

## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

### Panel Members

Beatriz Morales-Nin (Chair)	IMEDEA - Instituto Mediterráneo de Estudios Avanzados, Consejo Superior de Investigaciones Científicas (CSIC) , Universidad de las Islas Baleares
Erlend Moksness	Institute of Marine Research Norway, Norway
Fiona Tomas Nash	IMEDEA - Instituto Mediterráneo de Estudios Avanzados, Consejo Superior de Investigaciones Científicas (CSIC) , Universidad de las Islas Baleares
Ionan Marigomez	Universidad del País Vasco, Spain
Javier Ruiz	ICMAN – Instituto de Ciencias Marinas de Andaluzia, Spain

### R&D Units

Centro de Ciências do Mar do Algarve (CCMAR)	Centro de Ciências do Mar (CCMar/CIMAR)
Centro de Ciências do Mar e do Ambiente (MARE)	Universidade de Coimbra (UC)
Centro de Investigação Marinha e Ambiental (CIMA UALG)	Universidade do Algarve (UAlg)
Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR)	Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR/CIMAR)
Centro I&D Okeanos - Universidade dos Açores (Okeanos-UAc)	Universidade dos Açores (UAçores)



## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

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**R&D Unit:** Centro de Ciências do Mar do Algarve (CCMAR)

**Coordinator:** Adelino Vicente Mendonça Canário

**Integrated PhD Researchers:** 120

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**Overall Quality Grade:** EXCELLENT

### Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

**Base Funding for (2020-2023):** 1756 K€

### Recommended Programmatic Support

PhD Fellowships: 15

Programmatic Funding: 1108 K€, including for 3 (Junior) New PhD Researchers Contracts.

### Justification, Comments and Recommendations

CCMAR has high qualified staff who are dedicated to delivering excellent scientific knowledge and services to the scientific community as well as government departments, agencies, industry and a broad range of national and international stakeholders. CCMAR is linked to the University of Algarve, but has financial and organizational independence, which allows for flexibility and efficiency regarding resource use, apparently benefitting the overall productivity and efficiency of the Unit. The level of strategic, thematic and academic/scientific integration is very good, as it is the degree of integration of the whole RU personnel.

CCMAR is a multidisciplinary centre with the mission of promoting research and education on the marine environment, with emphasis on biological interactions and the sustainable use of resources. CCMAR is organized in three productive and coherent Research Groups (RG). The three research lines address scientific issues (basic and applied) related to the coastal ecosystems, fisheries and aquaculture, to provide Portugal (and the international community) with a better understanding of the ecosystems involved, collecting information on the species level for good management based on best knowledge provided and the potential of increasing aquaculture. The RG "Drivers, responses and tipping points in changing environments" has more of a global and basic approach in its research, including the Arctic and Antarctic. The RG "Management and conservation of marine resources" is more applied, and its approach has some similarities to typical marine Advisory Institutes in Europe. The RG "Unlocking the potential of marine resources" is the main group addressing issues related to the Blue Economy, as aquaculture, biotechnology and introducing and testing species as algae for industrial production. This is the largest RG, indicating that CCMAR has an aim to contribute to the future expansion of this area and to the Portuguese economy. In some cases, the research areas have some overlap with the research areas in some of the other RUs.

Portugal has a long coastal area with opportunities for tourism, fishery and aquaculture, and thus the research conducted at CCMAR is very relevant locally and regionally. Furthermore, the high quality of research and transfer of knowledge are also obvious at the international level, with members of CCMAR having produced numerous high quality and highly cited scientific publications, with strong international collaborations (15 of the 20 papers include international co-authors), as well as being involved with numerous international projects. Furthermore, CCMAR has been successful and experienced high return rate on external funding sources based on proposals. In general, the IR at CCMAR are highly skilled and very active in getting funding from several different sources, both national and internationally. The international funding (incl. EU) is approx. 61.000 Euro per IR, which can be considered at average of all RUs.

CCMAR members have relatively high participation regarding attendance and organization of seminars and conferences, both on local, national and international levels, which highlights that CCMAR IRs holds expertise that is vital for the society overall. The Research Unit provides government, public agencies and the maritime industry with a range of scientific, advisory and economic development services that inform policy-making, regulation and the sustainable management and growth of Portugal's marine resources.

The five selected contributions are at the forefront of their respective fields and evidence the broad scope of marine subjects where CCMAR is contributing; including climate and its impact on life, fisheries and aquaculture, coastal ecosystems or phylogeny. This quality and relevance extends to the full-text publications included. Connections with the private sector are also evident (e.g. pilot bioremediation plan).

The group on Drivers, Responses and Tipping points has identified climatic variability in the Iberian Margin on a time scale from thousands to one million years, thus providing a framework, which is useful in the context of climate change for Portugal but also for Spain and Morocco. At shorter time scales, this group is diagnosing the consequences of increasing temperature on seaweeds diversity and distribution, and of CO<sub>2</sub> on seagrass ecosystem functioning. In addition to the quality of this research, these are coherent contributions to the expected societal role of CCMAR. The contribution to cone snails' biogeography is significant and coherent with the Unit mission. There are also important contributions in microbial ecology and symbiosis that were not highlighted in the publications.

The group on Management and Conservation of marine resources has an important tactical component in CCMAR. They have contributed to policy by providing criteria to classify marine protected areas, a subject of high relevance owing to the commitments achieved by the international community to increase the surface of the ocean under protection. It has also contributed to understanding the role of environmental drivers in the recruitment of sardine, a natural resource which is creating societal alarm in Portugal.

