Report on the review of the third cycle education
at the Department of Marine Sciences,
University of Gothenburg
May 2018

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1. The review procedures and committee

1.1 Scope of the assessment

The review committee was asked to examine the academic and pedagogic quality of the doctoral education at the Department of Marine Sciences and its relevance to students and society. The PhD degrees awarded in the department are referred to as a PhD in "Marine Sciences", "Marine Geology" or "Oceanography", depending on the subject matter and the preference of the PhD students at the start of their studies. Since the Department of Marine Sciences was only recently launched (July 1, 2015), the evaluation primarily focuses on the period from 2015 to 2018. This also implies that the PhD students that graduated during this period all began their PhD in another department.

The committee was asked to review whether the provided education met the following criteria:

- *Achieved study results matching intended learning outcomes and the qualitative targets of the Higher Education Ordinance.*
- *Teaching being focused on student acquisition of knowledge/skills.*
- *The content and form of teaching resting on good scientific and/or artistic bases and proven experience.*
- *Teachers having up-to-date and adequate competence as regards their subjects, higher education pedagogics and subject didactics, and that said teachers being in proportion to the scope and content of study courses and programs.*
- *Study courses and programs being relevant to the needs of the students/doctoral students and society.*
- *Students/doctoral students having influence in planning, implementing and monitoring study courses and programs.*
- *There being a study and learning environment that is accessible and purpose-oriented for all students/doctoral students.*
- *There being continuous monitoring and development of study courses and programs.*

For doctoral education, it is particularly important that the doctoral students have access to an active research environment with sufficient subject depth, subject width and scope. It is also important to take into account the possibility for doctoral students to collaborate with researchers both nationally and internationally and with the surrounding community.

1.2 Composition of the review committee

The composition of the committee was as follows (see Appendix I for short CVs):

- Prof. dr. C.P. (Caroline) Slomp is professor of Marine Biogeochemistry at Utrecht University (chair of the committee);
- Prof. dr. M. (Michal) Kucera is professor of Micropalaeontology at the University of Bremen;
- Prof. dr. D. (David) Langlet is professor of Ocean Governance Law at Gothenburg University;
- Dr. I. (Ingela) Isaksson, Regional Coordinator MSP Skagerrak & Kattegatt at County Administrative Board of Västra Götaland;
- D. (Daniel) Sarabi, PhD student at the Faculty of Science, Gothenburg University and Chair of the PhD Council NDR.

1.3 Information provided to the committee

The committee was provided with a description of the PhD education at the Department of Marine Sciences at Gothenburg University in a detailed document with supporting electronic information. The committee subsequently had a preparatory electronic meeting on 23.2.2018

with the management of the Department of Marine Sciences. This was followed by a site visit on 9.4.2018 where the committee interviewed the management of the department, the administrative staff responsible for the PhD program, representatives from the PhD students, stakeholders and alumni and several supervisors and examiners (See Appendix II for the program). During the site visit, the committee was provided the opportunity to review all recent PhD-theses.

The disciplines at the department include biology, chemistry, physical oceanography, marine geology and conservational sciences, listed in the order of a decreasing number of staff per discipline. One third of the staff is located at two field stations. The remaining staff has recently moved to one building, after initially being located at 5 different locations. The department is in the process of integrating the various research cultures and streamlining internal procedures. Measures are being taken to improve the gender balance at the staff level. The director of research studies (also vice prefekt) has the overall responsibility for the research education of PhD students, and is supported by a committee for research education which includes 3 staff members and one PhD representative.

The PhD research education at Gothenburg University is 4 years in total, comprising 1 year of courses (60 ects) and 3 years of research. Most PhD students also teach and this time is added as extra time to their PhD (up to 20%). This implies that the maximum duration of a contract is 5 years, not counting parental leave and sick leave. All PhD students are employees. They are mostly funded through a combination of external grants (75%) and internal department funds (25%). Some PhD students are fully funded by the department. All PhD students are recruited through an open advertising procedure that is essentially worldwide. For each position, a selection committee assesses all incoming applications and selects a candidate after holding interviews. The head of the department takes the formal decision to hire. Because of the international background of many of the PhD students, both English and Swedish are used in day-to-day communication. Currently, there are 20 PhD students in the department. The ambition is to increase that number significantly over the coming 5 years.

