Final Report

NF – POGO Centre of Excellence in Observational Oceanography

at the

Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung

Biological Station Helgoland and Wadden Sea Station Sylt, Germany

Phase II, Year 1 (1 December 2013 – 30 September 2014)
Report dated December 2014 (updated January 2015)

Prof Dr Karen H. Wiltshire (Programme Director) and Dr. F. Gerald Plumley (Coordinator)
Executive Summary
The Alfred-Wegener-Institut Helmholtz-Zentrum für Polar-und Meeresforschung (AWI) proudly hosted the most recent Centre of Excellence in Observational Oceanography (CofE). The Phase I CofE, conducted in Bermuda (CofE-BIOS), was completed after four very successful years (2008 – 2012); Phase II was relocated to Germany as the CofE-AWI (starting in 2013).

The CofE-AWI continued its strong focus on providing state-of-the-art training in ocean and marine sciences to Scholars from developing countries. Ten Scholars from 10 developing countries were resident in Germany for 10 months, primarily at the Biological Station Helgoland and the Wadden Sea Station Sylt; the scientific focus on Helgoland was the global oceans while near shore/ coastal/ shelf issues were dominant themes on Sylt. In addition to coursework on a variety of topics (including both 'science' and 'core skills'), field trips and research cruises, the Scholars conducted independent research projects on select topics; the results of the research projects were presented to the entire faculty/staff as an oral presentation and as a written report in the format of a scientific journal suited to the specific subject matter.

The CofE-AWI was very successful. The exit interviews were strong. All 10 Scholars were honored to have attended and all indicated they would recommend the programme to friends/colleagues. One of the goals of the CofE-AWI was to provide 10 early-career Scholars with the knowledge, skills and, importantly, the confidence required to move forward in their chosen fields of study. That this goal was met is indicated by the statistics: four of the 10 Scholars have since acquired in PhD positions in Europe; two Scholars are actively pursuing PhD options in the US and two are pursing PhD options in India; the remaining Scholars have returned to their home countries to continue with their previous work/research, often with a corresponding increase in status/salary commensurate with their CofE training. All are now participating in the NANO-Programme.

The CofE-AWI also supported a very successful three-week Training Programme in the Philippines; one of the attendees was subsequently invited to participate in the Year 2 CofE-AWI. A brief overview of the training programme includes the following details:

Detection of HABs in Southeast Asia by Remote Sensing:
Operational Warning and Regional Monitoring Protocols

The Marine Science Institute (MSI)
University of the Philippines Diliman (UPD)
Dr. Laura T. David and Dr. Aletta T. Yñiguez
Seconded by: Dr. Rhodora V. Azanza, Mr. Joseph Dominic Palermo and Mr. Aldwin Almo
23 February – 15 March 2014

This report provides an overview of the goals and objectives of the CofE-AWI, details of the 10 month programme, and plans for the future of the programme. The appendices offer a wealth of information about the Scholar research projects, the Bolinao training programme, the CofE-AWI student handbook, shipboard training, and numerous other activities and accomplishments of the Year 1 CofE-AWI.
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Figure 1. Year 1 Scholars at the Inauguration Event, Museum of Natural History, Berlin.
1.0. The NF-POGO CoE-AWI Programme

1.1. Mission
The NF-POGO Centre of Excellence provides world class education and training courses in the field of observational oceanography using the expertise and infrastructure of the Alfred-Wegener-Institute for Polar and Marine Science (AWI) and building on existing POGO expertise and networking with international experts.

1.2. Central Goals
- To utilize the infrastructure and expertise at the AWI to found a Nippon Foundation – POGO Center of Excellence and provide world class education and training with an emphasis on emerging countries;
- To solidify the already effective networks between trainees and Professors of previous NF – POGO training programs, and the new scholars who will be trained at the Centre of Excellence;
- To setup a regional training program

1.3. Rationale
Ocean and shelf seas are pivotal to the future of humankind. Currently the oceans provide roughly 20% of the protein consumed by humans. Emerging countries, with a huge need for ocean resources, will play an increasing role in the near future, defining ocean governance and science. Education founded on a well-managed mix of interests and needs in the field of oceanography and marine science is imperative in order to secure Earths’ Future Ocean as a sustainable resource.

The Nippon Foundation is highly successful in bringing together expertise from all over the world in educational programs specialized in marine issues. The AWI is Germany’s foremost Polar and Marine Research Institution with an excellent worldwide research and teaching reputation. This combination, profiting from the experience of the NF-POGO Centre of Excellence (CoE) at BIOS, was the rationale for setting up a new NF-POGO Centre of Excellence in Observational Oceanography at the Alfred Wegener Institute of Polar and Marine Research.

The NF-POGO Centre of Excellence Phase II goal is to enroll 10 scholars per year with the aim to:
- Combine multi-disciplinary expertise to broaden international horizons in ocean education;
- Increase the capacity and knowledge required for ocean observation in fragile shelf seas;
- Provide new training programs in emerging countries highlighting sustainable ocean needs with the help of an international team of experts;
- Build on the NF-POGO Expertise and scholar teams to ensure ocean educational continuum;
- Build on international collaborations and networks for increased communication of vital ocean issues.