The group for Unlocking the Potential of Marine Resources exhibits a broad field of expertise, including research on nutritional and hormone modulation of fish physiology, with contributions that are of quality and relevant for aquaculture. There are also important genomic contributions, such as the paradigm overturn of asymmetry in flatfish, for which CCMAR members have taken advantage of a strong collaboration with Chinese partners to provide high impactful science. The tactical value of bioremediation is high and the group seems to be doing a very substantial and sensible contribution for using sludge to treat mining drainages. One important contribution to human health is highlighted, but it appears to be somehow beyond the scope of CCMAR. The harvesting potential of microalgae is mentioned as one of the three main achievements but not backed by any document in the 20 full texts provided. This is the only group with clear evidences of technology transfer with the contribution of a prototype for bioremediation in collaboration with the industry.

The Business Unit (BU) is an interesting construction, however, it is unclear how it works towards society/industry in creating new projects that are relevant, as for Blue Economy. Despite the high potential CCMAR high-quality science has for the Portuguese administration, no specific strategy is described for a more stable liaison with public bodies in need of scientific advice. Actions to reinforce the science to business axis of CCMAR are too generic. Incorporating representatives of stake holders as members of the advisory board could help strengthen the outcomes of the BU.

Some patents and one spinoff are indicated, but it seems that these outputs do not revert back benefitting CCMAR. The development and support of patent and spinoffs is a good approach, but a clearer and better strategy needs to be put in place so the efforts put by CCMAR on these aspects brings economic benefit back to the RU.

The Unit seems to be developing collaboration with Chinese institutions at different elements of their research groups. Given the growing strength of this scientific community, this seems an interesting path to keep exploring since it can be a distinctive opportunity of internationalization.

The organizational structure is largely bottom-up based, and it appears to be very effective, keeping the scientific team motivated and involved but may be subject to risks that need to be assessed, particularly when strong economic constraints appear

The production of PhD thesis is good at CCMAR, but it is crucial to provide information on their professional trajectory and success; lacking this information impairs a full evaluation of the quality of these numbers.

Similarly, the actual number of people that are reached by outreach activities and the influence these activities have in terms of enhancing ocean literacy, etc., should be evaluated.

The size of CCMAR indicates that it is a robust organisation and has a staff with future potential regarding both creativity and innovation. The integrated researchers contribute to high quality science, training, and transfer of knowledge, as indicated by the productivity of the researchers in terms of number of publications, the journals where they publish (more than 50% are in the Q1 of the respective themes), and the citations that these publications have. Furthermore, being affiliated with the university allows CCMAR to strongly contribute to education; with ca. 50% of the staff

participating in the education of undergraduate students, about 80% of staff contributing to the scientific training of undergraduate and Msc students (on average more than 1 student per PI per year) and nearly 60% contributing to the training of PhD students and postdocs (ca. 1 per PI every 2 years). The excellence of the researchers is also illustrated with different recognitions and awards (e.g. PEW marine fellow, award from the University of Gothenburg, chair of ERC Panels).

Many researchers, however, are not actively involved in participating in outreach activities (only ca 20%) nor in the organization of conferences, workshops (ca 15%). Given the important goal of enhancing knowledge transfer and ocean literacy, a more active role in these activities by a higher proportion of members is recommended.

The contribution of science to society is very evident in the group for the management and conservation of marine resources, including an association with IPMA researchers, which is of high synergic value and should be reinforced if feasible. Contribution to the CFP of Portugal by this group is key owing to the main role of marine resources in Portugal. Seaweeds research at the group of Drivers response and tipping points also shows evidences of conducting high quality transference to the society.

Part of the research conducted in the group for unlocking the potential of marine resources seems is conducted in an area (human health) which appears to be beyond the scope of CCMAR mission; this is a meritorious achievement, but the Unit should consider whether it is an adequate line to invest in within CCMAR. There are fewer evidences for an intense contribution in terms of science for business.

CCMAR has been effective in using past funds to develop scientific excellence and to train new researchers. The proposed strategy for the next period keeps this momentum with three thematic lines paralleling the previous structure in research groups. The present diagnose detected broad focus and potential for further collaboration among researchers, which this new internal structure should help to optimize. Establishing a steering committee where the diversity of research topics addressed by CCMAR can be considered is a sensible step forward in the maturation of the Unit as a research body of reference.

The Doctoral school is an excellent initiative that could be an optimal platform to promote research careers, the sense of community amongst early stage researchers, offer an effective formation in transversal skills, provide visibility to early stage researchers (e.g. towards potential contractors or overall, the society), enable conflict resolution, and provide a voice of representation to this group.

More transversal collaboration amongst members of the RU is recommended, with strong synergic potentials given the merit of the group members. For example, a stronger collaboration between the geology and biology expertise is desirable. Similarly, it is unclear whether the RG on "Drivers, responses and tipping points in changing environments" contributes to Blue economy (e.g. via expertise on microalgae/seagrass/kelp).

The PhD fellowships awarded should be distributed between the three Research Groups.

One new PhD researcher is recommended for each one of the three Research Groups.

The Programmatic Funding can be partially used for contracting of personnel and equipment.

## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

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**R&D Unit:** Centro de Ciências do Mar e do Ambiente (MARE)

**Coordinator:** João Carlos Sousa Marques

**Integrated PhD Researchers:** 198

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**Overall Quality Grade:** EXCELLENT

### Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

**Base Funding for (2020-2023):** 3485 K€

### Recommended Programmatic Support

PhD Fellowships: 15

Programmatic Funding: 1105 K€, including for 3 (Junior) New PhD Researchers Contracts.

### Justification, Comments and Recommendations

The five R&D Units (RU) included in the evaluation are quite diverse and interdisciplinary. The RU MARE has seven locations (at higher education campus), six in the central part of Portugal, both coastal and inland, and one in the Madeira archipelago, this is itself a challenge that seems to be handled well by the organisation. MARE is the second largest R&D Unit considered for evaluation and combines expertise allowing approaching scientifically and technologically all types of aquatic systems, from river basins and associated landscapes, to estuaries, coastal, and large marine ecosystems.

The RU outstands in its degree of internal consistency with two research groups focusing in stream dynamics and in the biology of the coast with special emphasis in fish and biodiversity. Both are of relevance and provide contributions at the top of their specific areas of expertise. No case of activities marginal to the aims declared for MARE has been detected. Although there are not contributions to top journals such as Science or Nature, the RU is leading the 20 texts presented and they are all of relevance to the role expected for MARE and consistent with its aims and structure. The research areas at MARE has to some extent overlap with the research areas of some of the other four RU in the area of coastal systems and ocean; however, there is no overlap in the area of river basins.

The research agenda seems to be set by a bottom-up process, and it is not clearly what the priorities in certain research areas are. Of the two RGs, the "River basin" is the smallest and with clear objectives. The RG is particularly strong in producing research aimed at the management and conservation of aquatic ecosystems with emphasis in diadromous fish species. The competence within this RG has the potential to reach to excellent level.

The RG "Coastal Systems and Ocean" consist of more than 260 IR and there is an understanding that this RG in reality consist of several smaller informal "RGs". The RG address issues that are high up on the agenda, nationally and internationally and the impression is that the RG are leaning forward and aims to be in the front, nationally and internationally. However, it is not easy to spot what research areas are in the forefront of science in the way they are organised. Maybe MARE should consider developing its organisation further, by having more focused RG and a more top-down approach. A benefit from such a change is that it might give MARE options to identify research areas and RGs that might develop into being at the edge of science in their field and being an international reference.

The declared strength in technology transfer is not supported by the evidences provided. The patents declared in the nuclear CVs are not licenced and they seem to have a scope reduced to Portugal (in one case to Portugal and Spain), thus with little international projection. Similarly, the projection to business (e.g. spinoff) seems to consist in the lecturing of courses and little evidence is provided on spinoff generated by the Unit and its business trajectory. MARE has identified the Blue Economy (aquaculture included) as a high priority area. Contributing to developing aquaculture in Portugal should be one priority area for MARE.

Portugal has important river basins, long coast line and a large open sea area under its jurisdiction (Exclusive Economic Zone). MARE has a holistic approach, addressing all aquatic systems within Portugal's jurisdiction, to provide Portugal (and the international community) with better understand of the ecosystems involved, collecting information on the

species level for good management based on best knowledge provided. The research areas have some overlap with the research areas in the other four RU, special in the coastal zone.

MARE appears as a well-structured and very consistent team of researchers, however, there is some imbalance between the two groups, with Coastal Systems and Oceans having a greater number and a higher degree of internationalization, when considering the participation in international research projects. The internal composition of the research groups also reflects complementary expertise of their members, providing further evidences of a well-structured RU. Even so, the researchers from both groups have a high degree of internationalization and are respected professionals at their respective area of expertise. In some cases (Dr. Sousa) this international recognition includes awarding the prestigious Prigogine Gold Medal and it is accompanied by high responsibilities (Chairmanship of one FCT boards).

The composition of the RU regarding the competence of the IRs seems to be relevant for the overall deliveries from the RU. The overall gender ratio in the RU is 61/39 (F/M). This indicates that MARE has staff with future potential regarding both creativity and innovation.

The constructions (Platforms) MAREFOZ (Coimbra) and CETEMARES (Leiria) are interesting as their aims is to allow a direct knowledge and technology transfer towards start-ups and spin-offs, as well as multiple companies and entities. The identified areas are within fisheries, aquaculture and biotechnology. Despite the declared intention to contribute to technology and business, it is evident the deficiency of this type of expertise in the overall team of researchers.

The RU shows a high capacity to supervise PhDs and Postdocs. This indicates quality of the work they conduct, attracting young talent to the RU.

In the description of the objectives and strategy for 2018-2022, MARE aims to continue its holistic approach by improving and updating the knowledge on the functioning of freshwater-, estuarine- and marine ecosystems. This includes risk assessments, report on ecological and health status, contribute to development of new tools for monitoring, exploration and management, contribute to the development of Portugal's Blue Economy, be in the forefront of advanced education and training and develop good communication to the society overall.

The strategic vision of MARE for the 2019-2022 period continues the sensible and structured rationale implemented in the Unit. The same two research groups are considered, what seems a sensible decision given past success. The strategy for the future of MARE is neat and well-focused, with seven thematic lines building on the expertise already existing in the RU and developing scientific knowledge of societal relevance. The previous activities in the period 2013-2017 do not provide a strong support for the specific strategy of the two technology lines, Biotechnology and Monitoring Technology. The RU expects to hire a researcher for bioactive compounds and elements related to the pharmaceutical industry. It is argued the projection of this line on the pharmaceutical and other components of the private sector (including the promotion of start-up), but the evidences for the previous period do not fully support this argumentation. Similarly, the line focussing on Monitoring Technology seems devoted to the implementation of existing technology rather than to development. The strategy here must be clarified because it is mention 6 PhD researchers and it is not evident if MARE is considering graduate students, postdocs or the more senior staff that would be necessary to boost a credible strategy. The identification of Blue Economy (aquaculture and natural resources valorisation) should be explored more and might open new important avenues for the RU. Independent of these comments, the RU is leaning forward to strength national and international cooperation and partnership, with the goal to be at the frontiers of the research covered by the RU.

