United Nations
Educational, Scientific and
Cultural Organization

Intergovernmental
Oceanographic
Commission

ANNUAL REPORT 09

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of UNESCO

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Dates: Unless otherwise indicated, all dates are understood as falling in the year 2009.

Editors: Thomas Gross
Designer: Eric Loddé

Special thanks to contributing authors, and those who assisted in providing information and illustrations.

For bibliographic purposes, this document should be cited as follows:
Annual Report 2009
IOC Annual Reports Series No. 16, UNESCO 2009
(English)

Printed in 2010
by the United Nations Educational, Scientific and Cultural Organization
7, place de Fontenoy, 75352 Paris 07 SP, France

(IOC/2010/AR/16)

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1.0 Statement from the Chair

Javier **VALLADARES**
Chair
Intergovernmental
Oceanographic
Commission
of UNESCO

Dear colleagues and friends

Whenever we face an annual review, we seek to identify the most significant aspects of the period, highlighting them with a brief analysis. In this case, 2009 has been a very intense and participative year making a short summary into a really complex task.

We have experienced the selection process for our new Executive Secretary. We have gone through a period of almost ten years in which we shared and benefited from the expertise and experience of our former Executive Secretary, Dr. Patricio Bernal (Thank you Patricio!).

The selection process showed, in a very clear manner, our shades as an intergovernmental agency with regional views and opinions as well as interests linked to more than only ocean sciences. Our selection process became a forum for debates, opinions and changes within UNESCO.

And from the process a new light emerged, with a new energy and an invaluable new vision in the person of Dr. Wendy Watson-Wright, selected not only for her managerial experience in interdisciplinary organizations but also for her skills within the intergovernmental arena. In addition the IOC is proud to respond to the UNESCO gender equality mandate by selecting our first female Executive Secretary.

The start up phase of a regular process for global reporting and assessment of the state of the marine environment including socio-economic aspects (AoA) was, without any doubt, a very important interagency effort for IOC within the UN system. Reaching consensus was not easy, but almost all of us understood that these assessments of the ocean imply a continuous process where the scientific view cannot be absent. Obviously this "almost all of us" clearly shows that differences persist, though I believe not on the need of the process, but in its implementation methodology.

We convened a very important Ministerial Round Table on Oceans in our search of more and better dialogue and commitment with the issue. But here we ran into the interdisciplinary walls and boundaries that still remain within the system, which clearly demonstrate the shades and interests of our Member States and even the different stances some of them hold in diverse fora.

The current challenge is to find the best way to get a continuous and useful assessment of the marine environment, by integrating and understanding these different approaches.

Aware of UNESCO's mandate, we have tried to prioritize Africa in all our activities.

Another new challenge is the incorporation of the marine biology community through the integration of the Ocean Biogeographc Information System (OBIS) to our organization.

Already the IOC has been preparing in a dynamic and professional way for the IOC's 50th anniversary, which will be celebrated with several events organized for 2010 and 2011.

We are again reminded of our responsibilities by two devastating earthquakes, Haiti and Chile, with the latter generating a tsunami with very short lead time to warn coastal communities. We work now with the challenge not only of forecasting and alert, but also optimizing times and reaction mechanisms after the alert for each of our member states. Linking science with coastal communities is not just "application or operational oceanography" but first and foremost "saving human lives", and we as IOC have to make our best contribution.

1.1 Statement of the Executive Secretary

I take great pleasure in the opportunity to honour the 2009 achievements of the IOC in this Annual Report. In doing so, I am reminded of the quote by Isaac Newton that we see further now than we have in the past because we are "standing on the shoulders of giants". The former Executive Secretary of IOC, Dr. Patricio Bernal, led the commission with passion and determination during his tenure, and I thank him for this. His retirement from IOC in 2009 corresponded with changes in UNESCO's leadership as well. Though our chair has pointed out that I am the first woman to lead the IOC as its Executive Secretary and Assistant Director General to UNESCO, again I will have the privilege of seeing greater heights because of the leadership of UNESCO's new and first female Director General, Irina Bokova, who took office in 2009.

The 2009 Annual Report provides me the occasion to express great hope for our future based on the successes of our past. The IOC reached a momentous milestone in 2009, celebrating at the OceanObs'09 conference in Venice ten years since an early proposal for an observing system for the global oceans in 1999. Likewise, the completion of the Assessment of Assessments as lead-up to a regular process was, as discussed later, an impressive accomplishment. 2009 also saw the beginning of the integration of the biological information from the Ocean Biogeographic Information System into the work of the International Oceanographic Data Exchange. I am especially excited to see this transition to a more fully integrated data system.

Communication is critical – communication of knowledge provides us with a tool for survival. IOC, in leading the global effort to establish ocean-based tsunami and coastal hazards warning systems, in 2009 helped several National Warning Centres acquire their own expertise and experience, and work together to streamline data exchange and communication. With every test and practice run, we are coming closer to reaching our goal of ultimately providing adequate protection at local, regional and global scales.

Having led the Canadian delegation to IOC a number of times, I have seen the importance of interagency collaborations and commitments within the UN. The IOC in 2009 upheld its earlier commitments to work more closely within UNESCO and the UN family. With our partners in WMO, JCOMM held its third successful session. We collaborated effectively with our colleagues at UNEP throughout the Assessment of Assessments process as well as during the launch of the Blue Carbon Report, and with our UNESCO colleagues during the 'Climate Change and Arctic Sustainable Development' workshop in Monaco. For COP-15 in Copenhagen, IOC worked with our network of marine institutions to provide support to African Ministers and Negotiators in the lead up to the meeting. We were also a key member of the UNESCO team responsible for supporting Madame Bokova's commitment to tackle climate change issues on several fronts. This was the first UNFCCC Conference of the Parties convention a Director General of UNESCO has ever attended and it marked a significant step in the direction of scientific support.

During the 2009 IOC Assembly, we saw the distribution of several flags to member states whose research vessels will help us celebrate the IOC's 50th anniversary. These ships are now sailing the world and helping to spread the word of the exemplary work the IOC team has done and continues to do. It is thus with great honour that I assume the helm of this wonderful organization as we move into our 51st year and beyond.

Fair winds and following seas!

Wendy **WATSON-WRIGHT**
Assistant Director-General,
UNESCO
Executive Secretary
Intergovernmental Oceanographic
Commission of UNESCO

1.2 Mandate and Summary of 2009 – IOC global results and achievements

2009, a year of change and engagement.

Sometimes we may lose track, amidst the continuous rounds of meetings, conferences, and missions, of how our engagement in this sometimes cumbersome, often indirect, inter-governmental process is effective for our core mission. At such times it helps to remind oneself that we are all, IOC, UNESCO and all our partners too, engaged in contributing to the same vision - making our blue planet a safer, more sustainable space with all peoples sharing equally in its governance and benefits.

This year I will look through the lens of this vision at how 2009 played out for the Intergovernmental Oceanographic Commission. The year was the last one for Patricio Bernal as Executive Secretary of the Commission. He was at the Commission's helm for a decade during which period many opportunities arose; some were seized and some were too complex to negotiate in the time available. Overall we moved forward and were stronger for it and have his leadership to thank for it.

Reading through the annual report our engagement in climate matters at many levels is clear, as are the many efforts at making Africa a priority. Observations and proofing communities from ocean-based hazards also stand out as issues that again underscore the importance of IOC as the UN agency for the oceans.

The 2009 XXV IOC Assembly began the celebrations of the 2010 50th Anniversary of the IOC by accepting the official IOC anniversary logo.

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Organisation des Nations Unies pour l'éducation, la science et la culture
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Commission océanographique intergouvernementale
Comisión Oceanográfica Intergubernamental
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1960-2010

'SAFE' FROM A CHANGING CLIMATE

In a piece in this report "Science and Politics of Climate: the Essential Role of the IOC", one can be informed of the timeline of events that has brought us to 2010 - without clear and bold commitments on emissions that will cap global temperature rise to 2 degrees C. In a changing world, IOC has nevertheless striven to address climate from several angles – governance, science, observations, and capacity-development.