The AWI is at the forefront of research in the field of ocean science. AWI has an exceptional pool of highly motivated and experienced teachers delighted to facilitate learning. Thus, the programme is geared to meets its goals by being able to attract highly motivated young graduates by offering them an ideal environment for an interdisciplinary, synergistic, and state-of-the-art training programme in ocean observations. Former NF-POGO teachers and organizers will be involved
organizing, running and teaching the programme, thus ensuring optimal utilization of previous CofE expertise in the new CofE.

The focus of the CofE-AWI is to provide training courses for ten scholars per year mainly from emerging countries (at least 7 out of the 10 scholars) on aspects of observational oceanography required for making educated and socially relevant decisions on the sustainability of the marine environment.

2. Description of the NF-POGO Center of Excellence in Observational Oceanography

Ten scholars were trained over a period of ten months in the field of observational oceanography, coastal ocean ecology and management, shipboard techniques, and independent research. The following sections provide details on each component of the 10 month programme.

2.1 Teaching: Description and Setup
The success of the teaching and training in the CofE was based on the following factors:
1. An excellent training environment
2. Relevant and interesting courses,
3. Honing of Communication skills and
5. Excellent experienced and motivated faculty.
6. Excellent students from different disciplines and backgrounds.

Although the AWI is capable of providing training under sophisticated conditions, we taught the courses from the basics up. For example, Scholars needed to know how to sample with a bucket and simple net and how to do rough analyses of carbon. The Scholars learned how to count phytoplankton/zooplankton with a basic microscope and were shown how to work accurately and effectively under a non-existent budget. It helped that many of the CoE faculty came from very poor countries and basic environments; it is also helpful that CofE faculty are engaged in a large number of International Projects, many of which make them very aware of the needs and constraints in developing countries. Hence, one of the many unique approaches that was pursued in lab. and fieldwork was to train scholars using the best possible conditions while at the same time ensuring that modified Protocols were provided with guidance for less sophisticated conditions.

2.1.1 The Daily/Weekly/Monthly Routine of Scholars
The Scholars had a busy schedule, including course work, shipboard work, development of core skills, and independent research; Cultural Exchange Events were also part of the curriculum. Classes generally met ‘all day’ Monday through Friday on Helgoland; Friday was devoted to independent research on Sylt. Evenings were devoted to a combination of social time, shared meals, and/or homework; many of the courses required considerable out-of-classroom time. The last two months were devoted to Independent Research Projects (along with the associated data analysis, synthesis, preparation for oral presentations, written reports) as outlined in Section 2.2.

2.1.2 Teaching: Schedules, Course Names and Instructors
Scholars received one month of formal introductory training (i.e., General Oceanography; Core Presentation Skills; Scientific Writing), after which more detailed and specialized courses were
provided; these courses optimized the expert scientific and teaching skills of a group of dedicated scientists/educators (Table 1).

Once the introductory course was completed the detailed courses began and, as can be seen from the syllabus (Table 1), included climate and the oceans, modelling of energy flow through the oceans, remote sensing, data management and statistics. The courses were highly practical in their set up.

The CoE encouraged the combination of simple experiments with monitoring as a basis for lab and field work. This unique combination of experimental science with monitoring programs formed a continuous basis throughout the syllabus of the CoE for student work; this approach was further emphasized during the "Question-based Learning Exercise", which focused on a comparison of the BATS time series (Bermuda) and the Helgoland Road time series. Having the PI of both time-series (Lomas and Wiltshire) available on Helgoland was a tremendous asset to the CoE Scholars.

The CoE-AWI was unique, relative to the CoE-BIOS, in that it was held at two locations, the Biological Station Helgoland and the Wadden Sea Station Sylt. Both locations are home to AWI research (the primary institute is in Bremerhaven; the Scholars made periodic visits to the home institute, spending approximately two weeks in total). Although the two AWI stations are both situated on islands in the North Sea, they are incredibly different in terms of overall environments (Helgoland is the open ocean site, while Sylt is the near-shore coastal site, situated in the Wadden Sea).

Scholars spent the first five months on Helgoland. As expected for the North Sea ecosystem, it was rather cold and very windy. Scholars moved to Sylt in May, just as the days were getting noticeably longer and warmer. From a scientific perspective, these were ideal locations to teach the course in ‘ocean’ and ‘nearshore’ science.
# Table 1. Course groupings, titles, dates, and instructors.

