

News from the POGO members

Almost all seabirds to have plastic in gut by 2050

Researchers have assessed how widespread the threat of plastic is for the world's seabirds and found the majority of species have plastic in their gut.



A red-footed booby on Christmas Island, in the Indian Ocean. © CSIRO, Britta Denise Hardesty

The study published in the journal PNAS, by CSIRO's Dr Chris Wilcox and Dr Denise Hardesty with Imperial College London's Dr Erik van Sebille, found that nearly 60 per cent of all seabird species have plastic in their gut.

In 1960, plastic was found in the stomach of less than 5 per cent of individual seabirds, rising to 80 per cent by 2010. The researchers predict that plastic ingestion will affect 99 per cent of the world's seabird species by 2050, based on current trends.

The scientists estimate that 90 per cent of all seabirds alive today have eaten plastic of some kind. This includes pieces of bags, bottle caps, balloons, toys and cigarette lighters, which have washed out into the ocean from urban rivers, sewers and waste deposits.

There is still the opportunity to change the impact plastic has on seabirds through improving waste management. Even simple measures can make a difference, such as reducing packaging, banning single-use plastic items or charging an extra fee to use them, and introducing deposits for recyclable items

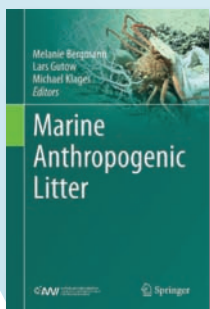
like drink containers. Efforts to reduce plastics losses into the environment in Europe resulted in measurable changes in plastic in seabird stomachs in less than a decade, which suggests that improvements in basic waste management can reduce plastic in the environment – and the negative effects this plastic has – in a short time.

The work was carried out as part of a national marine debris project supported by CSIRO and Shell's Social investment program as well as the marine debris working group at the National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara, with support from Ocean Conservancy.

In related research published in the journal Science, Dr Wilcox and colleagues found around 8 million metric tonnes of plastic go into the oceans each year, equivalent to 16 shopping bags full of plastic for every metre of coastline (excluding Antarctica). The international team analysed 192 countries bordering the Atlantic, Pacific and Indian Oceans, and the Mediterranean and Black Seas. By examining the amount of waste produced per person per year in each country, the percentage of that waste that is plastic, and the percentage of that plastic waste that is mismanaged, the team worked out the likely worst offenders for marine plastic waste.

This article was provided by Simon Torok, Communication Manager, CSIRO Oceans and Atmosphere

Spotlight on marine litter: A new book presents the current state of research



A new book gives an overview of the current state of research and of research gaps concerning litter in our oceans: "Marine Anthropogenic Litter" was released by Springer-Verlag as an Open Access publication in June 2015. The editors, Melanie Bergmann and Lars Gutow from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and Michael Klages from the University of Gothenburg's Sven Lovén Centre for

Marine Sciences, brought together experts from around the globe to contribute to the book. Estimates of the amount of litter in the world's oceans, its distribution, effects on humans and biota, and prevention strategies are just some of the complex topics addressed in the book's 16 chapters.

The editors were surprised to learn just how many regulatory initiatives exist around the world that deal with marine litter.

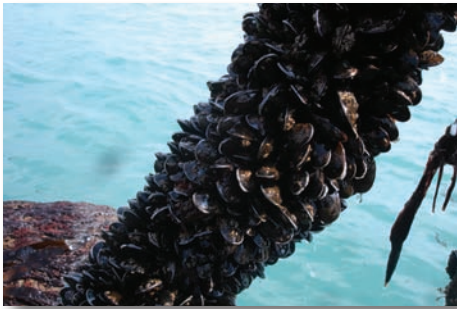
Unfortunately, they do not seem to have had an effect on the global scale: the rise in the amount of litter in the oceans shows no signs of slowing down. However, the book also highlights positive examples of litter prevention: "Some less prosperous countries such as Rwanda and Somalia have strictly prohibited plastic bags, which means that they cannot enter and harm the environment," Bergmann says. The introduction of a levy on plastic bags in Wales and Ireland has significantly cut the number of bags in circulation and is reflected in lower numbers of shopping bags found on Irish beaches. These measures show that, with good litter management, individual countries can make a difference, even at low expenditure.