The Ministerial Round table at the 35th UNESCO General Conference (Nov 2009, Paris) addressed Oceans and Climate change: Adapting Coastal Communities to Sea-level Rise was one of the 3 themes discussed. It may be premature to gauge the impact of this round table, but it was certainly timely and addressed an issue important to the most vulnerable communities. These communities are placed in unenviable positions as climate change adaptation strategies have to account for emissions that do not seem to be on track to asymptote at the hoped for 2 degree level. Given the low capacities on the ground in developing regions for such adaptation, IOC as an inter-governmental body needs to ensure that in the end its interventions help and do not unintentionally hinder the very communities it is trying to help.

IOC participated in the climate change dialogue through its presence in the World Climate Conference 3, COP-15, and OceanObs'09 conferences in 2009. IOC collaborated with UN partners and presented climate-related documents 'Blue carbon: the role of healthy oceans in binding carbon' with UNEP; 'Ocean Acidification' with IGBP, SCOR and IAEA; and a comprehensive new version of the Surface Ocean CO_2 Atlas (SOCAT) Project dataset, containing more than 2,100 cruises from 1968-2007.

Coastal erosion is a primary concern to West African nations.

MAKING AFRICA AND DEVELOPING REGIONS A TRUE PRIORITY

Working with developing regions requires adherence to the principle of Delivering as One-UN, by working closely with UN partners and the national mandates of countries. Any other approach will distract scarce trained human resources from national priorities. This is a difficult fit for IOC, bound as we are with coordinating programmes formulated at global or regional scales. But as the UNESCO Priority Africa slowly gains traction, our efforts are increasingly in line with the UN principles of ownership that lead to sustainability. Some examples from the year illustrate the One-UN approach.

IOC assisted the African Union Commission to respond with one African voice in the run up to and during the Copenhagen COP-15. Estimates from IPCC on the costs of adaptation to climate change impacts in the coastal zones meant that these populous areas needed to be highlighted in the negotiating text for the COP-15. Presentations by African experts were facilitated at two special meetings of the African Ministers Conference on the Environment (25-29 May 2009, Nairobi, and 19-23 Sep 2009, Addis Ababa). The presentations were in response to important reports released, a few months before COP-15, on the costs of adaptation to climate change in the coastal zones (World Bank, Sept 2009), and estimated emissions vis-à-vis targets to cap global temperature rise to 2 degrees C (International Institute for Applied Systems Analysis, Sept 2009). IOC engaged African scientists to create a report, "Climate change impacts on the Coastal zones of Africa", and be present as a team to support African negotiators during COP- 15.

On a different tack, the Capacity-development section also held over a dozen workshops in Mozambique, Tanzania, and Kenya on the use of Decision Support Tools as a means of informing policy makers and civil society on the implications of coastal activities. This has now progressed to the point where participants can act as trainers, propagating the use of these numerical models. IOC also facilitated two workshops in Gabon and Cameroon on an integrated sub-regional approach to coastal erosion using Decision Support Tools.

The new ODIN AFRICA IV project was approved for 4 years (2009 to 2013). The outputs from

Dr. Paricio Bernal, with his wife Dr. Aracelie Bernal, receiving deserved thanks for his ten years of service as Executive Secretary of IOC from the 2009 XXV Assembly of IOC.

this project will be of direct use to countries as the plan was developed by participating countries. Products such as the national coastal and marine atlases, communication tools including policy and media briefs, and further volumes in the African Oceans and Coasts book series, will be immediately usable by all member states.

Ocean Sciences coordinated and is implementing the West Africa Adaptation to Climate Change in Coastal Zones (ACCC) Project (funded by UNDP and GEF). This project is developing adaptation measures to erosion in designated pilot sites of Gambia, Senegal, Cape Verde, Mauritania and Guinea Bissau.

KEEPING PACE WITH THE ALTERED NEEDS FOR OCEAN OBSERVATIONS

Calls from the OceanObs' series of conferences have built oceanographic scientific community consensus to certain grand objectives. The ocean observations community signaled its desire to help build sustained observing networks as the open-ocean component of GOOS at OceanObs'99 (18-22 October 1999, St Raphael), a concept developed by IOC and WMO in 1989. A decade later as GOOS implementation was seemingly stagnating at 60% of the full system, OceanObs'09 (21-25 Sept 2009 Venice) has again signaled a new resolve calling on 'all nations and governments to fully implement by 2015 the initial physical and carbon GOOS', also calling on 'all nations and governments to the implementation and international coordination of systematic global biogeochemical and biological observations...'

The Ocean Science communities will be well served by sustained observations as they diversify from a focus on global-scale ocean and climate prediction, and struggle to follow the decrease in environmental biodiversity, increasing carbon dioxide with resulting acidification, increasing nutrients in coastal waters, and higher invasions from species most likely by ballast waters. Loss of resilience of marine ecosystems and resulting loss of species is now much higher than in pre-industrial times and driving down the resilience of the ocean ecosystem. Reporting this to policy makers is our task that will be made easier by sustained and systematic global biogeochemical and biological observations systems.

OceanObs'09 was one of many IOC co-sponsored meetings furthering the dialogue on ocean climate change research, response and mitigation during 2009.

KEEPING COASTAL COMMUNITIES SAFE FROM HAZARDS

The IOC tsunami effort has earned the most visibility in recent years. It is the single IOC program that responds to the Delivering as One-UN in all aspects. The programme works at three levels – global, regional and national. At the national level the programme works with governments, civic authorities and others to raise awareness in coastal populations and increase their preparedness to respond to different levels of tsunami warning. As nations take up the challenge of putting in place national warning systems, the inter-governmental nature of the IOC plays a key role facilitating the exchange of information and knowledge between the different national systems and strengthening responses in the regional Tsunami Warning System. At the global level, the programme provides 'guidance on establishing the framework mechanism for a comprehensive, sustained and integrated end-to-end global system covering tsunami and other hazards related to sea level'. The section on tsunamis illustrates poignantly the lesson learnt from the lives lost in the tsunami off Samoa (September 2009) - that for near-shore earthquakes there are no warnings of tsunami, just a disciplined response in the few life-saving minutes given to coastal populations to respond. Unfortunately some 70 plus people died in the event, but even more unfortunately, many who survived the first sweeping wave left the high grounds to gather fish washed up after the first wave. They were washed away in the second wave. It is a sad reality that some-times even our sincerest and most professional efforts fall short. There remains gratifying work ahead as long as we can continue saving lives.

CONCLUSION

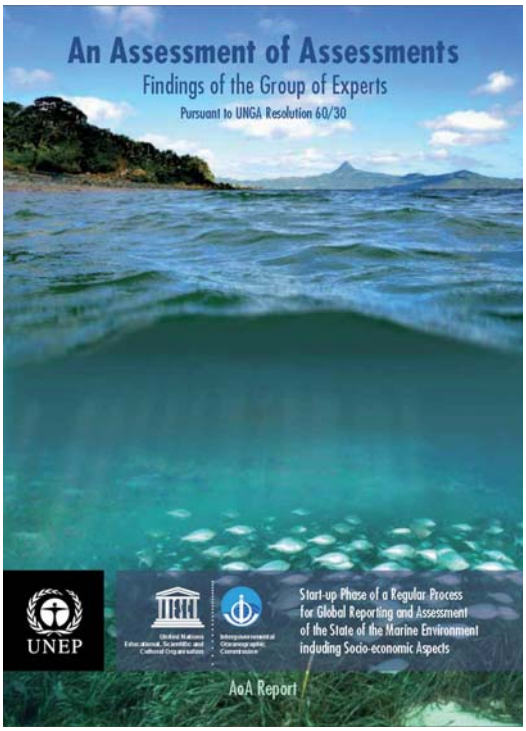
The year 2009 has been good for IOC. However one target proved a stretch too far as member states could only agree to postpone the launch of the Regular Process of Assessment of the State of the Marine Environment including Socio-economic aspects. Sometimes our proposals run ahead of the inter-governmental machinery rate of processing consensual agreements.