<table>
<thead>
<tr>
<th>Course Title/Dates</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 December 2013 – 28 March 2014</strong></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td>F.G Plumley, Rebecca Störmer</td>
</tr>
<tr>
<td><strong>Ocean Sciences</strong></td>
<td></td>
</tr>
<tr>
<td>General Oceanography</td>
<td>F.G. Plumley</td>
</tr>
<tr>
<td>Biological &amp; Chemical Oceanography</td>
<td></td>
</tr>
<tr>
<td>Plankton Ecology</td>
<td>Karen Wiltshire, Alexandra Kraberg</td>
</tr>
<tr>
<td>Elementary Marine Chemistry</td>
<td>Karen Wiltshire, Alexandra Kraberg, Ragnild Asmus</td>
</tr>
<tr>
<td>Molecular Methods for Plankton Observations</td>
<td>Katja Metfies, Estelle Kilias, Christian Wolf</td>
</tr>
<tr>
<td>Ecological (Nutrient) Stoichiometry</td>
<td>Maarten Boersma</td>
</tr>
<tr>
<td>Trace Elements and Natural Radionuclides</td>
<td>Michiel Rutgers v.d. Loeff</td>
</tr>
<tr>
<td><strong>Physical Oceanography</strong></td>
<td></td>
</tr>
<tr>
<td>Basics</td>
<td>Grit Freiwald</td>
</tr>
<tr>
<td>Waves: From Whale Songs to Tsunamis</td>
<td>Ursula Schauer</td>
</tr>
<tr>
<td>Global Cycles of Biogenic Elements</td>
<td>Dieter Wolf-Gladrow</td>
</tr>
<tr>
<td>Physics of the Earth/Ocean Climate System</td>
<td>Peter Lemke, Martin Werner</td>
</tr>
<tr>
<td>Remote Sensing</td>
<td>Roland Doeffer, Birgit Heim &amp; Astrid Bracher (T. Platt and S. Sathyendranath)</td>
</tr>
<tr>
<td><strong>Question-based Learning Exercise</strong></td>
<td></td>
</tr>
<tr>
<td>Time-series: Theory and Practice</td>
<td>Michael Lomas, Karen Wiltshire, Alexandra Kraberg, Maarten Boersma (F.G. Plumley)</td>
</tr>
<tr>
<td><strong>28 April – 9 May</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Shipboard Training</strong></td>
<td></td>
</tr>
<tr>
<td>Heincke Cruise</td>
<td>Jelle Bijma, Vikram Unnithan, FG Plumley</td>
</tr>
<tr>
<td><strong>3-11 May 2014</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Spring Break</strong></td>
<td></td>
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</tbody>
</table>
12 May – 25 July 2014

North Sea and Wadden Sea Ecosystems

<table>
<thead>
<tr>
<th>Course</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population and Community Ecology (Sylt)</td>
<td>Christian Buschbaum, Tobias Dolch</td>
</tr>
<tr>
<td>Physics and Hydrodynamics</td>
<td>Hans Burchard</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Ralf Ebinghaus</td>
</tr>
<tr>
<td>Ecosystem Function</td>
<td>Harald Asmus</td>
</tr>
<tr>
<td>Geological Processes and Methods</td>
<td>Christian Haas</td>
</tr>
<tr>
<td>Sediment Biogeochemistry</td>
<td>Michael Schlüter</td>
</tr>
<tr>
<td>Benthic Techniques</td>
<td>Werner Armonies</td>
</tr>
</tbody>
</table>

Experimental Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Design</td>
<td>Maarten Boersma</td>
</tr>
<tr>
<td>Statistics in R</td>
<td>Mathias Wegner</td>
</tr>
<tr>
<td>Time-series Analyses</td>
<td>Mirco Scharfe</td>
</tr>
</tbody>
</table>

Applications to Seas Worldwide

<table>
<thead>
<tr>
<th>Topic</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal and Shelf Seas Management</td>
<td>Victor de Jonge, Diana Giebels</td>
</tr>
<tr>
<td>Comparative Oceanography</td>
<td>Harald Asmus, Claudio Richter, Bernhard Mayer</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>Bela Buck</td>
</tr>
</tbody>
</table>

28 July – 2 October

Independent Research Project

<table>
<thead>
<tr>
<th>Activity</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Period</td>
<td>Various</td>
</tr>
<tr>
<td>Final Oral Presentations</td>
<td>F.G. Plumley (and M. Boersma)</td>
</tr>
<tr>
<td>Submission of Final Written Reports</td>
<td>F.G. Plumley</td>
</tr>
</tbody>
</table>

Notes:
Core Skills modules, such as Scientific Presentation, Writing, Ethics, Management, etc. were held periodically throughout the 10 month CoE.

2.1.3 Advanced Study Topics

The 10 month programme included almost eight months of course work, seven of which was on more advanced topics. The courses were designed to be useful to students and not a showcase of methods and equipment. Consequently we encouraged the combination of simple experiments with monitoring as a basis for lab and field work. This unique combination of experimental science with monitoring programs formed a continuous basis throughout the syllabus of the CoE for student work.

Figure 6. Lab work.
The first set of advanced topics included work in the major disciplines (i.e., Biological Oceanography; Chemical Oceanography; Physical Oceanography). These courses were followed by more ‘integrative courses’ such as those involved in Climate Change, Remote Sensing, and Biogeochemical Cycling. On Sylt, the focus of coursework shifted toward ecological functions and/or coastal processes. These courses provided most of the Scholars with the tools they will most likely be using in their home countries, where there is frequently an emphasis on ‘coastal issues’, such as management and/or fisheries.

