attractiveness of the team is excellent as they were able to attract permanent research staff and PhD students. The team contributes actively to outreach activities.

Strengths and possibilities linked to the context

The team has improved its visibility (more publications) and attractiveness (more collaborators, permanent and students). Two PhD students were hired and three CNRS staff (a researcher and two ITA) were attracted to the team. This is very good news for the team and will help increase productivity in the future. The researcher contributed to six publications and is a partner in a recent ANR grant. The team has also been able to attract funding from various sources, mostly nationally (2 ANR grants) and one grant from the Swiss Science Foundation. The team is well surrounded by collaborators, both national and international (India, Brazil, Switzerland...). Finally, members of the teams have been active in conferences locally and internationally (18), including meeting organisation (3). The visibility of the team, given these developments, is very good to excellent.

The scientific production of the team is very good to excellent. They published a total of thirteen research articles, nine as leading authors. The team's expertise in the non-canonical models they study is a strength. The integration of developmental biology with phylogeny and ecological studies is a very good development that is likely to increase the impact of the research conducted in the team. This has already yielded some results that can be seen in their recent papers. This said, the majority of the papers published are in specialised journals (EvoDevo, Frontiers, Journal of Experimental Zoology, etc.) making the production very good to excellent, but leaving room for improvement. The team is also active in writing review papers (4 reviews and book chapters), which is very good for their international visibility.

Weaknesses and risks linked to the context

The team seems to be expert in the lineages they study and the methods they employ. Although the team has been strengthened, there is still risk for dispersion as the topics are broad and the approaches diverse. The publications are good, but the team could take some occasional risk when appropriate and try to increase the impact of some projects.

Analysis of the team's trajectory

The team follows up on their projects studying non-embryonic development in tunicates. They are adding a comparative genomics angle along with a new eco-evo-devo angle focusing on salps. The latter is done in collaboration with a German team who has the ecology expertise. The proposed trajectory seems reasonable, although it may lead to some dispersal. The team leader seems to be aware of this risk. The presence of a CR, who leads the eco-evo-devo project, is a great plus.

RECOMMENDATIONS TO THE TEAM

The team is encouraged to continue its effort to attract collaborators through international postdoctoral fellowships, for example.

The impact of the papers could also be further improved, which could open more attractive international opportunities to the team.

Given the size of the team, caution should be taken not to disperse the effort too much. This is particularly important given the diversified approach the team is taking: multiple species of tunicates, development, evolution, ecology, comparative genomics etc.

It would be good for the CRCN to prepare the HDR and bring additional supervision help to the team.

Team 6: Genome and protein evolution in animals
 Name of the supervisor: Mr. Richard Copley

THEMES OF THE TEAM

The team research is divided into two complementary axes: 1) describing and understanding the diversification of developmental genes (e.g. transcription factors) in relation with the diversification of cell types and life cycles during the course of animal evolution, 2) studying the phylogenetic relationships between animal lineages (e.g. Xenacoelomorpha/Deuterostomia) to provide a solid evolutionary context to interpret anatomical evolution.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendations from the previous report (in italics) have been addressed as follows:

1- to revise the working strategy to put the team's own projects in the upfront.

The team takes advantage of active collaborations with (local and foreign) experimental biologists to study animal evolution using bioinformatic approaches. Collaborative work remains pivotal for the research activity of this team because among the nine articles produced during the period (1 review + 8 research articles) only two were led/co-led by the team leader, R. Copley.

Nevertheless we can note that the team leader is now co-leader (not only partner) of two (one European and one ANR) granted projects, this represents an obvious improvement compared to the previous period.

2- to increase the number and the impact of publications where the team takes the lead.

The number of papers led by the team leader remains low and the total number of articles has not increased, but the impact of the co-led publications appeared in highly regarded journals (Nature ecology & Evolution; Science Advances)

3- to attract researchers and postdoctoral students and be more involved in training highly qualified personnel

The number of supervised PhD has increased as recommended previously and thanks to his own ANR project the team leader managed to recruit engineers (CDD) to increase the workforce. The team failed to attract Master two students, postdoctoral students, or permanent researchers.

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	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	3
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	3
Doctorants	0
Sous-total personnels non permanents en activité	0
Total personnels	6

EVALUATION

Overall assessment of the team

Bioinformatic approaches are pivotal for developmental and evo-devo research, making the expertise of this team a strength for the unit. The overall quality of the research performed and of published papers is very good to excellent regarding the limited workforce of the team. The visibility is excellent, with funding resources from multiple national and international competitive grants and networking with several outstanding teams. Attracting and training students and young researchers would increase the dynamism of the team.

Strengths and possibilities linked to the context

The visibility of the team is excellent. The ongoing collaborations with internationally recognised local, national and international teams ensure to go on performing very good science leading to high-level publications. The team obtained national (2 ANR, 1 coordinated) and international (HFSP and ITN) grants.