1.3 Moving toward an United Nations Regular Process for Assessing the State of the Oceans

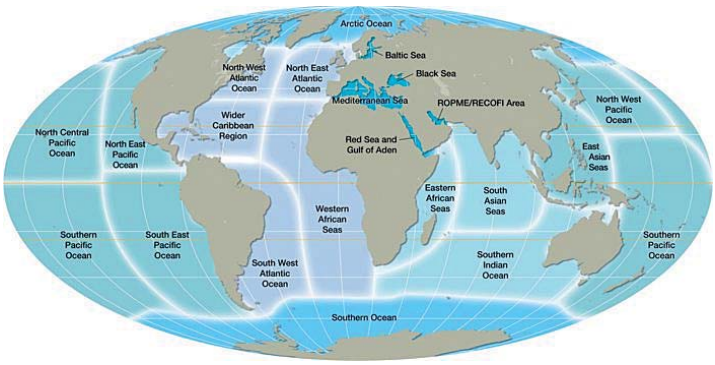
Despite the central role oceans play in our lives, significant gaps exist in our understanding of the complex processes at work – both natural and caused by human intervention. The oceans are changing and responding to a multiplicity of climate change and human driven processes affecting: the full dynamic of ocean circulation; the origin and fate of nutrients, carbon and other bio-active elements and molecules; large-scale changes in marine habitats, natural resources and the ecosystems under increased pressure from human activities. This is why the status of ocean natural systems, responsible for key ecological services, must be regularly monitored to establish a baseline upon which to compare changes and trends, and to provide scientifically based information for decision makers and more generally for society.

In view of these alarming trends, governments – at the 2002 World Summit on Sustainable Development (WSSD) decided to establish, by 2004, a Regular Process for the global reporting and assessment of the state of the marine environment, including its socio-economic aspects. Subsequently, the UN General Assembly in 2002, through Resolution 57/141: "Decided to establish by 2004 a regular process under the United Nations for the global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments […]" (paragraph 45). In 2005 the UN General Assembly, by resolution 60/30, requested the UN Environment Programme (UNEP) and the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) to serve as the lead agencies to carry out a three year start-up phase, in cooperation with all relevant UN agencies and Programs of the UN, to conduct an "Assessment of Assessments (AoA)".

Julian **BARBIERE**



AoA Findings of the Group of Experts book.



21 regions agreed on by the Group of Experts for the purpose of reviewing the assessments at the regional level are delineated to avoid overlaps while ensuring global coverage, including high seas areas.

The AoA was implemented through an independent and geographically diverse Group of Experts set up in 2006, tasked with a detailed examination of the various existing marine assessments, an evaluation of factors central to the quality of assessments, such as scientific credibility, policy relevance and legitimacy. The Group was also charged with the identification of best practices; thematic, geographic or data gaps, scientific uncertainties, as well as research and capacity-building needs, particularly in the developing world. The report also describes the type of assessment products that is expected from the process. The final and most critical task of the group was to formulate a series of options and recommendations regarding the institutional arrangements that would need to be put in place to implement the Regular Process. Amongst these, the proposal to establish a coordinating UN secretariat within one or two UN agencies is key to the process.

The crucial added value of the Regular Process will be its ability to deliver fully integrated assessments, bringing together environmental, social and economic aspects. The centerpiece of the package of products that the first cycle will deliver should therefore be a first version of an integrated assessment of the world's oceans and seas. This would be produced in the later years of the first cycle (2014–2015) on the basis of a number of preparatory, supporting products. As part of this integrated assessment, there could also be a thematic assessment of a major cross-cutting aspect of the world's oceans, such as food security. This would help develop novel cross-disciplinary and cross-sectoral approaches.

The publication of the AoA report was launched by IOC and UNEP on 31 August 2009 in New York. (The AoA report and its Summary in 6 UN languages is available at http://www.unga-regular-process.org). As expected and according to UN Resolution 63/111, a special Working Group of the General Assembly met in New York, to recommend to the UN General Assembly at its 64th session a course of action regarding the Regular Process, on the basis of the results of the AoA and the options defined by the Group of Experts. Whilst UN Member States have agreed in principle on the scope of the Regular Process, the UN General Assembly has decided to provide additional time for Member States to agree on the modalities for the implementation of the regular process, including the key features, institutional arrangements and financing. This review should be completed by a second meeting of the Ad Hoc Working Group (in September 2010) hopefully leading to the launch of the Regular Process in 2011. Most countries are supportive of the process, and even expressed intentions to fund it, some other countries requested additional time for Member States to review and decide on the modalities of implementation of the Regular Process. It will therefore be important to ensure political support of those nations in the coming months.

The contribution of IOC and UNEP was acknowledged during the Ad Hoc Working Group meeting and our leadership during the AoA phase was recognized in the UNGA Resolution (A/64/71) of December 2009, the future role of the two secretariats in the coordination and implementation of the Regular Process still remains to be defined by the General Assembly, hopefully in 2010.

The possibility of conducting preparatory work exists, but will have to be undertaken carefully, in view of different political sensitivities. As an example, in 2009 IOC and UNEP began implementing an 18 month GEF Medium Size project on a Transboundary Water Assessment Programme (TWAP), looking at the development of a common marine assessment methodology for open ocean, Large Marine Ecosystem (LME) regions and coastal zones. The project has been designed to also serve the needs of a future Regular Process in terms of assessment methodology, data gathering and products.

Another issue that will need to be clarified is the interaction of a future Regular Process with other global environmental assessment processes such as the future Intergovernmental Science-Policy Interface on Biodiversity and Ecosystem Services (IPBES) in terms of mandate, scope and deliverables, since it is the intention that the IPBES mechanism will include marine biodiversity.

The coordination of the Regular Process will require the engagement of all UN Programmes and Agencies relevant to ocean affairs, and particularly FAO, IMO, WMO, ISA. In the course of 2010, high level discussions will be required amongst UN executive heads so as to agree on the model for an inter-agency secretariat of the Regular Process. The UN-Ocean mechanism could be an appropriate forum for discussing the inter-agency secretariat issue.

All documents relating to the AoA and Regular Process can be found at http://www.unga-regular-process.org

Capacity-development

OVERVIEW 2

Ehrlich **DESA**

The Capacity Development programme of IOC identifies national priorities in marine and coastal management and engages experts with in-country training to address these priorities. The first phase of the programme, funded by the Swedish and Italian governments, came to an end in 2009. During the year the second phase of implementation began with training activities and projects in some regions. Training on hydrodynamic modelling took place in West Africa, and institutes in East Africa developed bathymetry mapping capabilities and implemented a number of projects addressing coastal management issues.

Catamaran lecture, Baltic Floating University

Various ship and land-based training and awareness raising activities on marine and coastal science were facilitated by the UNESCO/IOC Chairs, Floating Universities, and the University of the Seas programme. Support was provided by UNESCO/IOC and the network of marine institutions for African Ministers and Negotiators preparing for the Climate Change Conference (COP- 15).

The next biennium (2010-2011) will see a change in focus from in-country training of experts addressing national priorities to harmonization of capacity development activities across programme sections of IOC. The 2010 annual report will then report on the training activities conducted by the science, observations, and hazards programmes of IOC.

2.1 Decision Support Tools (DST) and training for coastal management

Strong capacity, locally generated and sustained, is essential to the success of any development enterprise.