To ensure that interested members of the public can also find comprehensive information on the subject, the editors and authors have made the book freely available on the Internet as an Open Access publication. Its DOI: 10.1007/978-3-319-16510-3.

This article was provided by Margarete Pauls, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research

News from the POGO members (cont'd)

Satellite technology puts 'mussel' into shellfish monitoring



Cultivated mussels.
Photo Credit: CEFAS

A Plymouth Marine Laboratory, PML-led project involving a team of UK scientists is exploring the use of satellites and meteorological data to monitor and forecast water quality events threatening shellfish farms, for the benefit of the shellfish industry and, ultimately, consumers.

The 2-year ShellEye project, funded jointly by the UK Biotechnology and Biological Science Research Council (BBSRC) and Natural Environment Research Council (NERC), will help to advance shellfish farming management practices, initially focusing on developing novel satellite monitoring and short-term forecasting techniques. These will then be integrated into the first water quality monitoring service for harmful algal blooms and targeted pollution events, specifically for the shellfish aquaculture industry.

Changes in water quality, such as the formation of harmful algal blooms, can have a negative impact upon shellfish farms and even pose public health issues through consumption of contaminated stock. Water quality in and around aquaculture farms in the UK and Europe is currently monitored by government agencies, using

a series of tests based on collecting water samples and analysing the flesh of the seafood being farmed.

Enhancing current monitoring practises, through using satellites and weather forecasts, will provide farmers with a cost-effective, near real-time source of information, to help manage shellfish harvesting. In turn, this should help minimise potential health risks and financial losses, supporting farmers in making more informed decisions about when and how much to harvest.

Dr Peter Miller, ShellEye project leader and senior scientist at PML, comments: "Our team will be working with colleagues in aquaculture companies, two in Cornwall and one in Scotland, to extend and adapt approaches that have been successfully developed for salmon farmers so that they can also benefit shellfish farmers. Importantly, this new approach to monitoring water quality around aquaculture sites will help build a multidisciplinary approach to support the UK's shellfish aquaculture industry."

The ShellEye team, led by PML, includes scientists and technicians from the University of Exeter, the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), and the Scottish Association for Marine Science (SAMS).

This article was provided by Helen Murray, Communications Officer, Plymouth Marine Laboratory

WHOI takes delivery of new research vessel *Neil Armstrong*



The *Neil Armstrong* research vessel
Photo Credit: Karla DeCamp, WHOI

Following completion of successful acceptance trials, the United States' newest research vessel, the *Neil Armstrong*, was officially turned over by the U.S. Navy on September 23 to the Woods Hole Oceanographic Institution (WHOI), which will operate the vessel as part of the national academic fleet.

In May 2010, the Office of Naval Research selected WHOI to operate the new vessel, which is designed to meet the range, endurance, and technical requirements for advanced oceanographic research around the world. Named for the Apollo astronaut who first walked on the moon, the *Neil Armstrong* replaces the recently retired *R/V Knorr*, which had been in operation since 1970. The new ship will meet the academic community's need for a general-purpose research vessel based on the East Coast of the United States.

"The U.S. Navy is proud to support the national research fleet by delivering state-of-the-art research vessels like the *R/V Neil Armstrong*," said Chief of Naval Research Rear Adm. Mat Winter.

WHOI's experienced crew, many of whom served on the *R/V Knorr* and have won high praise for their professionalism and service to ocean science, will serve on the *Armstrong*, with Captain Kent Sheasley in command.

The ship is expected to undergo a series of shakedown and science verification cruises starting in February and March 2016, which will allow scientific users to test the ship and its systems and make any necessary adjustments before it is declared fully operational. The *Neil Armstrong's* first science mission is planned for May 2016 in the North Atlantic.