Another area of advanced studies involved the Experimental Methods courses, which placed considerable weight on sampling and experimental design and statistics (i.e., proper sampling and experimental design combined with correct application of statistics, which is of essential importance in scientific research). During these weeks, the most common experimental and sampling designs, errors in these designs, and basic statistical tests needed to analyse these designs were considered. Previous experience had shown that the level of knowledge on statistical methods of graduated students is generally low; the same proved to be true for the Year 1 CoFE Scholars. As the courses progressed, Scholars dealt more with advanced statistical analyses such as multivariate analyses, pattern recognition and non-parametric statistics.

2.1.4 Communication Skills
An essential aspect of becoming a successful scientist is to be able to communicate information (e.g., results and implications obtained from research) in both oral and written form. These skills are often not adequately covered in earlier education, and hence are appropriate topics for the CoFE.

2.1.4.1 Oral Presentation Skills
Oral presentation skills were practiced early and often. For instance, on the second day the Scholars were in Germany they were asked to stand at the front of the class, use Google as source of information, and tell us about the food, tourist attractions, and local beauty of their home countries. This is an easy ‘ice breaker’ exercise for the students, an exercise that helps allay shyness/fears of standing in front of the group – speaking in English. The next oral communication exercise was also done during the first week. This involved each student presenting a short “CV” of life events (e.g., photos of family, hobbies, etc.) and research (e.g., figures/graphs from earlier research). These presentations were further honed over the next few weeks and were eventually given to faculty/staff when the Scholars arrived on Helgoland and again when the Scholars arrived on Sylt. Scholars were required to give oral presentations in several courses as part of the ‘examination process’. In at least one course, the examination process included debates. The final presentations on independent research represented the final organized work on oral presentations (Section 2.2).

2.1.4.2 Scientific Writing Skills
Writing skills were also practiced, both early and often. For instance, during the first few weeks of the training, Scholars were asked to write short (~200 word) abstracts about several key figures or organizations associated with the CoFe-AWI (e.g., Alfred Wegener; POGO; Nippon Foundation). These reports were graded more for ‘English’ than for content (i.e., Google searches quickly provide
much more than 200 words on each topic); the English corrections were done in class, with considerable input/questions from all Scholars.

Several courses required written reports, in one form or another, as a component of the evaluation/grading scheme of the course. The final written report of the independent research (Section 2.2 and Appendix 7.2) represented the final assignment in scientific writing.

2.1.5 Shipboard Training

Periodic cruises were carried out on Helgoland and Sylt. Many of the cruises on Helgoland emphasized methods/protocols used in the Helgoland Road Time-series Program; however, several cruises were related to course work and/or Scholar research projects (see Appendix 7.2). Cruises from Sylt were generally related to courses and/or Scholar research. Most cruises (Helgoland/Sylt) were rather short (e.g., a few hours), while cruises on the Heincke were several days in duration. More details are provided in Table 2.

As one example of shipboard experiences, work on the Aade involved Scholars working in small groups (2-4 Scholars/group) that visited the Helgoland Roads sampling site. Water samples were taken along with physical/chemical measurements (e.g., temperature, salinity, O₂, etc.). Water samples were returned to the lab where the Scholars, working with ‘subsamples’, determined nutrient levels (e.g., nitrate, ammonium, phosphate), alkalinity, salinity and chlorophyll. Primary production (¹⁴CO₂) measurements were taken at routine intervals by the Helgoland Roads crew, but with ‘assistance’ by the CofE Scholars. Periodic net tows were used to examine phytoplankton and/or zooplankton abundance and diversity. These site visits and the subsequent analyses of data were conducted as part of the courses in Chemical and/or Phytoplankton Oceanography.

Work on the Heincke was more diverse. Participants included graduate students from the AWI POLMAR program and undergraduates from Jacobs University. CTD casts were a routine part of the water column sampling program. Bongo nets were used for zooplankton. Multi-corer and box core samples were taken at different locations (emphasizing either muddy sediments from regions with low current speeds or sandy sediments from regions with greater current speeds). Side scan multi-beam sonar was used for topological mapping of the seafloor and/or identification of ships sunk in the area during WWII. Laboratory work on the Heincke involved numerous steps: water samples were processed for nutrient analyzes (to be conducted in Bremerhaven); chlorophyll analysis; DO measurements; sediment analyses (grain size and type); and microscopic identification of phytoplankton and zooplankton.
Four Scholars (Shaazia, Mathew, Subrata and Lobsang) were selected to attend the Strategic Marine Alliance for Research and Training (SMART) Atlantic Summer School, which took place on board the RV Celtic Explorer from 12th to 16th September 2014. Details of the SMART training can be found in Appendix 7.1.