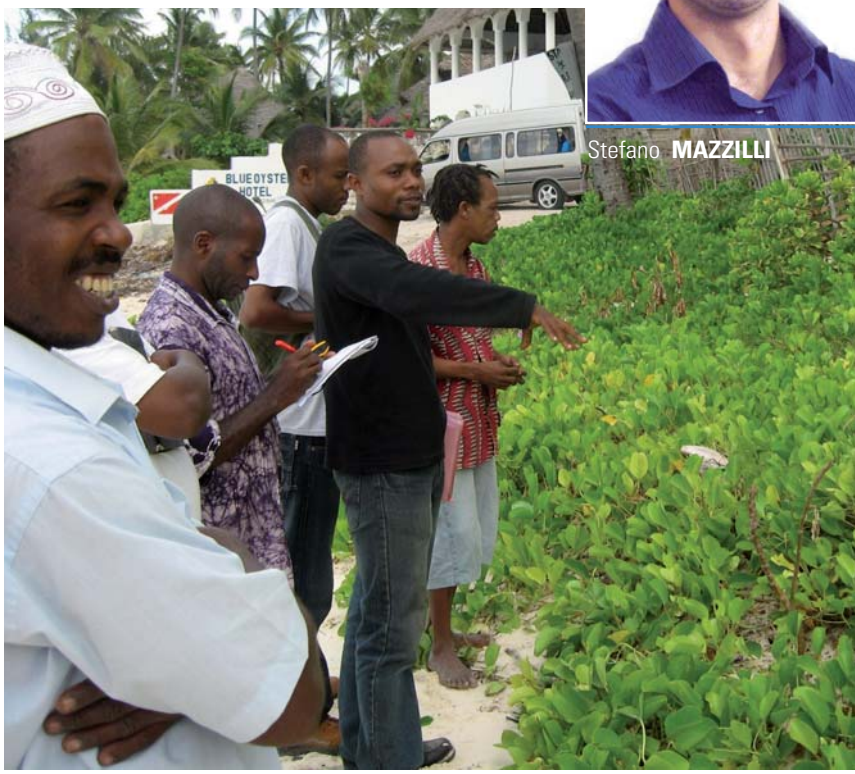
DST are visual, interactive tools, to inform stakeholders and decision makers on management issues for coastal cities and the environment, such as predicting the impact of a sewerage outfall or expected sea-level rise. The DST developed through the programme are built on hydrodynamic models covering <10km to 300km of coastline, and utilizing data collected locally and from remote sensing. They provide research and funding opportunities to scientists, and empower institutes to deliver quantitative scientific information on mandated issues.

Training in the implementation of DST continued in 2009 with an awareness raising and data collection workshop in the IOCEA region. This was a follow-up to the Loango proposal writing meeting, and addressed the use of DST for better management of the coastal zones. Thirteen participants from Angola, Congo, Cameroon, DR Congo and Gabon were trained in modeling at the workshop, with several expressing strong interest in pursuing further work. One portable tide gauge was installed in the port of Kribi and Cameroonian colleagues trained in its use. GPS-echo sounders were provided to Cameroon, Congo, and Gabon for use by Central African scientists to survey coastal bathymetry.

Institutions in the WIO region moved on to the implementation phase of DST activities: identifying funding sources and initiating 6 projects in 4 countries addressing coastal and marine management issues. Baseline reports on aspects of the ecosystem, driving processes, and stakeholder needs have been undertaken at these sites, as part of the project. Physical data collection includes: winds, tides, freshwater inputs, currents, bathymetry, sediments, and water quality properties. Data and models generated can now be used to address other management issues at the sites.

"Empowering Non State Actors (NSA) in Tanzania to plan for sustainable coastal livelihoods using Decision Support Tools" is a ReCoMaP (EU) funded project with a large participatory stakeholder component. It is implemented along the Jambiani–Bwejuu coast of east Zanzibar, Tanzania throughout 2009-10. The project assists communities and stakeholders to assess and make decisions on management approaches that mitigate the problem of erosion, and plan coastal development based on predicted future shoreline changes.

Stefano **MAZZILLI**



Members of JAMABECO, working with the ReCoMaP project in Zanzibar, show their previous interventions against erosion, Jambiani, Zanzibar.

KMFRI scientists undertaking current meter deployment (left) and preparation of bathymetry mapping equipment (right) in Shimoni, Kenya.

SUPPORT TO AFRICAN MEMBER STATES IN PREPARATION FOR THE CLIMATE CHANGE CONVENTION

In the lead up to the Climate Change Conference (COP-15) the African Union Commission, with support of UNESCO/IOC and the network of marine institutions, communicated to member states the increasing costs attributed to climate change impacts on the coastal zones. Presentations and discussions during consecutive AMCEN meetings in both Nairobi and Addis raised awareness on this topic, resulting in a request for support for preparation for the climate change negotiations at COP-15. Subsequently, support was provided to African ministers and COP-15 negotiators. This included expert advice and documents at meetings before the conference, and coordination of a team of African experts at COP-15. All documentation has been made available through UNESCO/IOC and the AU Commission.

The IOC Capacity Development programme gratefully acknowledges the support of the Eduardo Mondlane University, Mozambique; Institute of Marine Science, University of Dar es Salaam, Tanzania; Kenya Marine and Fisheries Research Institute, Kenya, and the Specialized Research Centre for Marine Ecosystems, Cameroon

RESEARCH AND EDUCATION

The University of the Sea (UoS) programme undertook a 'training-through-research' cruise in the Indian Ocean focused on geological-geophysical science in January-February. This was on board the German R/V the Sonne and attended by 6 trainees from the Asia-Pacific Region. A number of activities were also undertaken through the Baltic, and Caspian Floating Universities , and the Training Through Research programme organized one post-cruise conference in January 2009 at the University of Granada (Spain), focused on analysis of the results of the previous year's TTR-17 cruise.

Within the Baltic Floating University (BFU) programme, a 10-day cruise on board the sailing catamaran Centaurus II took place in July in the Eastern part of the Gulf of Finland (Baltic Sea) attended by 12 researchers and students. Lectures and seminars focused at environmental problems of the Baltic Sea. The database of the cruise participants is at OceanExpert (www.oceanexpert.org); cruise summary report at www.rshu.ru/eng/bfu/cruises).

The Caspian Floating University (CFU) programme organized a series of workshops and meetings

BFU Centaurus-II international team with IOC 50th Anniversary flag, returning from a 10-day cruise in the Gulf of Finland.

contributing to public awareness on Integrated Coastal Area Management, and the United Nations Decade of Education for Sustainable Development (2005-2014).

More than two hundred educators and students from rural schools, universities and municipal authorities attended. The Marine Ecology School continued to provide basic ecological knowledge to schoolchildren in 2009, and the proceedings of the 2008 International Applied Research Seminar for Schoolchildren and Students was published: "Sustainable Development of the North Caspian Coastal Territories: Current Status and Looking Ahead".

UNESCO/IOC Chairs in Concepción (Chile), Moscow and St. Petersburg (Russia), and Quelimane (Mozambique), carried out a number of training courses on cruises and at institutions, as well as undertaking project activities with students. The Chair for St. Petersburg facilitated international courses on the use and processing of satellite data for Oceanography involving 37 participants from Lithuania, Russia, and the Ukraine, as well as courses in using in-situ data to ground-truth remote sensed data in five sub-regions of the North West of Russia and in the Gulf of Finland. The Chair for Mozambique led trainings and hands on projects in hydrodynamic monitoring and modelling, and on the application of remote sensing techniques for research and monitoring of marine and coastal ecosystems and habitats.

OCEAN MAPPING

IOC's activities within the COASTMAP-IO Project significantly enhanced local capacities. Participants from the 12 countries affected by the 2004 tsunami were provided training to produce inundation maps using a mixture of national historical shallow water bathymetry as well as bathymetric data acquired during recent hydrographic surveys conducted by national agencies and institutions.

During the last biennium over 120 specialists were trained through COASTMAP-IO training programmes on hardware (single and multi beam systems), as well as software (Arc GIS Com MIT, CARIS, and SURFER). Participants who were trained on board the research vessels of the Indian Navy were given theoretical and practical exercises in addition.

EPILOGUE

The three pictures in the report above tell a story of science done at sea. We would wish a well equipped vessel and state-of-art equipment to operate in East Africa. But as continuity of effort is always a question, we constrain ourselves to what is available and can be sustained beyond the intervention.

The approach to technical cooperation is spelled out in 'Capacity-development: An UNDP Primer (2009)': "Technical cooperation may be appropriate in some instances to address short-term needs, but tends to be donor-driven and expensive, and to rely unduly on foreign expertise while distorting national priorities. Strong capacity, locally generated and sustained, is essential to the success of any development enterprise. Without it, the integrity of development achievements can be compromised and progress can remain rootless and illusory, separated from the capacities that already exist and vulnerable to the increasingly severe and complex challenges facing the world today."