"Today marks the launch of a new era of ocean research, building on the longstanding support of the U.S. Navy and the Woods Hole Oceanographic Institution for ocean science and exploration," said Senator Edward J. Markey (D-Mass.). "We look forward to the *Neil Armstrong* landing on Massachusetts shores and continuing the legacy of scientific excellence anchored in Woods Hole and impacting the world."

This article was provided by Stephanie Murphy, WHOI Public Information Office

News from the POGO members (cont'd)

Wave vibrations shaking Antarctic ice shelves

A new seismic study shows how Pacific Ocean waves are continuously shaking them



Map of Ross Ice Shelf seismic array
Photo Credit: SIO

A Scripps Institution of Oceanography, University of California San Diego-led research team found evidence that ocean-wave energy generated thousands of miles away in the North Pacific Ocean vibrates ice shelves in Antarctica, which can expand existing fractures that in turn may play a role in their disintegration.

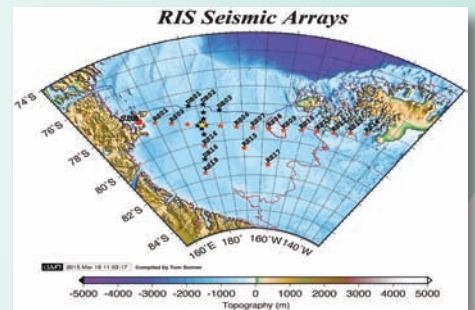
Scripps oceanographer Peter Bromirski and colleagues reported on data collected from a 34-station network of seismometers distributed across Antarctica's Ross Ice Shelf (RIS) in 2014-2015. In the National Science Foundation-funded project, the team is hoping to better understand the characteristics of seismic signals generated by ocean surface wave impacts, with the spatial variability of signal strength affected by propagation through zones of less competent ice. These vibrations could trigger the collapse of weakened ice shelves.

"The seismic survey studying the vibrations of the Ross Ice Shelf (RIS) in response to wave impacts will provide on-ice information on the structure and strength of the RIS, giving baseline 'state-of-health' ice shelf measurements that can be used to identify the magnitude of changes in its integrity over time," said Bromirski.

The seismic data showed that impacts of infragravity (very long wavelength ocean waves) and ocean-swell induced vibrations in the ice that can be felt 100 kilometers (62 miles) away from the front of the Ross Ice Shelf. Much of the ocean wave energy originated in the North Pacific Ocean, and caused higher amplitude vibrations than waves generated locally in the Southern Ocean.

Bromirski said the dominance of the long-distance wave energy is still not understood. The array will continue gathering data for 24 months, giving observations of two full annual cycles of change. A team of Scripps researchers returned to Antarctica in mid-October to begin retrieving the first full year of data.

This article was provided by Robert Monroe, Communications and Marketing, Scripps Institution of Oceanography, UC San Diego



Seismometers measure the vibrations of the Ross Ice Shelf
Image Credit: SIO

Fish teeth and tectonic plates tell a new story about world's largest ocean current

Fossil fish teeth recovered from drilling of the ocean floor around Tasmania, combined with the study of tectonic plate movements, has shed new light on the origins of the world's largest ocean current. This study by Howie Scher et al. (Nature, Vol 523, 30 July 2015: doi:10.1038/nature14598) has revealed how the flow of water around Antarctica began.

Despite its role in stabilising Antarctic ice sheets, the onset of the Antarctic Circumpolar Current (ACC) has been poorly understood. Tasmania separating from Antarctica about 35 million years ago created the Tasmanian Seaway and for a long time scientists have thought that the opening of this seaway enabled the onset of the ACC, but the study concluded that this is not the case.