Each PhD student has a supervisory team with a main supervisor, one or more assistant supervisors and an examiner. There is regular monitoring of progress, with a meeting with the supervisor and examiner at least once a year. Preferably, the advisory team consists of a mix of people of different ages/experience and includes researchers that can give hands-on support.

There are two mandatory courses: an introductory course (1.5 ects) and a pedagogic/teaching course (5 ects). PhD students are encouraged to take international courses and courses at other Swedish Universities, besides those offered at Gothenburg University. The department offers at least 20 ects in courses each year. Courses in soft skills are offered by the Faculty. A set of documents that act as a guide for PhD students to the Department of Marine Sciences including topics such as seminars, examination, responsibilities and PhD-courses, is available. The planning and progress of all courses and teaching of the PhD students and a brief description of their research (plans) are recorded in a mandatory and formalized Individual Study Plan. The committee was given the opportunity to assess all documents mentioned above, in addition to various course plans and evaluations.

2. Assessment by the committee

Overall, the committee found the training of the PhD students within the Department of Marine Sciences to be of high academic and pedagogic quality, with procedures in place to ensure successful completion of the program within the given time. All criteria listed in section 1.1

are met. The quality of the research was evident from the PhD-theses provided to the committee (see Appendix III for full list). The theses generally consisted of 4 or more papers/manuscripts, with at least 2 first-author papers by the PhD-candidates and their extent and scientific merit are comparable to the common international standard in the field. The assessment was further supported by the information on the education provided and the information from and on graduates from the program. Although detailed statistics were not available, the typical duration of a PhD of 4 to 5 years, after correction for teaching duties and various types of leave, is comparable to that in many other European countries.

The supervisors are clearly highly competent and committed to guiding the PhD students towards a thesis and providing them with the appropriate education for their respective fields. Both PhD students and supervisors agree that the supervisory structure that is in place - with the slightly overlapping roles of the supervisor and examiner - generally functions well. The PhD students are mostly very happy with their research and with the support they receive. For the PhD students interviewed, the choice to do a PhD at Gothenburg University was driven by their motivation to work on a given project or topic and to develop themselves further within the relevant discipline within Marine Science.

The PhD students are generally highly satisfied about the courses that they have taken so far as part of their education. Because of the interdisciplinary nature of the department, and the relatively limited number of PhD students per discipline, the department cannot cover all aspects of the education program. There is a need, therefore, for PhD students to follow specialized courses elsewhere. Most PhD students do so successfully within an individually tailored program including courses at other Swedish universities and abroad. Many of the PhD students are eager to teach and do so successfully. The PhD students are stimulated to attend international meetings and present their work. Where this requires writing small grant applications to obtain funding, this is generally well-supported.

The stakeholders and alumni interviewed by the committee confirm that the teaching and research at the Department of Marine Sciences is of high quality and emphasize the importance of PhD graduates in the field of marine sciences for society. They consider the new degree denomination (PhD in Marine Sciences) not to be an obstacle in the hiring process and highlight the positive value of the breadth in implies. This view was shared by the PhD students enrolled in the program. Only a relatively small proportion of the PhD students ultimately is expected to stay in academia, but there are many relevant alternative career possibilities. In the region, marine science is perceived as a growth sector with positive employment prospects. At present, the information on careers outside science is mostly provided through the PhD Career Day organized by the Faculty. Many alumni frequently recruit PhD students from Gothenburg University and emphasize the strengths of the PhD graduates: hiring an employee with a PhD degree is viewed as a plus because the training makes these recruits better problem solvers. Graduates from the PhD-program also often have better writing skills, are able to think more independently, are good at asking the right questions and are frequently more ambitious than others. The broad range in types of graduates, which is the natural result of an interdisciplinary department, is seen as a key strength. Some organizations have direct links with Gothenburg University through positions of staff as adjunct faculty (e.g. SMHI).