The IOC Self-driven Capacity-development Strategy approved by Resolutions XXIII-10 and XXIII-11 of June 2005 contains all elements of the UNDP approach, and some specifics for IOC. IOC has therefore approached technical Capacity-development in line with general UN principles. However staff allocation for Capacity-development in 2010-2011, will not allow IOC to continue this mode of technical cooperation. The only way to continue this effort is through specific staff and resources support from Member states and sponsoring agencies.

Regional activities

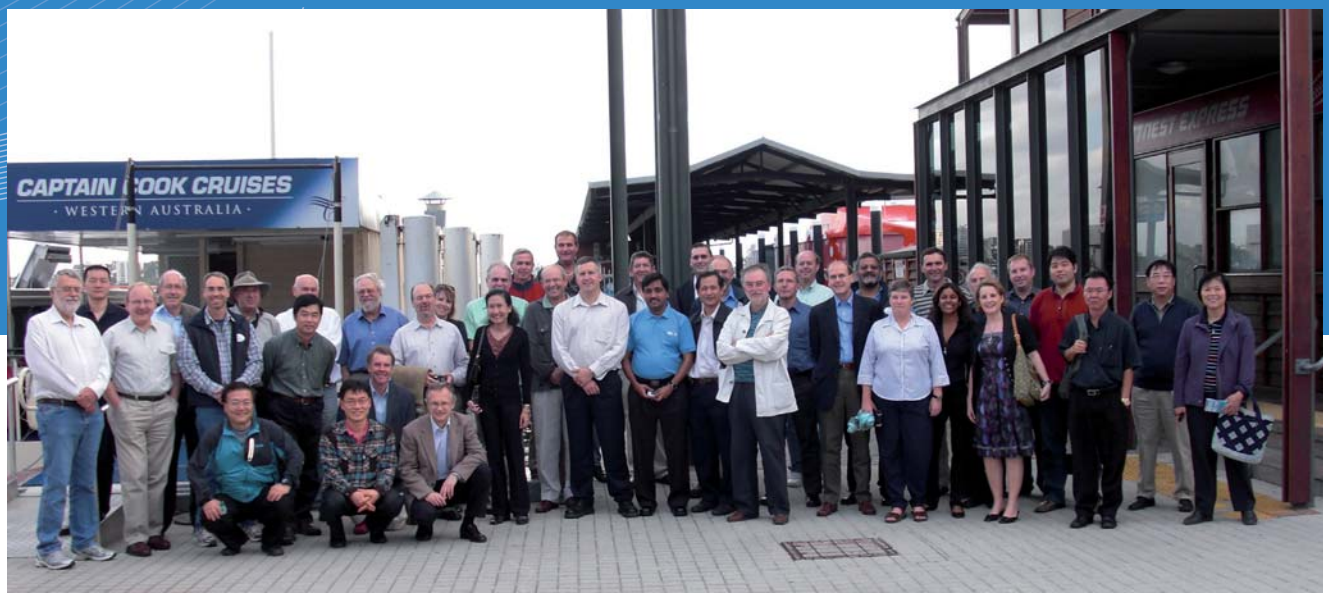
OVERVIEW 3

For 50 years now, a key challenge for the IOC has concerned how to resource its coordinating role across a complex range of programmes and over a wide spectrum of temporal and spatial scales, diversity of cultures and variable regional capacities. For the IOC and its constituency, this is a daunting task when one considers the vastness and remoteness of the globe's oceans, the difficulties of working in inhospitable oceanic and coastal environments and the enormous cost of oceanography, both in terms of sustaining observation systems and developing associated applications which will benefit the communities of the IOC's Member States.

2009 collaborative trans-Atlantic research cruise (Rio De Janeiro to Cape Town and Walvis Bay): team members aboard the Brazilian naval research vessel NHO CRUZEIRO DO SUL.

Perhaps the most tractable task is to work out what needs to be done and where. There are many laudable, rational and well structured plans, developed by many passionate and committed organisations and people, and covering all spheres of the IOC's High Level Objectives. Pragmatically, the IOC promotes a decentralised model to support its own mission in respect to international cooperation and coordination of programmes in marine research, services, observation systems, hazard mitigation and capacity development for the better understanding and management of our natural ocean and coastal resources.

The IOC Secretariat based in UNESCO Paris works in close collaboration with its diverse complement of nodal focal points around the world, including the IOC's regional subsidiary bodies and regional decentralised offices, as reported on herein. A key modality that has emerged, particularly over the past decade, has been the advent of collaborations (governmental, institutional and scientific) amongst IOC Member States under the frameworks of the IOC's focal points. This includes the GOOS Regional Alliances (GRAs), which provide two-way vehicles for (i) conveyance of the IOC's 'message' (in terms of its mission and objectives) more closely to the IOC's constituency of member states and their related communities and (ii) expression of the aspirations of those communities in terms of their own regional priorities and



Bringing together marine scientists and managers to plan for capacity development in ocean forecasting for the Indian Ocean, South East Asian and Australian regions during a workshop held in conjunction with GSSC-XII and PICO-II, Perth, Western Australia 2009.

needs, so that programmes and projects can be most effectively designed in order to best harness and align resources with local priorities. The GRAs and sub-alliance groups that are established within them can bring to bear significant regional and local resources in response to these imperatives.

The GRAs have evolved from originally being principally focused on blue-water physical oceanography, services and capacity development. They now generally have broadened scopes in terms of oceanic and coastal processes and applications, across both physics and biology, and continue to grow capacity development as a key end point for these programmes. This has been consistent with the maturation of the regional alliances in terms of their capacities to deliver benefits across the IOC's full range of objectives and to an increasingly larger global constituency.

When one considers the great human, infrastructure and financial resources residing within governments, institutions and general populations of the IOC's Member States, there is an enormous potential to progress the aspirations inherent in the IOC charter. To this end, the IOC's regional network of offices plays a fundamental role in helping to harness and align the world's oceanographic capacities for the societal benefit of collaborating Member States.

The following regional overviews provide an update on the progress being achieved in this regard through GOOS-AFRICA, IOCWIO, IOC/WESTPAC, IOC Perth, IOCARIBE and IOC Rio. Selected highlights exemplify the manner in which the regional offices operate, along with the nature of the contributions and outcomes that derive from them. The overviews also highlight the important underpinning role that local sponsorship and collaborations by host Member States have in respect to providing essential secretariat resources to the IOC's regional offices and GRAs, and for the collaborative projects under their purview.

Building the ocean observing system: installation of a tide gauge in Alexandria, Egypt.

3.1 The Global Ocean Observing Systems in Africa

Capacity development through education programmes and directed training courses are major activities of GOOS Africa.

GOOS-AFRICA maintained its strong advocacy and support for the development of home grown capacity in earth observations and operational oceanography, with particular emphasis this year on improving the understanding of climate change effects in the African and global domains. Strengthening institutional frameworks, improving ocean observing infrastructure, and enhancing related research, education and applications were key GOOS-AFRICA drivers in 2009.

Capacity development in Africa: students training in oceanography

Capacity development through directed training courses was a major activity of GOOS Africa in 2009. A training course supporting the GEONETCAST for and by Developing Countries project (European Commission's Seventh Framework Programme) focused on data dissemination systems for environmental resource management. Another workshop themed How to Build a Habitable Planet followed by an international science conference on Operational Modelling of Oceanographic Coastal Zones with regional relevance to Africa in respect to designing, planning and implementing operational oceanography systems for Southern Africa brought together African graduate students and leading African and international oceanographers. The Conference was held under the auspices of the Abdus Salam International Centre for Theoretical Physics (ICTP) and co-sponsored by the African Centre for Climate and Earth System Science in partnership with UNESCO, CSIR - South Africa, ICTP - Italy, JPL - Caltech USA, University of Bologna - Italy and IRD - France.

Justin **AHANHANZO**

Supporting GOOS-AFRICA's long term vision for capacity development in West Africa (closing the gap) education programmes is essential. Strong contributions to education are made by international programmes of Master and PhD in physical oceanography and applications through the UNESCO backed Chair in Mathematical Physics and Applications at the University of Abomey-Calavi in Benin Partnerships with the private sector (eg the International Association of Oil and Gas Petroleum) initiated in 2004 facilitated the development of visiting lecturer's programmes.