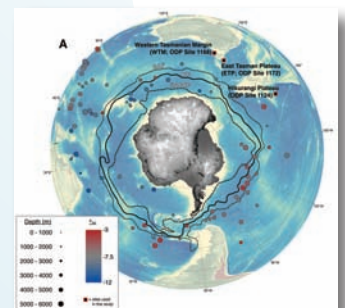
The study shows that in fact the Tasmanian Seaway had already been open for up to 5 million years before the ACC became a circulation feature. The authors found that opening of the Tasmanian Seaway on its own wasn't enough. It needed to move far enough north to be in the westerly wind band. Once it moved further north, the westerly winds were able to drive water through the seaway, and the Earth's biggest ocean current began.

Different oceans have distinct chemical (termed isotopic) "fingerprints", and this difference in the seawater is recorded in fish teeth that settle on the ocean floor, with the isotopes in their teeth preserving the seawater composition at their time of death.

The records show how Tasmania once formed a barrier between the Pacific and Indian Oceans, but as they moved apart water began to mix, first flowing from the Pacific towards the Indian Ocean, and then from the Indian Ocean to the Pacific, as it still does today.

These changes in ocean circulation are linked to global climate, and scientists believe this may have played a role in the draw down or sinking of carbon dioxide, leading to stabilisation of the 'icehouse' world.

This article was provided by Richard Coleman (Executive Director) & Joanne Whittaker (Marine Geophysicist), Institute for Marine and Antarctic Studies, University of Tasmania.



Seafloor map of the Antarctic oceans - the absence of land in a latitudinal band around Antarctica enables the present-day Antarctic Circumpolar current to circulate unimpeded. Image Credit: IMAS

News from the POGO members (cont'd)



Bryozoans live on the continental shelf around Antarctica. Photo credit: BAS

Antarctic sea bed life captures carbon as sea ice melts

Colonies of tiny filter-feeding Antarctic marine creatures (bryozoans), that appear to be thriving in response to a reduction in sea-ice cover, are playing an important role in carbon draw-down according to new research published on 21 September in the Cell Press journal Current Biology.

A British Antarctic Survey (BAS) investigation into biological change on sea beds of six continental shelf areas around Antarctica analysed bryozoan skeletons that were collected during ship-borne research cruises. Data from over 20 years included photographic studies that helped calculate their abundance. The most recent research cruises on board the *RRS James Clark Ross* used a custom built high-resolution camera lander.

Less sea-ice stimulates more growth in the algae that feeds the bryozoans, providing longer meal times. The data reveal that the annual production of carbon in the bodies of these bryozoans has increased due to a combination of

the animals growing more, living for longer and being more abundant. According to author Dr David Barnes from BAS these animals now take up 75,000 tonnes of carbon more than 20 years ago.

Dr Barnes said "The results from this study are an important step towards improving understanding of the impact of environmental change in Antarctica. It is well-known that the Southern Ocean is an important 'sink' for atmospheric carbon dioxide, but it was not realised that the seabed played such an important and increasing part. These changes to marine life in Antarctica's continental shelf areas – where the water is hundreds of metres deep – may help evaluate life's role in carbon draw-down. If this increased carbon capture applies to other sea-bed life then millions of tonnes of carbon from the atmosphere may be being transported to polar sea beds. This is equivalent to tens of thousands of hectares of tropical rainforest."

An unexpected find was that the South Orkney Islands—the world's first High Seas Marine Protected Area (MPA)—was identified as a place where the bryozoans were thriving most. A new international, BAS-led scientific cruise to the South Orkney Islands MPA in early 2016, should give researchers a close up look at why that particular location is so important. Barnes concludes: "The rain forests on land you can see are important with respect to the carbon cycle and climate change, but two-thirds of our planet is ocean, and below it the life you can't see is also very important in climate responses."

This research was funded by the Natural Environment Research Council (NERC), the Darwin Initiative (DEFRA) and the Pew Charitable Trusts. The paper 'Antarctic sea ice losses drive gains in benthic carbon drawdown' by DKA Barnes is published in Current Biology.