The administrative aspects of the employment as a PhD student are currently being improved making them well-arranged. The department has recently appointed a dedicated employee at the Human Resources department that is responsible for a smooth transition into the program, also for foreign hires, and for all other HR-issues. This employee is in direct contact with all

PhD students, knows them personally and is responsible for their welcome into the department, in collaboration with the faculty.

3. Recommendations

A key task of the review committee was to assess where and how improvements in the education, teaching and research of PhD students could be achieved. While overall the PhD training is going quite well, all parties involved in the interviews came up with suggestions for improvement with the goal to optimize the individual development and the research of the PhD students. The committee has merged these suggestions in a series of recommendations, as detailed per topic below.

3.1 Information to PhD students

At present, the PhD students need quite some time to become familiar with the practical aspects of doing their PhD. This includes the use of administrative systems for travel expenses and salary issues. The PhD students also find it challenging to find out what is expected from them with respect to research, education and teaching. This includes information regarding credits for courses. With the recent appointment of a new HR-employee, the welcome procedure for the PhD students is already in the process of being optimized. The committee recommends making sure that the welcome package includes the up-to-date information on administrative procedures and all relevant regulations, as well as local guides to seminars (compulsory, optional), administrative responsibilities, examination procedures including the PhD defense, PhD courses and information on the composition and activity of the appropriate committees for PhD education as provided to the review committee. We recommend to hand these documents out in printed form and to additionally make them available in electronic form on a website/drive that is accessible to all PhD students to ensure access to the most recent, up to date version. We recommend that feedback from the PhD students on practical issues is actively sought by the committee for PhD education at a regular basis and acted upon by the department.

3.2 Planning of education and teaching

As part of their education, the PhD students need to take two mandatory courses – the introductory and the pedagogic course. While PhD students are eager to take the pedagogic course, it can be hard to obtain a place. As a consequence, some PhD students that have been teaching are approaching the end of their contract but have not been able to attend the pedagogic course. Given that the pedagogic course is not organized by the department, this requires action from the management of the department and coordination at the level of the faculty and/or university.

Furthermore, while there is abundant information on past PhD-courses at the department, a clear overview of the upcoming courses at the department and faculty level is not in place and the capacity is not always sufficient. This hinders the planning of the education program of individual PhD students. This holds, for example, for access to the course on scientific writing and the pedagogic course mentioned earlier. In this context, the recommendations of the stakeholders and alumni for the education are of interest. They note that many graduates could benefit from improved communication skills, which besides presentation skills also include skills on how to get a clear message across in a range of professional settings including oral discussions. They also note that data analysis and programming skills could receive more attention and would be an asset for all graduates. We agree with this assessment and recommend ensuring the availability of such courses.

Besides such general courses, the PhD students require access to specialized courses. Given the small number of PhD students in some disciplines, such specialized courses, by necessity, should cater to PhD students from multiple universities. The department could consider whether it could be beneficial to make multi-year, formal arrangements with other departments in Sweden or abroad to exchange information on planned curricula, develop joint courses or to guarantee access when needed. Improving the course program, providing a long-term planning, strategy and vision and improving the visibility of the courses on offer is already recognized by the management of the department as the key task for the coming years. We agree with this assessment.

The fact that PhD students obtain teaching experience during their education is viewed as an asset for their potential future academic career. We recommend to continue offering this opportunity to all PhD students in the future. The teaching load of the various PhD students differs greatly. This is directly linked to the number of PhD students in each field; in fields where PhD students are few, they are requested to teach more. As long as all teaching is compensated for by extending the duration of the PhD-contracts, this difference among the PhD students is justified. However, there is room for improvement in the planning of teaching assignments. PhD students indicate that they have missed opportunities to teach because they learnt of them only a few weeks in advance. It is strongly recommended to aim for a multi-year plan of teaching assignments of each individual PhD student and for the department as a whole. Given that funding of new PhD students cannot be predicted, this plan will of course need to be regularly updated.