GOOS-AFRICA encourages and supports African-owned space-based industry which links sciences, technologies, innovations, education, applications and public awareness and which aims to address societal needs. Success stories include the establishment of the Space Advisory Company and Space for Development.

GEOSS Support for Decision-Making in the Coastal Zone: Managing and Mitigating the Impacts of Human Activities and Natural Hazards in the Coastal Zone describes a workshop series organised by the GEO Coastal Zone Community of Practice (CZCP). *Under this theme, a GOOS-AFRICA relevant workshop titled Decision-Making Support for Coastal Zone Management, Water Resources and Climate Change in Africa* is planned for 2010. This initiative reinforces inter-sectoral cooperation with the UNESCO International Hydrological Programme and mobilises partners including UNEP, LMEs, AARSE, the National Space Research and Development Agency of Nigeria and other African stakeholders to support a post Copenhagen COP-15 workshop titled *Decision-Making Support for Coastal Zone Management, Water Resources and Climate Change in Africa.*

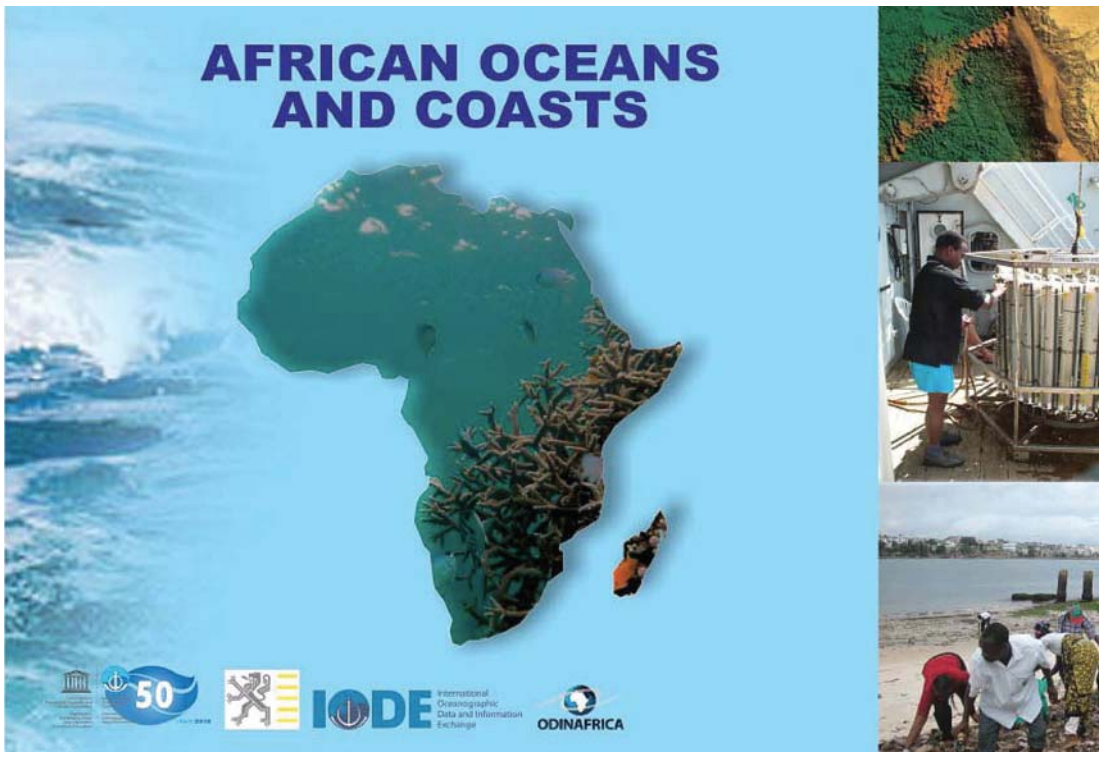
3.2 Ocean Data and Information Network for Africa

Self-driven development of data resources and data access underpin sustainable capacity in marine sciences.

The implementation of the third phase of the Ocean Data and Information Network for Africa (ODINAfrica) was completed in 2009, with the installation of a tide gauge at Alexandria in Egypt, and the publication of the book: "The African Oceans and Coasts". This was followed by the commencement of the project on "Integrated Data and Information Products and Services for the Management of Oceans and Coastal Zones in Africa" (which is also the fourth phase of ODINAFRICA-IV) to be implemented in the period 2009 – 2013. This phase will focus on developing sustainable capacity in African institutions to provide useful and usable data and information products for management of the coastal zones of Africa. The project will combine a regional approach – building networks and generating economies of scale - with nationally driven identification of needs and priorities.

The following products will be developed in order to achieve the project objectives:

- National marine atlases and the African Marine Atlas, including scenarios, models, forecasts and predictions on priority issues;
- Web-based data services, including catalogues and archives;
- Web-based Information Services, including literature catalogues and repositories, institution and experts directories, inventories of projects;
- National and regional data portals;
- Communication tools, including newsletters, policy and media briefs, and the African Oceans and Coasts book series.



The book African Oceans and Coasts, ODINAFRICA.

Mika **ODIDO**

3.3 IOC Regional Committee for the Western Indian Ocean (IOCWIO)

Coastal and marine management projects address Africa priorities.

Left: Seaweed farming provides some additional income to many families along the Jambiani coast, Zanzibar.

Right: Stakeholder review of preliminary model results with scientists from IMS and NIO, November, 2009, Zanzibar.

IOCWIO continued to focus on encouraging and facilitating self-driven capacity development initiatives in the region throughout 2009, with aligned institutions initiating six projects in four countries on coastal and marine management. The projects address priorities identified by institute and government leaders involved in the programme, both in terms of capacity development and management issues, including:

- Kenya: Malindi - sea level rise and flooding (Kenya Meteorological Department - KMD)
- Kenya: Shimoni - fisheries habitats (Kenya Marine and Fisheries Institutes – KMFRI)
- Mozambique: Bon Sinais - water quality (University of Eduardo Mondlane School of Marine and Coastal Sciences - UEM/ National Institute for Hydrography and Navigation - INAHINA)
- Mozambique: Beira - dredging and sediments (INAHINA/UEM)
- Seychelles: Fisheries habitats (Seychelles Fisheries Authority – SFA)
- Tanzania: Zanzibar – Coastal erosion (Institute of Marine Science - IMS)

Hydrodynamic models were developed for each site through the collaboration of international experts, and through workshops in Kenya, hosted by KMFRI, and attended by scientists from KMD and SFA, Mozambique hosted by UMD and attended by INAHINA and representatives of local authorities and Tanzania.

In Zanzibar, Tanzania, Institute of Marine Science is coordinating a consortium of local and national partners to implement a project titled *Empowering Non State Actors in Tanzania to plan for sustainable coastal livelihoods using Decision Support Tools*. This is funded through the EU's Regional Programme for the Sustainable Management of the Coastal Zones of the Countries of the Indian Ocean (ReCoMaP). The project runs for two years and in 2009 activities included: collection of data; development of a hydrodynamic model; presentation of a scientific report on the hydrodynamics of the Jambiani Coast, Zanzibar; a training workshop involving 10 participants concerning the preparation of hydrodynamic models; stakeholder analysis addressing issues of coastal lively-hoods at the site; and "Training of Trainers" from NGOs, government departments and institutions on participatory management and stakeholder analysis methodologies. Trainers then in turn led the project stakeholder workshop with 38 local participants. Projects are ongoing and reports are available on request.

Other activities undertaken included publication of a book for the completion of ODINAFRICA III, as well as support for other IOC activities in the region including the Capacity Development programmes activities with African States attending the Climate Change Convention.

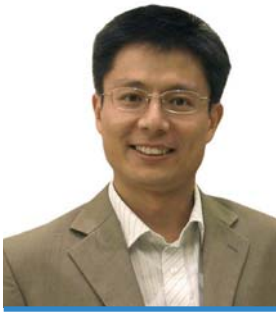
3.4 IOC Sub-Commission for the Western Pacific (IOC/WESTPAC)

Regional ocean observing systems provide data for management products and services as well as an infrastructure for regional capacity building.