This article was provided by Athena Dinar, Senior PR & Communications Manager, British Antarctic Survey

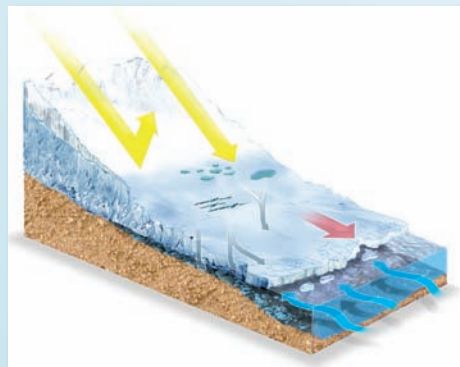


Image credit: Denver Museum of Nature and Science

Eye in the sky gives Arctic scientists new insight into ice loss

A custom-built Remotely Piloted Aircraft (RPA) has helped Scottish-based scientists survey one of the world's most dangerous terrains as they seek to discover causes of ice loss in the Arctic.

The RPA, a quadcopter, was built by Scottish Association for Marine Science (SAMS) engineer Shane Rodwell and used a mounted laser-range finder and a camera to measure and photograph glaciers in the polar region, collecting unique data for glacier experts Dr Nick Hulton of The University of Edinburgh and Professor Doug Benn of St Andrew's University.

The detailed images will help provide a 3D image of glaciers for their investigation into glacier 'calving' – the term given to large sections of glaciers breaking off and falling into the sea – which is increasing with global warming.

Dr Hulton explained: "The biggest increases to ice loss in the world's major ice sheets are happening not because of increased melting, but because of increased iceberg calving. "Warmer ocean temperatures have an effect because

they lead to more melting at the edge of the ice and this can destabilise and break-up the ice margins."

The mounted laser-range finder allowed SAMS engineer Shane Rodwell to photograph and measure the depth of every crevasse on a glacier. On each of the 15 – 20-minute missions, the camera took 1,000 images.

Mr Rodwell said: "The quadcopter has given us a viewpoint we didn't have before, so it will be really interesting to see what conclusions can be drawn from the new data.

The research was funded by the University of Edinburgh's Innovation Initiative Fund, The Carnegie Trust for the Universities of Scotland and the CRIOS project at the University Centre in Svalbard (UNiS) led by Professor Benn. The work was also supported by the Marine Alliance for Science and Technology Scotland (MASTS) and the NERC National Capability Funding for Technology Development.

This article was provided by Euan Paterson, Communications and Media Officer, SAMS

News from the POGO members (cont'd)

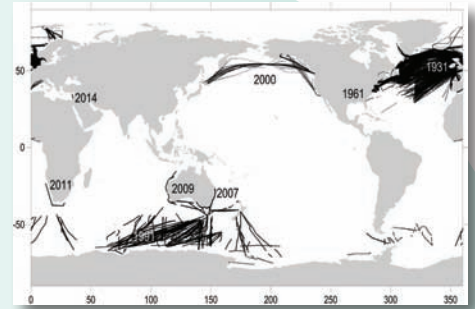
Global Alliance of CPR Surveys (GACS) – update

The Global Alliance of Continuous Plankton Recorder Surveys, known as GACS, brings together the regional CPR surveys around the globe with a remit to foster collaboration within the CPR community and to act as an interface between it and other global observing programmes. The most recent annual meeting was held in September 2015 where progress was reviewed and priorities set for the upcoming year:

- Development of the GACS database was acknowledged to be slower than originally anticipated, owing for the most part to the high turnover rate of IT personnel leading to inevitable delays as new staff are appointed and get up to speed.
- The next Global Status Report is due to be produced in 2016. The 2016 report will be modelled on its predecessor, available at <http://www.sahfos.ac.uk/research/publications/ecological-status-report.aspx>.
- Professional training and capacity building has been a particular strength of GACS recently, with a workshop held in September to provide CPR workshop training to survey members from Brazil and Australia. Since the Indian participants, who were to receive POGO funding, were not able to attend due to visa problems, SAHFOS will host an additional training workshop early in 2016.
- Conducting and publishing the first global analysis from the GACS database was seen as a major priority, and will focus initially on representative ecosystem Essential Ocean Variables (EOVs) currently being discussed by the GOOS community. GACS offers the best opportunity for describing plankton community variability at approaching-global scales.