MARE is a young organisation and should consider developing further the matrix structure of the organisation and this should be reflected in maybe increase the number of RGs and have more focused TLs. Important is this context it will be important to have a well distributed participation of the different Poles in the RGs. Overall, the RU will strengthen position in the international science landscape by identifying and financially supporting some of its research areas to be in the front line, and thereby be an international reference point.

The six PhD programs seem all very relevant for work carried out at the RU.

MARE declares a substantial reduction in its expectative of funding by FCT in the period 2019-2022 (from 17 to 3.6 M€) as well as in projects (from 3.5 to 1.8 M€). Although this produces a positive impact on the dependence from FCT support (from 49% to 22%), it does not seem compatible with the ambitions presented in the future strategy.

The Unit might ditribute the PhD fellowships according to their strengths.

The Programmating Funding awarded is to be partially allocated to participation in European networks & infrastructure and in initiatives to strengthen the relationship between the different Poles.

## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

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**R&D Unit:** Centro de Investigação Marinha e Ambiental (CIMA UALG)

**Coordinator:** Maria João Anunciação Franco Bebianno

**Integrated PhD Researchers:** 47

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**Overall Quality Grade:** VERY GOOD

### Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

**Base Funding for (2020-2023):** 675 K€

### Recommended Programmatic Support

PhD Fellowships: 8

Programmatic Funding: 587 K€, including for 2 (Junior) New PhD Researchers Contracts.

### Justification, Comments and Recommendations

CIMA is a research centre at the UALG. It aims to promote scientific knowledge, education and innovation in marine and coastal environmental areas aiming at enhancing the efficient use ecosystems to contribute to a more sustainable economic development, and at understanding, preventing and mitigating natural and anthropogenic risks.

In 2013-2017, research was organized in 4 interlinked research nodes: marine and transitional aquatic processes; system management and integrative activities; multiscale geological processes across ocean margins; and hazard assessment and technologies for a changing environment. These research areas have some overlap with the research areas of other Portuguese RUs evaluated in this call.

Based on the recommendations given by the External Advisory Board for 2013-2017, CIMA has made a valuable effort to conduct a SWOT analysis and thus reorganise the research plan for 2018-2020 around 2 research domains: Ocean and Coastal Dynamics, and Environmental Systems and Resources. This new organization is an appealing formulation that can be useful to pursue Excellence in at least one of the research domains. Particularly, according to the present Panel viewpoint, the Ocean and Coastal Dynamics domain is seemingly the strongest part of the research plan and the area in which CIMA can most likely achieve sufficient excellence as to be recognised as a world reference and European leading institution.

Likewise, CIMA has incorporated an additional Civil Advisory Board which is a neat evidence of the Unit very smart vision to project its work on end users. This is a distinctive merit of this Unit.

Neat evidences of this relevance are the outstanding numbers of international funds the Unit is able to get. Other evidences are the recognition some members have achieved internationally, including chair of international programs such as LOICZ as well as contributions/recognitions to/from other transnational bodies. The Unit includes scientists with enough merits and a good number of international publications in the journals of the subject. The quality and quantity of these contributions as well as the PhD that have been defended are adequate for the Unit size. Although these contributions do not show evidences of breaking paradigms of scientific knowledge, their projection on relevant societal components at national and international level is unquestionable. Integrated researchers produce very good to excellent scientific publications, both at national and international levels, however, efforts should be addressed to improve their international leadership, especially in top multidisciplinary journals.

The 2013-2017 contributions have a prominent applied component. In the field of ocean colour remote sensing it has been correctly identified the need for ground validation of algorithms and CIMA has contributed to this effort for the waters of Portugal. This is a necessary work to be done, however it cannot be qualified, per se, as a contribution to the scientific advance and, in many cases, it has a consultancy component which is acknowledge in the text presented by the Unit. Coastal Risks constitute a key action for any coastal state and CIMA has demonstrated an excellent contribution at international level, with WP leadership in an EU project (Micore or RiscKit) and papers in international journals. There is evidence of excellent international networking as CIMA integrated researchers have supervised



several PhDs defended in other countries. The contribution dealing with long term observations of transitional waters may pursue in the future a fruitful integration of high-frequency and long-period sampling with advanced high-throughput omic approaches; however, this merging seems to very at its dawn and the outputs are still “classical”; thus, the 2018-2022 period activities should be addressed to advance towards internationally recognised excellence, which will demand notable research efforts including also the formation of researchers, which to present has been quite limited. Certainly, CIMA provides evidences of high quality papers either on high-frequency and long-period sampling or on ecotoxicological omic approaches; however, evidences of the merged approach are lacking in the proposal. CIMA shows relevant scientific contributions to deep-sea mining and have recommended new methodologies to international bodies, thus evidencing a remarkable excellence in both scientific and social projection. Finally, biofuel production appears to be a strategic issue but CIMA’s contribution shows little evidences of important impact and to present is restrained to a national perspective without significant internationalization.