The scientific production is very good to excellent. Among the seven published research articles, two co-led by the team were published in excellent journals (Nature Ecology & Evolution and Science Advances). The results obtained by the two ongoing PhD projects and by the ongoing ANR MOPSEA are expected to yield to additional publications in a short time period.

Weaknesses and risks linked to the context

Considering the international reputation of this team (obvious via its numerous collaborations, see above), it is surprising that during the evaluated period the team leader failed to attract Master students, postdoctoral students and other researchers or associate professor. As a result, the size of the team remains (too) small and the presence of a unique part-time engineer (shared with the another) limits the workforce of the team (partly compensated by the hiring of CDD). Among team grant's, the funding, 2/3 are led by other teams making the team partly dependant of others.

Only two papers are led (co-led) by the team. This reflects the high proportion of collaborative research activity. In addition, one may expect that a bioinformatics team would publish papers on the development of methods or pipelines in bioinformatics/genomics journals.

The outreach activities of the team are limited.

Analysis of the team's trajectory

The team trajectory is perfectly in line with both 1) the whole trajectory of the unit and 2) the state of the art of the concerned research fields, aiming at elucidating cell type evolution, life cycle evolution and protein evolution during the metazoan history. The originality (and difficulties) of the research comes from the choice to mainly focus on non-bilaterian species (Cnidaria and Ctenophora). One of the more challenging goals the team wants to reach is to annotate orphan genes or clade-specific-genes using newly developed approaches/pipelines (taking into account protein 3D structures): this represents a 'biological black box' of 40–50% of non-bilaterian genomes, a whole set of exciting unknown molecular diversity. One PhD and one ANR led by R. Copley are already acquired for half of the next period.

RECOMMENDATIONS TO THE TEAM

The recruitment of a second permanent researcher (researcher or – assistant – professor) would strengthen the team by increasing the possibilities for the team to lead its own projects and the number of PhD supervision. The technical workforce should also be increased via either the recruitment of additional engineers (permanent or CDD). The overall increase of the critical mass would allow more efficient, time consuming, analyses, that are key in this discipline.

The team should be more implicated in training Master students because this is a win-win strategy. Considering his high level (DR), the team leader may be expected to initiate/lead the writing of book chapters or reviews or opinion papers in his field (bioinformatics, genomics/transcriptomics, phylogenomics).

Even though fundamental research and bioinformatics tools are difficult to popularise, they should try to do so, or to participate in the organisation of broad audience events with their experimental colleagues.

Team 7: Mitosis and spindle checkpoint
 Name of the supervisor: Mrs. Stefania Castagnetti

THEMES OF THE TEAM

The team focuses on the cell cycle regulation, studying how mitotic progression and its regulation by the spindle assembly checkpoint vary within eukaryotes. The first line of research concerns the role of the spindle assembly checkpoint in the embryonic development of non-chordate animals. The second is devoted to the study of the cell cycle and mitosis in a toxic dinoflagellate. More recent work focuses on dinoflagellates monitoring to implement biosensors with applied perspectives.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendations from the previous report (in italics) have been addressed as follows:

1- The current efforts on more applied research project are not incompatible with scientific success and will contribute further to the team integration in the scientific community and the Villefranche station at large.

The team has followed this recommendation with the collaboration with Rodolphe Lemée (LOV) on the toxic dinoflagellate and the integration of the team to a transdisciplinary group with Thomas Alava in Grenoble (CEA-LETI) to develop an automated biological analysis system for the prevention of outbreaks of toxic dinoflagellate.

2- Overall, the scientific goals of the team are very exciting. Tactically, the team leader should take care to explain why this work is important in applications for external funding.

The team leader has presented her work in four meetings and has been very active to present her work in several outreach activities.

WORKFORCE OF THE TEAM: IN PHYSICAL PERSONS AT 31/12/2022

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	1
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	2
Doctorants	0
Sous-total personnels non permanents en activité	2
Total personnels	6

EVALUATION

Overall assessment of the team

The team's scientific projects are very original and well adapted to the environment of the Villefranche-sur-Mer marine station. The scientific output during the reporting period is judged as good to very good, albeit with a single publication led by the team during the period under review. Visibility is considered good to very good, with still too limited attractiveness and no major national grant obtained during this period. However, efforts that came to fruition after the evaluation period, both in terms of publication and funding, show that the team is now in a more positive dynamic.

Strengths and possibilities linked to the context

Attractiveness is considered good to very good, with two PhD students and one postdoctoral student recruited during the period. One of the students has just published his work in a good journal (Development, 2023 – outside the evaluation period) and the other has a first-author paper on Biorxiv.

Scientific output is good to very good, with one team-led original paper in a moderately visible journal (Cells, 2020) and one collaborative paper (Harmful Algae, 2021) during the evaluation period. Recent work from the team concerns the study of dinoflagellates. This work is part of a collaboration with another unit of the Villefranche-sur-Mer marine station and opens societal applications, allowing designing means for monitoring dinoflagellates in the context of sea-mediated intoxication. The work offers additional collaborative perspectives and novel funding possibilities.