### TABLE 2. Research cruise details for Year 1 CofE-AWI.

<table>
<thead>
<tr>
<th>Ship/Vessel Name</th>
<th>Location</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aade</td>
<td>Helgoland</td>
<td>Helgoland Road Time-series and/or other class activities</td>
</tr>
<tr>
<td>Uthörn</td>
<td>Helgoland</td>
<td>Helgoland area</td>
</tr>
<tr>
<td>Heinke</td>
<td>Helgoland – Bremerhaven transect; North Sea around Helgoland area</td>
<td>Multi-day cruises with students from POLMAR and Jacobs University; at-sea programme led by Jelle Bijma and Vikram Unnithan (F.G. Plumley)</td>
</tr>
<tr>
<td>Mya II</td>
<td>Sylt</td>
<td>Classroom activities and/or Scholar research projects</td>
</tr>
<tr>
<td>Polarstern</td>
<td>Bremerhaven</td>
<td>Ship was in dry dock, but Scholars were able to spend a day to tour this world-famous ice breaker</td>
</tr>
<tr>
<td>RV Celtic Explorer</td>
<td>Ireland/ Belgica Mound Province</td>
<td>See Appendix 7.1</td>
</tr>
</tbody>
</table>

#### 2.2 Cultural Exchange Events

The CofE-AWI was about more than just work. The idea of Cultural Exchange is deeply embedded in the Japanese culture; the Nippon Foundation encouraged events beyond the ‘normal classroom/laboratory’ and especially those that facilitated inter-cultural learning experiences. Hence, the Scholars were involved in a large number of Cultural Outreach events, both those organized by the CofE and those organized by the Scholars and/or (new) friends of the Scholars. A list of CofE-organized events is provided below.

A few words about Cultural Events organized by Scholars and/or Scholars’ friends is appropriate. Many of the Scholars attended religious services while in Germany. There was an interesting ‘Drumming’ class on Helgoland that attracted the attention of many Scholars. The scholars attended all the national celebrations on the Islands eg. The 1. March celebrations. The Scholars frequently invited their new friends to dinner in their dorms/apartments and/or the Scholars were guests at the homes/apartments of friends. Weekly football matches were attended by several Scholars.

One Cultural Exchange activity, initially promoted by the CofE, but rapidly incorporated and expanded by Scholars, was the weekly evening meal each Saturday. Each week, a different Scholar was responsible for setting the menu, which was based on dishes from the home country. Everyone

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*Figure 8. Sharing dinner with the “Haus Mom” and Renate (helped process visa applications). Photo by Sutaporn Bunyajetporn.*
shared in the preparation and/or clean up – and certainly everyone sharing the food, exchanging stories about the food and/or listening (and dancing) to music from the 10 different countries.

Cultural Events organized by the CofE-AWI included:
- Berlin Wall Memorial
- Weekly German Classes (Helgoland)
- Tour of Helgoland Lighthouse
- Dinner with Helgoland Mayor (Jörg Singer)
- Helgoland Day (Independence of Helgoland, 1 May)
- Tour of Helgoland Weather Station
- Seal Colony/Winter Nursery (Düne)
- New Year Celebration (German style) on Helgoland
- 1st March Helgoland celebration
- Historical Churches, Homes, Business Establishments and Castles of Sylt/Keitum (Tobias Dolch)
- Denmark (Rømø area) Coastal Excursion
- Natural and Cultural History Tour of Helgoland (Prof Dr Gotthilf Hemple)

2.3 Independent Research Projects

2.3.1 Project Selection
Each CofE Scholar was given the opportunity to design and execute an independent research project. This concept was first introduced to Scholars when they first arrived in Germany; there were several ‘informal’ discussions about the topic during the General Oceanography course.

Scholars chose their independent research topic in mid-January while on Helgoland. Many Scholars were able to conduct a large amount of research very early in their CofE tenure, while others required more assistance and/or access to field sites on Sylt. Regardless, all Scholars completed the required coursework and managed to find time to read/think about their projects while on Helgoland; the research projects became increasingly important as the Scholars moved to Sylt, where one day per week (Friday) was devoted to research. The last weeks of the programme (28 July – 2 October) were devoted exclusively to research and/or associated activities (i.e., data analysis, synthesis, write up, preparation of the final oral defense). The project titles and mentors are listed in Table 3:

<table>
<thead>
<tr>
<th>Scholar</th>
<th>Research Project Title</th>
<th>Mentors</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Development of a Plankton Carrying Capacity Model for the North Sea</td>
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<td>Natália Signorelli</td>
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<td>Dmitry Sein, Mirco Scharfe, Grit Freiwald, Pedro Montoro, F.G. Plumley</td>
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</table>
2.3.2 Final Project Reports

Each Scholar was required to write a final report of their independent project. The format was to be that of a journal suitable for the research conducted. Reports were turned in to mentors for review/editing, and then returned to the Scholar to make suggested improvements. Manuscripts were subjected to multiple revisions. A copy of each report is available (Appendix 7.2).

2.3.3 Presentations, Graduation, and Departure

As the research projects were nearing completion, Scholars were asked at increasingly close intervals to present short PowerPoint presentations of their projects. Initial presentations focused on ‘the question/hypothesis’, while subsequent presentations focused on ‘materials and methods’, then ‘results’, and finally on conclusions’. As graduation approached, the seminars moved from weekly to 2X/week then 3X/week until near the end when meetings were daily.