Whereas the focus during 2008 was on building commitments and setting goals for WESTPAC, 2009 followed as a busy year of mobilizing resources dedicated to implementation. This was achieved through a series of regionally-specific activities on marine research, observation and capacity development in alignment with the IOC's High Level Objectives across climate change, ecosystem health, natural hazards and sustainable natural resource development.

Major highlights in 2009 include the following.

- Development of the Regional Ocean Research Priority Plan, aiming to identify the most compelling regional ocean-related issues, present possible research priorities and provide a framework for regional research investment in ocean science.
- Advancing ocean research on: i) " Response of Marine Hazards to Climate Change", through the identification of research foci with target geographic areas, and the organization of a joint cruise with data sharing among all participating members; ii), preparation of the Regional Status of Marine Non-indigenous Species through the establishment of a network of expertise and examination of relevant data and information; iii) Investigation of fluvial sediment sources, transport and discharge to the South China Sea through fieldwork, joint cruise and scientific visits; iv) the biogeochemistry and ecological nature of coral reefs through the evaluation of current coral status in different physical and environmental settings.
- Developing two regional observing systems, i.e. North East Asian Global Ocean Observing System (NEAR-GOOS) and South East Asian Global Ocean Observing System (SEAGOOS): i) NEAR-GOOS has been efficiently operating with the real time and delayed-mode transmission of ocean observation data, and provision of related data products and services to the public users; ii) SEAGOOS was substantially promoted through the initiation of pilot projects which aim to demonstrate the value of observations to the general public in the SEAGOOS region. The pilot project "Monsoon Onsets Monitoring over Andaman Sea and its Social & Ecosystem Impact (MOMSEI) was launched in 2009. This project aims to improve the understanding and forecasting of Asian monsoon events at a regional scale through the development and implementation of air-sea observations over the Andaman Sea and through the study of the preconditioning role that the ocean has in the onset of monsoon events. SEAGOOS is partnering with the IOGOOS and Australia in another pilot project "Ocean Forecast Demonstration" intended to develop an ocean forecast system to provide products and applications for the South East Asia Seas through the utilization and comparison of a wave-tide-circulation coupled model (MASNUM), BLUElink or other global ocean forecasting systems in the region.
- Strengthening the regional capacity through the conduct of a series of subject-oriented trainings and the materialization of UNESCO/IOC Regional Network of Training and Research Centres on Oceanography: i)Two IOC/WESTPAC training courses held in 2009: Establishment of National IODE Ocean Data Portal Nodes, Seoul; and Monitoring Techniques and Emergency Response of Marine Oil Spills, Qingdao; ii) one application was submitted and evaluation process has been completed on the proposed "UNESCO/IOC Regional Training & Research Center on Ocean Dynamics and Climate", which will provide regular training to young scientists from developing countries on a no cost basis.



Wenxi **ZHU**

3.5 UNESCO IOC Perth Regional Programme Office

At the fulcrum point of the South Pacific, Southern and Indian Oceans, the IOC Perth office levers achievements by joining mutual objectives across regional seas.

Schematic cartoon of Australia's Integrated Marine Observing System (www.imos.org.au).

Nick **D'ADAMO**

The Perth Office, co-located with the Secretariat of the ICG/IOTWS, receives core support and sponsorship through UNESCO IOC, Western Australian State Government and Australian Government. It works as an IOC regional focal point and services the IOC's High Level Objectives for the balanced mutual objectives of its three core Parties. It works principally through IOC HQ, the GOOS Regional Alliances (GRAs) of Indian Ocean GOOS, Western Australia GOOS, South East Asian GOOS and Pacific Islands GOOS, supports the Australian *Integrated Marine Observing System* (www.ioc.imos.org) and collaborates with IOC/WESTPAC. The Office provides sponsorship to underpin GRA meetings, projects and general activities. India, Australia, Thailand and Fiji/Samoa and provids Secretariat support (in-kind and cash) for these respective GRAs. IOC Perth attracted extra-budgetary sponsorship from BoM (Australia), NOAA and UCAR (USA), and CoML (Sloan Foundation).

The Office hosted GSSC and PICO in Perth during February 2009, including a workshop to develop a joint IOGOOS/SEAGOOS/WAGOOS collaboration for capacity building in ocean forecasting (www.iocgoos.org), with a follow-up workshop planned for Perth in 2010. As co-host, the Office geared up for the 2010 GODAE OceanView Perth Summer School (www.bom.gov.au/summerschool). It facilitated the development of a Census of Marine Life (CoML) regional node for the North West Indian Ocean and Arabian Sea region, with plans to produce a book on the region's biodiversity in 2010. The Office contributed to the UNEP *Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas* and established links with the Bay of Bengal LME project.

IOGOOS progress is underscored by: the growing Indian Ocean Observing System (IndOOS); the work of the CLIVAR/GOOS Indian Ocean Panel; the evolution of a bio-geochemical science alliance - Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER); and the soon to be formed IndOOS Resources Forum (IRF) to facilitate operational support to IOGOOS, IOP and SIBER. These initiatives have continued to discover the ocean's bio-physical properties and improve our understanding and predictability of oceanic and coupled atmospheric processes (including under climate change scenarios), the delivery of associated services to IOGOOS's constituency and the development of capacity thereof, through exercises conceived, supported and facilitated through IOGOOS and Perth Office coordination and sponsorship. Plans were developed for IOGOOS, IOP, SIBER and IRF to meet in Perth during 2010 under IOC Perth hosting as an integrated group and in celebration of 10 years since the formative 2000 Perth workshop called S ustained Observations of Climate in the Indian Ocean (SOCIO).

PIGOOS was in a process of transferral from SOPAC (Fiji) to SPREP (Samoa) as a result of a regional governmental decision to revise institutional arrangements for SOPAC. IOC Perth worked closely with SOPAC and SPREP in respect to the transfer of PIGOOS and a recruitment process was initiated for a PIGOOS Coordinator. Capacity development continued in the PIGOOS region through our collaborators in NIWA, New Zealand, with a highlight being the development of plans for the ongoing delivery of a pre-tertiary oceans and climate curriculum called SEREAD (www.argo.ucsd.edu/FrEducational_use.html) to SW Pacific schools during 2010.

3.6 IOC-Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE)

Support for improving ecosystem management.

Natural marine resources in the Caribbean. © A. Suarez

In January 2009 Cesar Toro was appointed to the consolidated permanent UNESCO position of IOC Secretary for IOCARIBE, thereby leading both the IOCARIBE Secretariat and UNESCO science programme for the region. This appointment was made in conjunction with the re-location of the Secretary to Kingston, Jamaica.

IOCARIBE convened the Tenth Meeting of the IOC Editorial Committee of the Bathymetric Chart for the Caribbean and the Gulf of Mexico (IBCCA) held in La Havana, Cuba. Fourteen of the Chart's 16 sheets been completed.

The Fourth Session of the Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS-IV) was attended by nearly 60 participants from 11 countries in the Caribbean Region and six regional organizations. The ICG reviewed the progress made during the inter-sessional period, and noted the list of criteria and standards for sea level stations in the Caribbean. The ICG decided to establish the Caribbean Tsunami Information Center (CTIC) and endorsed the Barbados proposal to host the CTIC.

An Interagency Agreement was signed between the UN's UNESCO/IOC and UN's Office for Project Services (UNOPS) for the implementation of the four-year Caribbean Large Marine Ecosystem (CLME) Project. The Project was approved by the Global Environment Facility (GEF) in April 2008 and began in May 2009. It has a total budget of $56 USD million; comprising $7.2 USD million in GEF funding and $48.8 USD million in cash plus in-kind support by government and multilateral donor agencies. The Project Coordinating Unit (PCU) was established in the offices of the IOCARIBE Secretariat in May 2009. UNDP is the implementing agency, UNOPS is in charge of administrative aspects of the project and the IOC, through IOCARIBE, is the lead technical agency. The First CLME Project Steering Committee Meeting and Inception Workshop were held in Cartagena, Colombia, in October 2009.