The PhD students indicate that the use of the Individual Study Plan as a living document and planning tool for their education and teaching can be improved. Currently, supervisors and examiners sometimes face technical challenges when implementing changes. Furthermore, given the planning issues regarding courses and teaching mentioned above, the appropriate information is not always available when supervisors and examiners meet with their PhD students. We recommend addressing the technical problems and we re-emphasize the need for improved long-term planning of the teaching and education. This will facilitate a more effective use of the Individual Study Plan as a planning instrument in supervisory meetings.

3.3 Research

PhD students and staff agree that the research aspects of PhD-projects are very successful. The PhD students feel well supported by their advisory teams and enjoy working at Gothenburg University which they find an intellectually stimulating environment. Some staff indicate that they would like to spend more time on supervision than is currently possible given their other tasks, but this does not appear to be an issue for a large number of the staff. Given the importance of supervision for the successful and timely completion of each PhD study, we encourage the Department to ensure that incentives to supervise are in place and clearly communicated to the staff.

The level of formal training in PhD supervision skills differs among the staff. Although we have no indication that this affects the quality of the supervision, we recommend that the Department and/or the Faculty implement measures to provide appropriate training to new staff and to facilitate peer-feedback, exchange and reflection on PhD supervision issues within the group of supervisors and examiners.

In some of the disciplines, such as marine geology and physical oceanography, there are relatively few staff and PhD students and there currently is a risk of a lack of critical mass.

This is not ideal for the continuity in and quality of the research aspects of the PhD training. If the ambition and advantage of PhD education in a broad Department of Marine Sciences is to be maintained, which we strongly recommend, the department must ensure a long-term sustainability of the diversity and critical mass of all key disciplines. The department management is aware of this issue and will take this into account when hiring new staff. We note that the research education would also benefit from a further integration of and collaboration between the disciplines and the award of one single PhD degree in Marine Sciences instead of the current situation where PhD students can choose between a degree in Marine Sciences, Marine Geology or Oceanography.

Because technical support in the department is limited, knowledge on analytical techniques and field procedures may be lost when there is no opportunity to transfer this knowledge from departing to incoming PhD students. This could be partly addressed by making a collection of manuals and method descriptions per discipline. Given that knowledge of techniques is best transferred by people, we recommend that the department develops an additional strategy for this, possibly by assigning these tasks to researchers without teaching assignments.

The alumni indicate that PhD students could benefit if they are made aware that their PhD project is a project that they are managing with their supervisors. The awareness that the management of their project can be approached in a structured way that is transferrable to other projects may be useful in their further career. PhD students should be focused primarily on the science of their project, however, and learning the skills to become a fully-fledged scientist ready to stand on their own solid ground.

3.4 Career planning

The PhD students, stakeholders and alumni all applaud the PhD Career Day organized at the faculty level but also indicate that more possibilities for career support and planning could be developed. The stakeholders and alumni actively participate in the Career Day but are eager to have closer contacts with staff at the department. A key motivation there is to remain up to date with technological and analytical developments at the university and to exchange knowledge and ideas. Inviting stakeholders and alumni for seminars and any other means of increasing their networking is recommended. The committee notes that career planning could be discussed more frequently during the meetings with the supervisor and examiner. An even more active role in supporting proposal-writing skills is recommended.

3.5 Vision and ambition

Because of its history and recent start, the Department of Marine Science is still in a transition towards a truly interdisciplinary department with a well-defined joint vision and ambition for its PhD program. From the discussions of the committee with the various representatives it became clear that both the staff and the PhD students increasingly identify themselves as marine scientists, which is a very good thing. We note that the staff emphasize that rigid quantitative criteria such as the number of papers per thesis do not do sufficient justice to the quality and diversity of research projects. We agree fully. To promote a further integration of the various parts of the program, we would recommend that the management and staff formulate a short qualitative joint vision and ambition for the PhD program and PhD theses in words (~ 1 page) and communicates this across the PhD student cohort.

We also recommend that the department accurately records and regularly monitors statistics regarding their PhD students. This should at the minimum include the duration and scientific

output of each PhD project, how much teaching the PhD students do, where they are employed after graduation, their gender and, if possible, how they progress in their career.