One main strength of CIMA is their internationally relevant activities in research formation, being able to attract both master students and doctoral candidates from all over the world; this is an aspect that must be highlighted and it is relevant that this long lasting experience in postgraduate and doctoral studies of excellence in which CIMA demonstrates international leadership is not left aside as the counterpart of addressing efforts to enhance excellence in research. Seemingly, CIMA conceives formation as a most relevant part of their research strategy. In agreement with this educational profile, CIMA indicates high activities among the IRs to participate and organise colloquia, seminars and conferences, both on local, national and international levels. This indicate that CIMA IRs holds expertise that is vital for the society overall and that the RU as a whole has an excellent social projection, both locally and also sectorally (towards stakeholders). Thus CIMA has a long-lasting experience in providing services and expert advice to government, public agencies and the maritime industry with a range of scientific, advisory and economic development services that inform policy-making, regulation and the sustainable management and growth of Portugal's marine resources. The Unit also include researchers whose knowledge has been demanded beyond science duties to advice in international conventions of interest to Portugal such as the Law of the Sea, Oslo or Barcelona.

However, although most likely based on these experiences CIMA aims at being active in the area of Blue Economy, presently it has only a few scientists addressing issues on aquaculture, ocean energy and deep-sea mining. Therefore, this part of the research strategy is probably still far away from being on the way towards international excellence and will need time to be on the track for which it might benefit of the advances in other CIMA research areas closer to excellence, which should act as tractors.

The citizen science approach can be highlighted as an additional indication of its social vocation

A major strength of CIMA is that it has been successful in achieving a very high return rate on external funding sources based on proposals, both national and, most remarkably, internationally. This reflects that the research strategy and the internal organization are excellent in attending societal challenges addressed by public calls. The international funding is approx. 58/115 k€ per IR (based on 47 IR), which is the second highest of the five RUs evaluated. The latter is both based on high qualified IR, however, also reflects a very good international network among the IRs. These activities would demand additional support for science management.

A large part of the staff is UALg staff and have double affiliation with a department/faculty; Postdoc (PhD) researchers, however, do not have the sufficient stability as to develop a career, although they can be Principal Investigators this is somehow limited to scientific coordination and not to responsibilities and management. It is recommended that CIMA works to get that the University recognises their capability as full PIs; this is applied in other Portuguese universities and being a RU can facilitate negotiations in this respect. Indeed, Postdocs have a great sense of CIMA community and they appear to participate as fully integrated reserachers, with the exception of legal hurdles (that can be overridden by UALg if properly managed)

PhD candidates were overall satisfied and selected CIMA due to its excellence and research themes, which reinforce the great advances of CIMA on the way towards international excellence. Financial problems were observed and there was a gap in PhD candidate recruitment starting in 2015, which seemingly is being solved because some PhD candidates have been very recently incorporated. There is a great potential to supervise and get excellent PhDs formed within the framework of CIMA.

Neat evidences of this relevance are the outstanding numbers of international funds the Unit is able to get. Other evidences are the recognition some members have achieved internationally, including chair of international programs such as LOICZ as well as contributions/ recognitions to/from other transnational bodies. In some cases, members of the Unit contribute to the supervision of PhD in universities outside Portugal, what is also a neat evidence of an expertise

demanded beyond the country. The Unit also include researchers whose knowledge has been demanded beyond science duties to advice in international conventions of interest to Portugal such as the Law of the Sea, Oslo or Barcelona.

CIMA should consider how realistic it is to enter some of the international areas, as an example, the European Marine Board (EMB) only accept two members from each country. However, EMB is an important area, as it is a policy body aiming to have a significant impact on the priorities for future marine research in Europe.

The overall strategy for structuring the Unit in the coming years is interesting and innovative. It will allow flexibility to the members of the Unit for circumstantial collaborations when necessary to focus on a particular objective of the four identified.

At least three (3) of the 8 PhD candidates should be allocated to the Ocean and Coastal Dynamics research domain 2018-2021.

The Ocean and Coastal Dynamics research domain 2018-2021. This area encompasses a great opportunity for the RU to reach excellence at international levels. CIMA has demonstrated the sufficient quality, merit, relevance and extent of internationalization in this field in the period 2013-2017 that a main objective for the period 2018-2022 should be reaching the required international standards as to be considered a world reference and a European leading institution.

A major strength of CIMA is that it has been successful in achieving a very high return rate on external funding sources based on proposals, both national and, most remarkably, internationally. These activities would demand additional support for science management.

The Programmatic Funding awarded should be partially applied mostly for hiring technicians baut also for equipment.

## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

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**R&D Unit:** Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR)

**Coordinator:** Vitor Manuel Oliveira Vasconcelos

**Integrated PhD Researchers:** 179

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**Overall Quality Grade:** EXCELLENT

### Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

**Base Funding for (2020-2023):** 3112 K€

### Recommended Programmatic Support

PhD Fellowships: 15

Programmatic Funding: 1120 K€, including for 3 (Junior) New PhD Researchers Contracts.

### Justification, Comments and Recommendations

The Unit makes a solid and neat description of its structure, vision and objectives. The objectives of the Unit are both scientifically and societally relevant, and correspond to the challenges faced by the international scientific community as well as the services science ought to provide to the Portuguese society. As a whole, the Unit makes an impressive contribution to these challenges.