At the same time the seminars moved to a daily schedule, the ‘type of presentation’ was also changed: early presentations focused on providing the Scholars with PowerPoint slides they could present to a scientific audience (e.g., at a national science meeting; at home to the colleagues at work/school); the daily seminars shifted the focus to a ‘general audience’ (e.g., the lay public). The general audience presentations also were required to be much shortened (i.e., ~30-40 minutes for the science presentations vs. 7-8 minutes for the general audience presentations).

Similar to our experiences in previous years (i.e., CoE-BIOS), these shifts (i.e., from science to general; long format to short format), were very difficult for the Scholars. Scholars insisted they “must” show every slide, every data point, and present and discuss every possible conclusion.

After more than 2 weeks of very hard work, the Scholars presented wonderful presentations to the AWI faculty/staff (including secretarial and administrative assistants), lay public from the
community, a representative from the POGO Secretariat, and a representative of the Nippon Foundation. Comments from the audience were entirely positive. Most/all commented that they understood every presentation, even those on topics that they previously would have deemed ‘too difficult’ and/or ‘too far afield’.

In the end, the Scholars went home with two presentations: a science presentation (30-40 minutes) and a general audience presentation (7-8 minutes). Importantly, the science presentations were greatly strengthened because the Scholars had learned how to focus on the key questions/issues of their work and how to minimize unnecessary discourse.

The Graduation Ceremony took place a few short hours after the final presentations. The venue was the Naturgewalten, Sylt, a facility adjacent to the Wadden Sea Station. The evening included presentations by the Mayor of Sylt, Dr. Trevor Platt (POGO Secretariat), Prof. Dr. Karen Wiltshire (AWI), and Mr. Kentaro Ogie (Nippon Foundation). Scholars were presented a NF-POGO CoE-AWI Certificate and will be provided with transcripts once Year 1 activities are finalized. The Graduation Ceremonies ended with dinner, drinks, and dancing.

Following Graduation, Scholars had a few days to finalize their written reports (which had been ‘in progress’ for several weeks). The Scholars hosted a number of going-away parties, including a very nice picnic lunch (for their instructors and AWI graduate students) which was complete with lawn games and great food. The final days, as always with the CoE, were filled with mixed emotions. Scholars were excited about returning home to family and friends and/or to moving to their next position (Section 4.4.2). At the same time, Scholars knew their POGO Family would never be the same. They would remain friends and colleagues for life, but never as a group of 10, all together to enjoy the hard work, the excitement of learning new material, and sharing food and friendship.

3. Scholar Handbook

A “Scholar Handbook” was prepared during Year 1 to assist and guide Scholars while enrolled in the CoE. The Handbook included a brief overview of the mission, vision, and goals of the CoE and AWI, as well as background biosketches on the key faculty participants/lecturers. A list of contact information (e.g., medical, fire, personal issues, etc.) was also provided for both Helgoland and Sylt. The AWI Code of Scientific Conduct was outlined with links to the on-line documentation. The Code of Human Interactions was written expressly for the CoE Scholars and/or those who interacted with the Scholars on a professional (or personal) level. A brief overview of Safety was also provided, as this important issue was covered in more details on Helgoland and Sylt when the Scholars were resident. A copy of the Scholar Handbook is provided in Appendix 7.3.

The Scholar Handbook was provided (in digital format) to Scholars when they first arrived in Germany. The Handbook topics were covered in one of the ‘orientation lectures’ during the first week and again during the next two weeks as Scholars adjusted to Germany, the Programme, and the barrage of new/different information offered. After giving Scholars time to read, ask question, and fully understand the Handbook, they were required to sign a form agreeing to abide by the guidelines/rules/stipulations of the Handbook.
4. The Scholars

4.1. Eligibility and Prospects
The CofE was open to 10 Scholars. Originally, the CofE was intended exclusively for Scholars from developing countries. At the suggestions of NF, it was decided to extend the Program to a limited number of students from developed countries, such that the final enrolment target was roughly 8:2 (developing to developed nation student ration). The objective of this change was to broaden the NF-POGO alumni network (now called NANO) into developed countries; this change was seen as a positive step in terms of students from developing countries having a broader base of network colleagues.

All scholars must have at least a first degree in science. Preference was given to applicants who currently hold a position in a research or academic institution in a developing (or developed) country and anticipate returning to the country after completion of training at the CofE. Candidates had to demonstrate immediate relevance of their training to on-going or planned ocean observations in their home country.

4.2. Scholar Applicant Review and Ranking
Each student was asked to submit a completed application form (Appendix 7.4), a resume, two letters of recommendation, and copies of transcripts and/or certificates. Complete applications were combined and collated for review.

Applications were reviewed by a Committee consisting of the CofE Coordinator, Faculty, and POGO Secretariat staff.