3.6 Concluding remarks

The committee was impressed by the quality of the PhD program and the enthusiasm and dedication of the PhD students and all staff involved. We stress that our recommendations thus are meant to improve an already well-functioning program. To aid implementation of the suggestions, the key recommendations are repeated in a short bullet-list below.

- Improve the information package for incoming PhD students (welcome package)
- Develop a long-term PhD course curriculum, with other universities as partners
- Facilitate long-term planning for the teaching by the PhD students
- Remove technical issues in the use of the Individual Study Plan as a planning tool
- Develop a strategy to maintain technical expertise beyond a PhD project and to optimize technical support
- Strengthen the links with stakeholders and alumni
- Develop additional strategies to support PhD students in their career planning
- Formulate a joint vision and ambition for the PhD program
- Award PhD degrees in Marine Sciences only
- Collect and monitor all relevant statistics on the PhD program

Appendix I – Curricula vitae of the committee members

Caroline P. Slomp is Professor of Marine Biogeochemistry at Utrecht University, the Netherlands since 2013. She received an MSc in Soil Science from Wageningen University (1991) and a PhD in Environmental Science from the same university (1997) based on research carried out at the Royal Netherlands Institute for Sea Research on Texel. Following postdoctoral positions in paleoceanography and groundwater chemistry, she was appointed Assistant (2004) and Associate (2006) Professor in Biogeochemistry at Utrecht University. Her research focuses on the biogeochemistry of modern and ancient marine systems using a combination of seagoing fieldwork, experiments and quantitative models. She has supervised 13 PhD projects to completion and has contributed to various international PhD courses on reactive transport modeling, paleoceanography and global biogeochemical cycles.

Michal Kucera is Professor of Micropalaeontology and Paleoceanography at the University of Bremen since 2012, and is currently the Dean of the Faculty of Geosciences. He finished his undergraduate studies at the Charles University in Prague in 1994 and obtained a PhD in Marine Geology from the University of Gothenburg in 1998. Following a postdoc at the University of California in Santa Barbara, he worked at Royal Holloway University of London, and held professorship positions there (since 2004) and at the University of Tübingen (since 2005). His research combines studies of biological processes in marine organisms with the investigation of their fossil record as archive of evolution and climate change. As past president of the Micropalaeontological Society and member of the steering boards of the international PAGES and PMIP projects, he strives to promote community engagement and international collaboration in research and education on past and present marine environmental change. He supervised 16 PhD students and is the speaker of the German-Canadian international graduate training group ArcTrain.

David Langlet was awarded an LLD (Doctor of Laws) in Environmental law from Stockholm University 2007 and was admitted as reader (docent) at the same university in 2010. He subsequently was senior lecturer and subject-director of environmental law at the Department of Law, Stockholm University. While on leave from Stockholm University he was a research fellow at the Faculty of Law at Oxford University and Christ Church in 2013/2014. Since 2015, Langlet is chair in Ocean governance law at the School of Business, Economics and Law, Gothenburg University. He is director of elective courses in environmental law and marine environmental law and supervises PhD students on various topics relating to the marine environment and marine resource governance. His research has touched on a wide range of topics in the fields of environmental law, law of the sea, energy law, and international economic law. Among his current areas of interest are jurisdictional issues relating to marine pipelines, the regulatory framework for carbon capture and storage, the role of the EU in marine environmental governance in the Arctic, and the relationship between scales and boundaries as understood in science and in law respectively.

Dr Ingela Isaksson holds a PhD in marine zoology and graduated from Gothenburg University in 1999. Main research areas include shallow coastal marine ecosystems, plant-animal interactions, eutrophication related issues and biodiversity. After six years abroad on different part-time post-doc positions she returned to Sweden. Since 2006 Ingela holds a position at a regional governmental agency, the County Administrative Board (CAB) of Västra Götaland, where she coordinates collaboration at the local, regional, national and international scale. At the CAB she also is coordinator of one of three national marine spatial plans under development in Sweden, the Skagerrak and Kattegatt marine spatial plan. In 2015

she was assigned (50%) to the national governmental agency, Swedish Agency for Marine and Water Management (SwAM). At SwAM Ingela is in charge of the coordination of the EU-funded collaboration Pan Baltic Scope aiming for alignment of national marine spatial plans in the Baltic Sea region involving all EU member states countries sharing the sea basin of the Baltic Sea Region and relevant regional intergovernmental authorities. Pan Baltic Scope is the successor for the recently finalized Baltic SCOPE (2015-2017) www.balticscope.eu which constituted a unique cooperation, a learning-by-doing exercise, as the national planning was taking place while the project was running, at the same time uniting planning authorities around the Baltic Sea.