The Unit incorporates a wide range of expertise what are active in publishing their research and participate on regional, national and international fora. They produce good to excellent publications in the five research areas of the Unit. The 20 submitted publications include three reviews where 13 involve international co-authors thus indicating a solid network beyond Portugal. These publications include contributions to top journals such as Nature or Science, but CCIMAR is not yet having the leading role and in some cases the scope of the paper is not directly connected to the aims declared by CIIMAR. The Unit has also been very dynamic in participating and organizing colloquia, seminars and conferences, both on local, national and international levels.

The IRs are very active in advanced training at PhD and PostDoc levels as well as lecturing and initiation of undergraduate or Master students to research. CIIMAR declares to be in the process of creating quantitative indicators for the professional trajectory of the PhDs supervised. This is a necessary step for a Unit of this dimension and it will help to have an indicator of the quality of the formation provided. It can also become an attractor for talented students looking to start a promising professional career.

The IRs at CIIMAR are highly skilled and active in getting funds from several different sources, both national and internationally. Nevertheless, the international funding (including the EU) is in the low range when compared to the other four Units. This makes this Unit very dependent on FCT funds, with the highest proportion of the evaluated Units.

Unit provides public agencies with a range of scientific and advisory services. Partnership with the private sector is also evident in the activities developed by CIIMAR. Some of the IRs have contributed to several patents with only one of them being licenced at the time the visit was made. The Unit declares three spin offs although basic numbers such as their revenue, royalties or share ownership were not available during this assessment.

The IRs are divided into 10 Research Groups of varying size and achievements:

#### 1) Evolutionary genomics and blue biotechnology – 70 IRs (34/36, PhD to non-PhD ratio)

This is a RG with contributions which are of scientific excellence as well as of relevance to the environmental and economic arenas. These include a review of antifouling as well as the role of genomics in the biosynthesis of natural products or the effect of pesticides on cyanotoxic bacteria. Some of the top publications (e.g. the origin of Australians) seem to have limited relevance to the aims of CIIMAR. In other cases the top publication is not led by CIIMAR, but it is indicative of the potential of the researchers to become world's leader if they receive the adequate support. Evidences

for the innovation capacity are supported by the good comments received from the PCT revision panel to one of the patents.

2) Natural products and medicinal chemistry – 18 IRs (11/7, PhD to non-PhD ratio)

The RG was not identified by the Unit as a main contributor to the five selected texts and the nuclear CVs. The papers, projects and PhDs carried out in this research group are relevant to CIIMAR since they are rooted in the use of marine products for medicine research. The attempt to extend patents to a more international scope, such as PCT/IB2013/050193, has been questioned by the PCT review.

3) Bioremediation and ecosystems functioning – 29 IRs (12/17, PhD to non-PhD ratio)

The RG was not identified by the Unit as a main contributor to the five selected texts and the nuclear CVs. The overall rationale of the group contributions is not evident with research in bioremediation but also declaring contributions in aquaculture and food health as well as in training of fishermen.

4) Animal physiology and functional genomics – 40 IRs (16/24, PhD to non-PhD ratio)

The RG has a too-wide research-focus, going from pollution to evolution and including the chemistry of otoliths and its use for assessing fish stocks. Although the contributions are individually relevant and of quality, the internal consistency of the group remains unclear.

5) Animal nutrition and health – 46 IRs (22/24, PhD to non-PhD ratio)

The RG has a very relevant contribution to the use of pro and prebiotics for nutrition and health of cultured fish. The quality of this research is not only evident in the publications, including reviews in aquaculture, but in a more difficult arena like the capacity of patenting (WO2008110325-A3) and licencing (DSM Nutritional Products Ltd) this technology.

6) Aquaculture and seafood safety – 35 IRs (20/15, PhD to non-PhD ratio)

The RG produces relevant publications to the understanding of cultured fish physiology and to increase the efficiency of aquaculture through the use of vegetal products as food for fish. Members of the group have also been involved in providing important services to Portugal at the level of national delegate for the KBB program.

7) Aquatic biodiversity and conservation – 42 IRs (25/17, PhD to non-PhD ratio)

The RG produces quality contributions to the understanding of biodiversity, kelp forest and biological invasions. Nevertheless, CIIMAR does not seem to have a major role in the two papers selected. Researchers from the group have been representatives of Portugal in UN IPBES.

8) Ocean dynamics, coastal and water systems – 23 IRs (15/8, PhD to non-PhD ratio)

The RG was not identified by the Unit as a main contributor to the five selected texts and the nuclear CVs. It develops innovative research in GNSS research. It has provided gadgets to satellite missions and the work being conducted is relevant to coastal risks.

9) Contamination pathways and mechanisms of toxicity – 52 IRs (23/29, PhD to non-PhD ratio)

The RG shows evidences of work relevant for protecting the sea against contamination, including the role of microplastics and the establishing of a database of spill incidents. This work is combined with high quality dissemination. Patents reported in FCT platform seem restricted to Portugal and there is no evidences of its licencing.

10) Law of the sea – 4 IRs (1/3, PhD to non-PhD ratio)

Although the merits in terms of projects, papers and other type of contributions are not yet at the same level of the other research groups of CIIMAR, the relevance of the topic for Portugal deserves support. Members of this RG were not present (or interacted) at the visit.

The Unit has an impressive team of researchers with a high degree of international recognition. Their work is routinely published at the best journals of their respective research areas and in several cases in top journals such as Nature or Science, although in these cases CIIMAR is not leading the contribution. This indicates that CIIMAR is close to but not yet the world's reference in specific elements of marine science connected to laboratory research of marine products and aquaculture, this final step seems feasible with an adequate and focused internal strategy as well as with enough external support provided to the Unit.