The review criteria included the following:
   a) student’s academic background, both in general scope and in terms of grades/marks
   b) student’s current position (whether the student had a position, either academic or professional, that would allow them to make a contribution once they returned to their home country following the course).
   c) letters of recommendation
   d) student’s statement of career goals
   e) the potential of the student to do work in his/her home country when he returned based on each individual country’s commitment, both financially and politically, to the study of the global ocean
   f) assurances that each student would carry on the traditions and diligence of the Nippon Foundation
   g) goodness of fit with AWI faculty research programs
   h) regional balance
   i) male/female ratio of approximately 50:50

The course Coordinator assembled all applications and discarded those that were incomplete. He then collated all applicant information (personal data, educational background, research interests, etc) into a spreadsheet. As the first stage of review, the Committee members reviewed each applicant from a given geographic region. To ensure consistency, two members of the Committee
(the course Coordinator, Gerry Plumley, and POGO Scientific Coordinator, Vikki Chueng), reviewed all applications. Each member provided brief written comments on each student's strengths as well as weaknesses (if any), as well as a score based on his/her suitability and qualifications to participate in the NF-POGO CofE.

Based on written comments and scores, a number of students were eliminated from further consideration, as they were deemed either unqualified or less qualified than the other applicants. A list of applicants who passed this initial screen was created and provided to the Selection Committee for discussion via teleconference, and the final selection was made taking into account regional and gender balance. The final list was then forwarded to Nippon Foundation for review and consideration. As a final step, telephone interviews were held with the provisionally selected students, to determine each student's ability to converse in English and check their availability and willingness to attend the CofE. After receiving a positive response from the Nippon Foundation, invitations to participate in the CofE were extended to 10 students.

4.3. Application Pool
Applications were received from 83 students from 33 countries (Table 4); these numbers were similar to the numbers for the final year of the CofE at BIOS. The male:female ratio (71:29) was also similar to the previous year.

| Table 4. Applications for Phase II, Year 1 were received from the following countries. |
|-----------------------------------------------|-----------------|-----------------|
| Azerbaijan                                    | Ghana (3)       | Philippines (2) |
| Bangladesh (7)                                | Guinea (3)      | Solomon Islands (2) |
| Benin                                         | India (7)       | Spain           |
| Brazil (13)                                   | India (but Tibetan) | Sudan          |
| Chile                                        | Indonesia (5)  | Tanzania (5)    |
| China (2)                                     | Iraq            | Thailand        |
| Colombia (2)                                  | Kenya (3)       | Togo            |
| Cuba                                         | Madagascar (2) | Trinidad & Tobago |
| Egypt (3)                                     | Mexico          | Uganda          |
| Eritrea                                       | Nigeria (4)     | Venezuela (2)   |
| Ethiopia                                      | Peru            | Viet Nam        |

4.4 Year 1 Scholars

4.4.1 Introduction of the NF-POGO CofE-AWI Year 1 Scholars
The criteria for selection (Section 3.2) set a high bar. The selection committee was extremely pleased with the applicant pool for year 1 CofE-AWI and had a difficult time deciding between about 15-20 extremely well qualified applicant. The final 10 chosen did not disappoint. The Year 1 Scholars did a fantastic job as students, network members, and soon-to-be peers in the global ocean observing programmes throughout the world. This group of 10 early-career Scholars had very diverse backgrounds in terms of both type and duration of academic studies and/or hands-on research experience (i.e., on-the-job training). Brief overviews of the Scholars’ backgrounds are provided in Appendix 7.5.
4.4.2 Comments about the Year 1 CofE-AWI Scholars

One of the strongest factors of this group of CofE Scholars was the extent to which they were able to work together as a team. There was a high degree of cooperation and collaboration, perhaps best recognized by one Scholar helping another Scholar who was struggling on a specific topic. It was very reassuring to see the Scholars studying in small groups, where the ‘expert’ on a specific/given topic was ‘tutoring’ those whose backgrounds were less robust on the subject. This happened so often that it soon became evident that: 1) everyone had deficiencies in one or more area(s) – hence no need to be embarrassed if help was needed; and 2) that at least one person in the group was an ‘expert’ on any given topic – hence this person was able to accrue a high level of confidence that will almost certainly be carried forward in their career (either as teachers and/or researchers).

Three of the 10 Scholars remained in Europe (Germany and France) to start PhD studies; a fourth Scholar was accepted into a PhD Programme in Germany a few months after the CofE ended. One Scholar has a new job in her home country (Brazil). One Scholar is finishing the final details of the MSc work. Other Scholars are busy applying to graduate programmes and/or fellowships in the US (two) or India (two); a final Scholar is awaiting word from her government about funding of a research proposal that would allow continuation of the project initiated as a CofE Scholar.
5.0 Regional Training Programme in a Developing Country

In 2014, a regional training programme was held at the Marine Science Institute (MSI), University of the Philippines Diliman (UPD) (see Appendix 7.6). It is important that these training programmes underpin the successful work of NANO and feed into the already highly successfully run training programs in e.g. Vietnam, Brazil, India, and the Philippines.