The Executive Director of POGO, Dr Sophie Seeyave, attended the GACS meeting and presented information on the GEO Blue Planet program. The upcoming 3rd Symposium will offer an opportunity to improve links between GACS and these other groups. The recently established GOOS Biology and Ecosystems Panel invited Dr Batten as the Chair of GACS to participate as a panel member. The panel will use the experience of its members with sustained ocean biological and ecosystem observations to develop and identify relevant EOVs. It is intended that promotion of the EOVs and expanding successful observing systems will enable them to become part of a sustained GOOS framework. The goals of GACS match very closely with the goals of the panel and our involvement should be mutually beneficial.

This article was provided by Sonia Batten, Chair of the GACS Board of Governance



Map showing the GACS coverage to-date. The inception year of each regional survey is overlaid. Image Credit: GACS

Capacity Building Updates



The new scholars of NF-POGO Centre of Excellence in Observational Oceanography. Photo Credit: Alfred Wegener Institute/ Nadine Michel

The 3rd Year Scholars arrive at the NF-POGO Centre of Excellence at the Alfred Wegener Institute

The 10 new NF-POGO Centre of Excellence scholars have recently arrived at the Alfred Wegener Institute and are starting their training in observational oceanography. The training programme will last ten months and will provide a multi-disciplinary approach to enable the young scientists to learn a broad understanding of oceanographic processes.

North South Atlantic Training (NoSoAT)

During a "floating summer school" an international group of 32 scholars will be trained in basic techniques of oceanography and marine biology on a North-South transect of the Atlantic from Bremerhaven to Cape Town,

onboard the *RV Polarstern*. In a competitive process 32 scholars were chosen from 470 applicants to take part. The scholars will learn to sample and analyse waters ranging from shallow shelf waters of the North Sea through deep waters of the Canary Islands and highly productive waters of the upwelling areas in front of the coast of Namibia.

The floating summer school is a joint project between the Alfred Wegener Institute, the Nippon Foundation-POGO Centre of Excellence and the Irish Strategic Marine Alliance for Research & Training (SMART) program. This programme is jointly supported by the Mercator Foundation and the Nippon Foundation-POGO Centre of Excellence. It is an initiative in the framework of the European Campus of Excellence (ECE).



The RV Polarstern plough through the open sea. Photo Credit: Alfred Wegener Institute/ Folke Mehrtens

POGO Activities

The second batch of scholars graduates from the NF-POGO Centre of Excellence at the Alfred Wegener Institute

On August 20, the second year scholars graduated from their 10 months of training at the Nippon Foundation-POGO Centre of Excellence (CofE) in Observational Oceanography hosted by the Alfred Wegener Institute in Germany. On behalf of the POGO Secretariat, Sophie Seeyave attended the graduation ceremony in Helgoland, where the scholars had spent the first half of their training at the CofE. The scholars were joined by many of their lecturers and tutors and were presented with their certificates by Mr Kentaro Ogiue (Nippon Foundation) and by Prof. Karen Wiltshire (AWI).



Photo Credit: Alfred-Wegener-Institute/Uwe Nettelmann

It was very rewarding to see the students graduate and to be able to talk to them about their integration in the alumni network (NANO). The students gave presentations on their research projects, which were all very impressive. A number of them will continue to work with their supervisors on manuscripts for publication. Four of them are returning to permanent positions in their home countries. One has been accepted onto a PhD programme in Germany and others are waiting to hear the results of similar applications or will be applying for positions back in their home countries.