The team shows a high capacity to supervise PhDs and Posdocs. This is symptom of the quality of the work they conduct, which act as an attractor of young talent to the Unit. In several instances, this implies supervision of PhDs outside

Portugal, indicating the international recognition of the Unit. The awarding of an ERC grant provides further evidences of the international excellence achieved by members of CIIMAR.

The work conducted by the researchers is not only of scientific excellence but also of relevance for the contribution to society expected from a Unit like CIIMAR, although some deviations were also detected from the marine character of the Unit. This relevance is also evident in the participation of researchers in responsibilities to represent Portugal at international bodies such as the KBB program.

A portion of the researchers in the Unit declares contributions with industrial projection mainly in the area of chemical products. This includes several patents but the analysis of them shows that they are mainly presented within Portugal. During the visit it was stated that these are now in a more international scope except one, but still only one seems to be licensed.

The gender ratio in the RU is 60/40 (F/M) and well distributed among the ten research groups.

Whereas the scientific excellence of the Unit as a whole is unquestionable, the structuring into RGs and their internal consistency is not always apparent. There seems to be excessive fragmentation into small groups which then have a broad focus, thus resulting in a high degree of overlapping among groups in a strategy whose rationale is not evident. A more thematically-consistent internal-structure being also able to boost emerging activities in CIIMAR (e.g. Law of the Sea) might benefit the efficiency of the Unit. Despite the existence of these internal inconsistencies, all levels consulted in the visit (senior, post-doctoral and Ph D students) consistently declared that this is not creating inefficiencies in the use of resources or the exchange of ideas across RGs within the Unit. This structure seems to be also functioning to provide students with an international networking as well as to solve conflicts when present, what seems to support the Unit choice for internal structure.

High quality of governance and enthusiastic motivation is evident in the different layers of CIIMAR, from the coordinator to the PhD students. All of them show sincere identification with the functioning of the Unit and are proud of it, its strategy and aims. This identification seems to be the reason for high quality professionals to join the Unit. The operational flexibility and the spirit of trans-team collaboration is identified as a key element that facilitates scientific work in the Unit, from the most senior to the youngest components.

The declared research interest of CIIMAR seems wide and overlapping with other Units having easier access and scientific capacity for in situ studies. In contrast, scientists in CIIMAR seem close to become the world leader in some aspects of in laboratory research for natural products and aquaculture. Within this framework, it seems sensible to focus efforts and strengthen the strengths of the Unit to make of CIIMAR, as declared in the aims, the world reference for some areas of research. This is an aim which seems feasible with internal focus and external support.

In other cases, such as the Law of the Sea, they are unique, and this relevant uniqueness also deserves support by the Unit.

There is more scope in the Unit for transforming the high degree of scientific excellence into IPR, which might contribute to ameliorate the economic sustainability of the Unit and its high dependence of FCT funds. To this aim, sharing capital and royalties should be considered as a necessary component of the relationship of CIIMAR with the spin offs they produce. Also, the investment in patents, with an international component or not, should be limited when licensing is not evident. Technology production and its projection on the Blue Economy is starting to gather inertia but it is still in its infancy at the Unit, a future where the demonstrated scientific success of the Unit can be spilled over this component will make of CIIMAR an actor still more relevant for Portugal science and technology system.

Owing to the advantages expected of focusing efforts in the areas where CIIMAR is stronger, the Panel advises to allocate at least one contract to the TL of Marine Biotechnology and one contract to the TL of Biology, Aquaculture and Ecosystem Services.

The participation of CIIMAR in international networks and the polar program deserves support.

During the visit, the different levels of the Unit unanimously identified the lack of technician support as the main hamper for the routine operation of CIIMAR. The Panel advises to prioritize the Programmatic Funding awarded mostly to meet this need over investing in equipment.

## Evaluation Panel: THEMATIC AREAS - Marine Sciences and Technologies

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**R&D Unit:** Centro I&D Okeanos - Universidade dos Açores (Okeanos-UAc)

**Coordinator:** João Manuel dos Anjos Gonçalves

**Integrated PhD Researchers:** 31

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**Overall Quality Grade:** EXCELLENT

### Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

**Base Funding for (2020-2023):** 528 K€

### Recommended Programmatic Support

PhD Fellowships: 8

Programmatic Funding: 1080 K€, including for 4 (Junior) New PhD Researchers Contracts.

### Justification, Comments and Recommendations

Okeanos is the research centre of the UAçores, successor of IMAR-Ac (only remnant after IMAR, which as private foundation acts as Management Institution with UAçores as main holder).

Okeanos focuses on scientific research and education on the ecology, ecosystem functioning, and ecosystem-based management of open ocean and deep-water marine ecosystems, including seamounts, hydrothermal vents, mid-ocean ridges, abyssal plains, and the pelagic and mesopelagic realms, with a special focus on the Atlantic Ocean. It is a small but multidisciplinary RU including a wide range of disciplines, from general ecology of deep sea and benthic ecosystems, fishes, marine mammals, sea-birds and competence within data and GIS. Research work is focused on deep-sea ecosystems, 3D spatial ecology of megafauna, climate change, new technologies for open ocean and deep-sea research, and knowledge transfer for management and conservation. This research has limited overlap with the research areas of the other four RU, render Okeanos rather unique, though it cooperates with other Portuguese RUs to provide access to deep and open ocean for research and training. Discussion with seniors ratified the uniqueness, excellence and solidness on which concept, expertise and contributions are sustained.