A brief overview of the training programme includes the following details:

Detection of HABs in Southeast Asia by Remote Sensing: Operational Warning and Regional Monitoring Protocols

The Marine Science Institute (MSI)
University of the Philippines Diliman (UPD)
Dr. Laura T. David and Dr. Aletta T. Yñiguez
Seconded by: Dr. Rhodora V. Azanza, Mr. Joseph Dominic Palermo and Mr. Aldwin Almo
23 February – 15 March 2014

The causes and consequences of HABs vary from country to country within the SEA region. The premise of the Bolinao training programme was that, despite the country-by-country differences, there exists a single common set of detection methods and protocols that could be implemented, regardless of the region, for detection of HAB events in the early stages of bloom formation: these same methods and protocols could also serve as a platform for the development of an early-warning system.

The training programme included lecturers from the Philippines, Malaysia, Singapore, Japan, South Africa and the USA. In addition, 14 staff members from the UPD-MSI main campus and/or from the Bolinao Marine Lab (which is part of UPD-MSI) provided expert technical and teaching advice and training. A total of 24 trainees from six SEA countries participated in the training programme.
6.0 Preparation for the Future of the NF-POGO CofE-AWI

6.1 Going Forward: Plans and Programmatic Changes

6.1.1 Scientific Writing
The CofE-AWI had planned a course on Scientific Writing. Unfortunately, time was too short in Year 1 (and the push to start Year 2 soon after the Year 1 Scholars departed) precluded implementation of this important course. This must be remedied.

6.1.2 Independent Research Projects
Time was rather limited for the Scholars to carry out independent research projects in Year 1 (only 2 months, which included research, analysis, synthesis, writing, and presentation). In Year 2, the schedule of classes was reduced, providing more time for research, which is clearly the predominant reason most of the Scholars want to attend the CofE.

It should be noted that, despite the short time available for research, most of the Year 1 Scholars did a very professional job with their projects. The hope/goal for the future, however, is that these projects can be quickly/easily converted to publications – this will require additional time for detailed work, analysis, synthesis and writing.

6.1.3 Helgoland and/or Sylt
In keeping with the desire for a longer research period, a decision was almost made that the Scholars should spend most of their time on either Helgoland or Sylt in the out years. For Year 2, the decision was made to spend most of the year on Helgoland, with 1 month on Sylt.

6.1.4 Meals
The Scholars of CofE-BIOS did not have ready access to kitchens and/or grocery stores, hence meals were provided in the on-site cafeteria (excluding holidays). In contrast, Scholars of the CofE-AWI had easy access to kitchens and local grocery stores. The original plan was to provide two cooked meals per day for the CofE-AWI Scholars during the academic week (i.e., Monday – Friday). This proved impractical due to expense and venue selection (i.e., few establishments are open during the winter on Helgoland). After a few weeks on Helgoland, Scholars were given the choice of self-catering dinner or having a served meal; there was a unanimous decision to self-cater dinner during the week and all meals on the weekend while on Helgoland. Meals were much improved on Sylt and were provided at a reasonable cost due to the AWI connection with the Naturgewalten. Hence, Scholars very much enjoyed lunches and periodic dinners at this venue while on Sylt.

Clearly, food choices (served vs. self-catered) must be considered more carefully for incoming Scholar cohorts. Our preliminary contact with the Year 2 CofE-AWI Scholars has suggested a very different group dynamic in terms of meals, indicating ‘meals’ will continue to be an issue for the foreseeable future.

6.1.5 Research Tools
Another substantial change implemented in Year 2 of the CofE-AWI was to aggregate and condense coursework that involved research ‘tools’ (e.g., Stats: Modeling; Experimental Methods). These "core skills" courses were moved to the beginning of the course (immediately after the General Oceanography course) in the Year 2 schedule. Preliminary feedback from the Year 2 Scholars (who
arrived in Germany on 22 October 2014) has been very positive. The importance of this move is that it is intended to allow course instructors to ‘get deeper’ into the science, without having to backtrack/re-train Scholars on basic tools required for understanding the material.

6.1.6 ECTS Credits
The CoF has not been an accredited programme, either at BIOS or the first year at AWI. Many Scholars are not interested in receiving ‘official’ credits for the programme, but many Scholars would be able to use credits toward advanced studies. Karen Wiltshire has been in long-term talks with Jacobs University (Bremen) about securing accreditation for the programme. Meetings with the University President, Registrar, and Deans and Faculty from various schools within the University have all been positive – but this remains a work in progress. The goal is for Scholars enrolled in the CoF to receive up to 80 ECTS (European Credit Transfer System) credits for their course work and independent research.

6.2 Year 2 Scholars
The Year 2 Scholar selection process generally followed that of Year 1. The number of applicants was somewhat reduced, while the number of countries was almost unchanged. Pictures and home countries of the ten Scholars selected (who arrived in Germany on 22 October 2014) are provided below.
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7.1 Strategic Marine Alliance for Research and Training (SMART) Atlantic Summer School

7.2 Research reports of CofE Scholars
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7.3 Scholar Handbook

7.4 Scholar Application Form

7.5 Background Education and/or Training of Year 1 Scholars

7.6 Regional Training Programme: Philippines