The graduation presented a good opportunity for POGO representatives to meet with Mr Ogiue from the Nippon Foundation, to discuss the future of NF-POGO activities. It was agreed that Karen Wiltshire and Sophie Seeyave would pay a courtesy visit to the Nippon Foundation following the POGO-17 Meeting in Japan. It was also discussed, and later agreed by the Executive Committee, to invite some of the NF-POGO alumni to give presentations/posters on their research and NANO activities as a side event to the POGO Meeting.

This article was provided by Sophie Seeyave, Executive Director, POGO Secretariat

POGO Executive Committee Meeting

The POGO Executive Committee Meeting took place on September 10-11 in London. It was attended by Executive Committee members, Karen Wiltshire (Chair), Eduardo Balguerias, Ed Hill, Margaret Leinen, Jan Mees, Yoshihisa Shirayama, Sun Song, and POGO Secretariat staff Sophie Seeyave and Vikki Cheung. Apologies were received from John Field.



Photo Credit: POGO Secretariat

The Committee Members made good progress on the agenda items including finalising POGO's Strategy Document, discussing the legal status of POGO, finalising the Memorandum of Understanding for the POGO Members and the Operating Procedures, evaluating requests from potential new members to join POGO, and making plans for the next POGO meeting in Yokohama hosted by JAMSTEC, with particular focus on the parallel workshops and keynote speakers.

Recommendations were made for POGO to support (a) the Principality of Monaco's request for an IPCC Special Report on the Ocean, and (b) the topic of ocean observations for societal need, particularly in the Arctic, for the forthcoming G7 Summit in Japan in May 2016. The two days proved to be very productive and the high attendance showed the commitment of the Executive Committee members to POGO.

This article was provided by Vikki Cheung, Scientific Coordinator, POGO Secretariat

5th European Marine Board Forum "Ocean-Climate Nexus"

Sophie Seeyave represented POGO at this high-level event at the European Parliament in Brussels on 21 October 2015. Certified with a "COP-21" label, the Forum aimed to deliver a voice from the marine research community on the critical role of ocean science as part of the societal response to climate change and on the key research priorities. Scientific presentations were given by Prof. Mojib Latif (GEOMAR, Germany) and Dr. Ceri Lewis (University of Exeter, UK) before the Consensus Statement was officially launched.

The Statement (http://www.marineboard.eu/ocean-climate-nexus/sites/marineboard.eu.ocean-climate-nexus/files/public/The%20Ocean-Climate%20Nexus_Consensus%20Statement.pdf) summarises the role of the ocean in the Earth and climate systems, sets out some of the key challenges for unravelling the links between ocean and climate and the most important research priorities that can help provide answers and support an evidence-based societal response to climate change. In particular, it highlights the need for ocean observations, the gaps in our current capacity to observe the ocean (e.g. biological and biogeochemical parameters), and the critical role of long-term time-series observations.

This article was provided by Sophie Seeyave, Executive Director, POGO Secretariat

Other News

New Directors

POGO welcomes the incoming Directors of Woods Hole Oceanographic Institution (WHOI), The Scottish Association for Marine Science (SAMS) and Sir Alister Hardy Foundation for Ocean Science (SAHFOS). During September and October, Dr. Mark Abbott, Prof. Nick Owens and Dr. Willie Wilson became the Director of WHOI, SAMS and SAHFOS, respectively.

New POGO Members

POGO has accepted two new members to the forum. Rutgers University and Harbor Branch Oceanographic Institute, Florida Atlantic University, both in the USA, submitted requests to become members, which have been approved by the Executive Committee.

POGO-17 Meeting

26-28 January 2016, Yokohama, Japan – Hosted by JAMSTEC

The agenda for the POGO-17 Meeting will soon be finalised and will be placed on the POGO website at <http://ocean-partners.org/pogo-17>. Delegates are advised to make their travel and accommodation bookings well in advance.

Attendees should register for the meeting using the online form at https://docs.google.com/forms/d/1wnl0zWegBwoiVwYRSGR9VWC94YdydQrk24y5i9pMtQQ/viewform?edit_requested=true.



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