Daniel Sarabi is a PhD student at the Institute of Chemistry & Molecular Biology, Department of Biochemistry & Biophysics at the University of Gothenburg. He received a BSc in Biomolecular Science from Griffith University, Gold Coast, Australia (2013) and an MSc in Protein Science from Lund University, Lund, Sweden (2015). The title of his current research project is '*Computational Development and Analysis of Time resolved Protein Dynamics*', under the supervision of Professor Richard Neutze. Daniel is currently also the chair of the PhD council at the faculty level, representing all PhD students at the Faculty of Science.

Appendix II Program of site visit, Gothenburg University, April 9, 2018

08.00-08.30 The assessment panel carries out an internal meeting
08:30-09:30 Interview: Department leadership

- Per Hall (Head of Department)
- Henrik Pavia (vice head of Department, head of Department from July 1 onwards)
- Göran Broström (Director of research Studies)
- Lotta Willerstrand (Head of administration)

09:30-10:15 Interview: Administrative staff
10:15-10:45 Coffee break
10:45-11:45 Interview: External stakeholders and/or alumni
11:45-12:00 Time for reflection
12:00-13:00 Lunch
13:00-14:00 Interview: Doctoral students
14.00-15:00 Interview: Supervisors and examiners
15:00-15:45 Coffee. Panel prepares feedback to faculty and department management
15:45-16:30 Feedback to faculty management and department management/equivalent
16:30-18:00 Panel works with review statement

Appendix III – List of PhD students that finished their PhD since July 1, 2015 and their current employment (where relevant).

1. Josefin Sefbom, 25 September, 2015, "Dispersal of microalgae." Postdoc University of Gent, Belgium, and return period at Department of Marine Sciences, University of Gothenburg.
2. Susanna Strömberg, April 2016 "Early life history of the cold-water coral Lophelia pertusa - with implications for dispersal".
3. Sam Fredriksson, 29 April 2016. "Estimating the air-sea gas transfer velocity during low wind conditions". Permanent position at consulting company SEMCON (40%), and soft money researcher at Department of Marine Sciences (60%).
4. Lisa Sundqvist. September 30, 2016. "Genetic structuring in natural populations". Permanent position at Swedish Meteorological and Hydrological Institute (SMHI).
5. Louise Eriander, December 2, 2016, "Restoration and management of Eelgrass (*Zostera Marina*) on the west cost of Sweden". Soft money Researcher position at Department of Marine Sciences (60%). Presently maternity leave.
6. Fabian Roger, June 2, 2017. "Biodiversity and ecosystem functioning. What is diversity? What functioning?" Postdoc at University of Lund, Sweden.
7. Ola Kalén, June 16, 2017. "Ocean circulation in the Amund Sea, West Antartica". Permanent position at Swedish Meteorological and Hydrological Institute (SMHI).
8. Daniela Carvalho de Abreu. October 27, 2017. "Evaluation of suitable nursery areas for Penaeid shrimps in shallow water systems in southern Mozambique". Works in Mozambique, was part of an exchange between Mozambique and Sweden.
9. Susanna Gross, November 24, 2017 "Phenotypic and Genotypic Responses in the Planktonic Diatom Skeletonema marinoi: Effects of Natural Processes and Anthropogenic Stressors".
10. Gurpreet Kaur Kahlon., November 28, 2017. "From Sea to Society - Climate change, Microbial community interactions and Socio-economic impact scenarios".
11. Stina Jakobsson-Thor, 2017. "Seagrass wasting disease: impact of abiotic factors and chemical defense". Moved to Bergen, look for position (possible postdoc), work on project at Department of Marine Sciences a few more months.