Discussion about technological prospects clarified some aspects that had been apparently too ambitiously and unrealistically in the text of the proposal. After discussion it was clearly seen that the planning and expectations are certainly more realistic and feasible than anticipated from the written proposal. Indeed it became clear that the planning is a continuation with some reinforcement of previous experiences of collaborative research with engineering and technological companies and Okeanos is at the same time promoter, actor in tech development and end user but not so much enterprise beneficiary (this is not an okeanos' major priority).

Overall, the claim for blue growth and technological research seems is not really supported by the evidences provided. Efforts should be addressed to fully develop all its potential for international excellence in the fields of deep-sea ecosystems and spatial ecology of megafauna.

Okeanos has a high qualified staff with 31 permanent and temporary IR (all with PhD), who are dedicated to delivering the best scientific advice and services for the Research Unit. Okeanos is planning to strength its organisation by hiring 20 researchers in 2019-2022, mainly change in contracts of IR already working in the RU. It is important for the working conditions at the RU to make most of the staff to have permanent working positions. The contribution from FCT is vital for the research at the RU and for future development.

Okeanos devotes its efforts to biology and biodiversity research in deep-sea and open-ocean systems. The five selected contributions and the uploaded ten manuscripts are coherent with this sensible strategy. These contributions are all of excellent quality (international multidisciplinary) and relevant to the declared objectives and aims of Okeanos, but a significant proportion of them seem not to be leaded by Okeanos. However, the international excellence is essentially recognised in the fields of deep sea ecology and 3D spatial ecology of megafauna. In contrast, other aspects such as, for instance, aquaculture are interesting but far away from excellence and require much research efforts in the next years.

Okeanos is a comparatively small Unit but incorporating researchers with a very neat focus which is consistent and relevant with the role that can be expected for the Unit. This team produces contributions which are appreciated at the international level as evident by the papers produced. The 10 papers submitted for evaluation were all of good or excellent quality, all relevant to the objectives of the RU and internationally authored. 7 of the 10 submitted publications for the time period 2013 to 2017 involved international co-authors. Senior researchers outlined that the low leadership in top multidisciplinary multi-author papers is because they are based on collaborative research and that usually they are partners but cannot afford leadership in those international projects and this has an effect on leadership in publications. They prioritize being part of those consortia rather than being leaders of less (reduced resources)

In general, the IR at Okeanos are highly skilled and very active in getting funding from several different sources, both national and internationally. The international funding (incl. EU) is approx. 165.000 Euro per IR. The latter is both based on high qualified IR, however, also reflects a very good international network among the IRs. The recent creation of Okeanos has not yet allowed to create enough inertia to drive this efficiency to a higher level of international leadership by making use of the privileged geographical location of the Unit, but the fact that the Unit is already attracting international young researchers is a promising sign.

Okeanos has a focused and neat view of its role as provider of scientific knowledge for the Azores area where it is located. Okeanos' IRs participate and organise colloquia, seminars and conferences, both on local, national and international levels. Okeanos provides government, public agencies and the maritime industry with a range of scientific, advisory and economic development services that inform policy-making, regulation and the sustainable management and growth of Portugal's marine resources. Okeanos has contributed to the development of autonomous underwater vehicles (AUV) and novel multi-sensor tag for soft-bodied animals (squid and jellies) and provides advice on wide areas of expertise (listed in the report) both on regional, national and international levels. This indicates that the Okeanos holds expertise that is vital for the society overall.

The strategic role of Okeanos at the Azores seems to be attracting young international researchers interested in these systems and whom apparently find there an adequate research environment for their work. Discussion with postdocs revealed a great success in attracting highly motivated researchers mainly due to academic reasons and to the scientific challenges/topics addressed by Okeanos. Insularity does not seem to be a problem because researchers (both postdoc and senior) feel worldwide connected and technical limitations are overridden by mobility, which is apparently easy on a regular basis. Global contacts are secured by international-external funding. There exists a great sense of community. There are real opportunities to promote their research career e.g. by acting as PIs in research projects and contracts. Laboral instability is a major drawback; however, contracts (maybe discontinued) have been secured for the long term in many cases thus supporting their research careers (e.g. depending on ongoing projects/contracts).

Efforts should be addressed by this RU to fully develop all its potential for international excellence in the fields of deep-sea ecosystems and spatial ecology of megafauna.

Okeanos has been efficient in formation of PhDs, with a ratio of 0.41 per IR. Thus secures continuation of excellence in formation of early stage researchers.

Of the PhD Fellowships, at least 4 should be for the 1, 2, 3 and 7 research programmes).

Programmatic Funding awarded should be mostly applied in contracting 1 secretarial assistant to help with the administration and management of research projects and contracts programs, and between 1-2 research technicians to assist with maintenance and operation of scientific instrumentation, field and lab work, and data processing, according to the Okeanos's preference; co-funding could be a good practice herein.

The Programmatic Funding can also contribute to the acquisition of a new fluorescence spectrophotometer for biochemical analyses from organisms to cellular levels, replacing obsolete diving equipment, acquiring high-quality cameras and computers to create a deep-sea imagery analysis lab, and acoustic releases for deep sea (>3000 m) moorings. Other equipment to be purchased include multiparameter sensors and probes and other small equipment for lab and field applications, and computers.