Weaknesses and risks linked to the context

The team benefits from a limited visibility and attractiveness. The team leader participation to scientific meetings is too infrequent, and the team has not identified enough collaborators at the national and international level. During the reporting period, the team has remained small with only two permanent researchers (one part time PAR and only one CR, the team leader) often limiting the experimental potential, in particular when no PhD or Postdoctoral student are in the team (current situation). No Master 2 students were recruited. The small team size also limits fundraising possibilities, with no major grants obtained during the period of reference.

The team's scientific production during the reporting period has been low, with a single team-led publication in a moderately visible journal.

Analysis of the team's trajectory

The team aims at pursuing its main focus centred on the cell cycle regulation. The recent publication of its work on that research axis in a respected journal (Development, 2023) should facilitate attracting grants and provide an opportunity to enter into a positive dynamic.

The team also aims at developing the work on dinoflagellates as a biosensor. This work resulted in a collaborative publication during the reporting period, allowed developing a collaboration at the national level, and most importantly raising fund at the national level, with the acquisition of an ANR as a partner in 2023.

Both team research axes thus seem to be heading in a positive direction.

RECOMMENDATIONS TO THE TEAM

The team future plans are encouraged. There is a clear view and it is grounded on the local biodiversity and on the marine station excellent environment for the research topic. The team should keep the two ongoing projects and should increase its efforts to get national or international grants. This should be facilitated by creating or expanding local and international collaborations.

To increase the attractiveness and the chances of getting funded, there is a need to attract M2 Students/PhDs/Postdoctoral students and to speed up the publication process. Indeed, two of the three articles published during the reporting period were already mentioned 'in preparation' at the end of the previous contract, and therefore took several more years to be published than anticipated.

CONDUCT OF THE INTERVIEWS

Dates

Start: 07 novembre 2023 à 14 h

End : 08 novembre 2023 à 18 h

Interview conducted : on-site

INTERVIEW SCHEDULE

Day 1, Nov 7th 2023

12:30-2 p.m. Lunch

2 p.m. – 2:15 p.m. Preliminary meeting of the expert committee (closed hearing)
Attending: expert committee, Scientific Officer (SO, Yacine Graba)

2:15 p.m. – 2:30 p.m. Presentation of the Hcéres evaluation to the unit (SO)
Attending: expert committee, SO, representatives of institutions and all unit members

2:30 p.m. – 3:30 p.m. Presentation of the research unit by the unit director
(including 15–30 min questions)
Attending: expert committee, SO, representatives of institutions and all unit members

3:30 p.m.–3:45 p.m. Break

3:45 p.m.–6:05 p.m. Team scientific presentation Session 1 (4 teams)
(15 min presentation + 10 min questions + 5 min with PI + 5 min debriefing of the committee). *Attending: Team members, expert committee, SO, director of Unit, representatives of Institutions*

- 3:45 p.m.-4:20 p.m. Evelyn Houliston/Tsuyoshi Momose
- 4:20 p.m.-4:55 p.m. Alex McDougall/Remi Dumollard
- 4:55 p.m.-5:30 p.m. Hitoyoshi Yasuo
- 5:30 p.m.-6:05 p.m. Michael Schubert/Jenifer Croce

8 p.m. Diner

Day 2, Nov 8th 2023

8:30–10:15 Team scientific presentation Session 2 (3 teams)

- 8:30-9:05 Stefano Tiozzo
- 9:05-9:40 Richard Copley
- 9:40-10:15 Stefania Castagnetti

10:15–10:30 Break

10:30–11:00 Parallel meetings (3 subcommittees)

- Meeting with technical and administrative personnel (in French 45 min). *Attending: Technicians, Engineers, Administrative staff, sub-committee 1 of expert committee, SO*
- Meeting with thesis students and postdoctoral students (45 min). *Attending: PhD*

students and postdoctoral students, sub-committee 2 of expert committee, SO
—Meeting with researchers and professors (in English 30 min). *Attending: Researchers except group leaders, sub-committee 3 of expert committee, SO*

11:00–11:30	Committee debrief
11:30–12:30	Meeting with the representatives of supervising bodies (CNRS, University). <i>Attending: expert committee, representatives of Institutions, SO</i>
12:30–2 p.m.	Lunch (to be organised by the unit)
2 p.m.–2:30 p.m.	Visit of the lab/aquarium facility
2:30 p.m.–3 p.m.	Meeting of the Committee with the head of the unit. <i>Attending: Unit Director, expert committee, SO</i>
3 p.m.–6 p.m.	Deliberation of the Committee (closed hearing) <i>Attending: expert committee, SO</i>

PARTICULAR POINT TO BE MENTIONED

None

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 29 février 2024

Objet : Rapport d'évaluation LBDV - Laboratoire de Biologie du développement de Villefranche-sur-Mer

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 « LBDV ».

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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