The ICAM Project *Demonstrate Approaches for Nutrient and Sediment Reduction at Selected Pilot Study Areas in the Wider Caribbean Region*, proposed by NOAA and adopted at IOCARIBE-X in Puerto La Cruz 2008, has focused on examining the effectiveness of best management practices in the watersheds of four member countries (Dominican Republic, Dominica, Grenada, and Trinidad and Tobago).

Cesar **TORO**

3.7 UNESCO-IOC Regional Office for GOOS in Rio de Janeiro

IOC's Rio office facilitates support of open ocean observation systems

The RIO Office focuses on facilitation and oversight of GOOS pilot projects in the Tropical and South Atlantic, aides GOOS projects in the region and organizes training activities, conferences and outreach programmes.

One of the office's key objectives is facilitation of the Permanent Research Moored Array in the Tropical Atlantic (PIRATA, http://www.pmel.noaa.gov/tao/). PIRATA is achieving excellent data return rates (average of 79% in the past 10 years) since its inception 12 years ago. The Brazilian Navy, a key stakeholder of the Rio Office, played an important role in supporting field activities for PIRATA through its vessel RV Antares: CTD and XBT deployments; radiosonde launches; incorporation of CO_2 sensors in ATLAS buoys. In conjunction with data from these components of PIRATA and other data available through the Brazilian Ministry of Science and Technology INPE-CPTEC website, a significantly improved understanding of oceanic behavior in the North Atlantic has been achieved.

The Rio Office also provides the Secretariat for the Regional Alliance in Oceanography for the upper Southwest and Tropical Atlantic (OCEATLAN) and oversees the implementation of actions as contained in OCEATLAN's Action Plan. Accordingly, in 2009 the Office sponsored and organized the OCEATLAN-V meeting in collaboration with Servicio de Oceanografia Hidrografia y Meteorologia de la Armada (SOHMA). Key outcomes of the meeting included:

- Approval of the implementation plan for 2009-2011;
- A formal request from SOHMA to be an active member of the International South Atlantic Buoy Programme (ISABP), a regional action group of the Data Buoy Cooperation Programme;
- The increase of knowledge on continental shelf upwelling, the circulation pattern and the absorption of CO_2 from the atmosphere in the Patagonian Shelf since the South Atlantic Climate Change Consortium (SACC)
- The excellent performance of Brazilian National Buoy Programme (PNBOIA), as a national contribution for the ISABP;
- A project to provide hydrographic oceanographic capabilities to vessel ROU 22 "Oyarvide" of the Uruguay Navy with the advice of the Directoria de Hidrografia e Navegacao (DHN, Brazil); and
- The assistance being received from the Servicio de Hidrografia Naval (SHN, Argentina) in staff training and support received in conjunction with UNESCO-Uruguay in the implementation and updating of the Uruguay National Oceanographic Data Center (CENDO).

2009 collaborative trans-Atlantic research cruise (Rio De Janeiro to Cape Town and Walvis Bay): multi-parameter water sampling from the Brazilian Navy Oceanographic Ship NHO CRUZEIRO DO SUL.

(right) Maintaince work on one of the PIRATA buoys by the Brazilian Navy Oceanographic Ship Antares

Janice **TROTTE**

Capt (Ret.) Frederico Antonio Saraiva Nogueira was appointed Acting Officer in Charge of the Rio Office, following the departure of Mrs. Janice Romaguera Trotte-Duhá who is pursuing further education. Capt (Ret.) Frederico Antonio Saraiva Nogueira was formally Hydrographer, Brazilian Navy, and holds a MSc. in Physical Oceanography.

Tsunami unit

OVERVIEW 4

During the five years since the Indian Ocean tsunami on December 26, 2004 endless efforts have made the coastal population of all oceans aware of the hazard the oceans pose and increased their preparedness to respond adequately. The interim advisory cover established in January 2005 by the Pacific Tsunami Warning Center PTWC in Hawaii, USA and the Japan Meteorological Agency JMA in Tokyo, Japan will be ending when in 2011 to 2013 the new regional tsunami warning systems take on their full responsibility for the end-to-end tsunami warning systems in their region. These will address all ocean-related hazards possibly affecting the coastal zones.

During 2009 new national warning systems joined others that had started earlier, enhancing the regional cover. The National Warning Centres acquired their own expertise and added experience, and practiced to work together streamlining data exchange and communication. In parallel with national disaster management organizations standard operating procedures have been developed and tested. On the national and local level IOC assisted governments, authorities and local entities in how best to respond to the threat of tsunamis.

All four regional TWC systems focused on how better to prepare for the threat of near-field tsunami which arrives at the shores in less than one hour. Ways to enhance regional detection capacities have been developed, and plans for a faster response to the first signs of an imminent near-field tsunami are being implemented. The tsunami on September 29, 2009 off Upolu, Samoa again reminded all that there is no prediction; only well-rehearsed response can save lives. The tsunami arrived in less than 15 minutes. Despite the deplorable loss of lives and livelihoods on the islands of the Southwest Pacific intense preparation efforts in recent years to develop an effective tsunami early warning system, to work with communities, to raise public awareness and to practice drills and evacuation exercises helped to save many lives. The coastal population in many cases knew how to respond.

To ensure sustained and effective warning systems UNESCO/IOC agreed with the Secretariat of the Preparatory Commission of the Comprehensive Test Ban Treaty Organisation CTBTO on making their seismic data available for tsunami warning purposes and to cooperate in training and capacity building. The IOC became a member of the Tsunami Commission of the International Council of Scientific Unions ICSU, ensuring close cooperation to garner advice and support to keep all warning systems at the forefront of operational quality.

The Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems Working Group (TOWS-WG) reviews and provides guidance on establishing the framework mechanism for a comprehensive, sustained and integrated end-to-end global system covering tsunami and other hazards related to sea level, exploiting existing IOC mechanisms, capacities and capabilities, and facilitating priority projects and programmes, in alignment with the IOC Strategic

Peter **KOLTERMANN**

Plan and IOC Assembly decisions and in coordination with relevant stakeholders. In order to enhance coordination, common requirements, and exchange of information and knowledge among the ICGs the 25th IOC Assembly in 2009 established under TOWS-WG three inter-ICG task teams on (i) Sea Level, (ii) Disaster Management and Preparedness and (iii) Tsunami Watch Operations. These Task Teams will report to the next meeting of the TOWS-WG in 2010.

The importance of the IOC's tsunami programme to member states has been acknowledged by the UNESCO General Conference 2009 by again increasing its regular budget for the biennium 2010 – 2011. Nevertheless the Tsunami Programme still depends on considerable extrabudgetary resources. To a certain extent this forges strong links between the Programme and potential donors to highlight the need for and role of Tsunami Warning Systems to protect coastal populations and their well-being.

SUMMARY OF 2009 INTERNATIONAL TSUNAMI WARNING ADVISORIES

From the International Tsunami Information Center (ITIC)

The Pacific Tsunami Warning Center (USA), Japan Meteorological Agency (Japan), and the West Coast / Alaska Tsunami Warning Center (USA), provide international tsunami advisory services for the Pacific Ocean, Indian Ocean, Caribbean Sea and adjacent region, and western Atlantic Ocean. Each center independently and continuously monitors the earth's seismicity to evaluate the tsunamigenic potential of large earthquakes, and then work together to coordinate their advisories to ensure consistency in the results they report. In 2009, the USGS reported 159 earthquakes sized Magnitude 6 or greater.

Tsunami Warning Tower, Banda Aceh
© IOC

The Pacific Tsunami Warning Center, covering the Pacific Ocean, including the South China Sea, Indian Ocean, and wider Caribbean regions:

- responded to over 1300 earthquake alarms;
- issued earthquake observatory messages for 659 earthquakes;
- issued official products for 45 earthquakes (reporting threshold Magnitude 6.5 in the Pacific and Indian Oceans, and Magnitude 6.0 in the Caribbean region);
- issued watch bulletins for three earthquakes in the Indian Ocean, and warning/watch bulletins for four earthquakes in the Pacific Ocean

The Japan Meteorological Agency, covering the Northwest Pacific Ocean, including the South China Sea, and Indian Ocean region:

- issued official products for a total of 24 earthquakes;
- issued a Northwest Pacific Tsunami Advisory for 18 earthquakes (reporting threshold Magnitude 6.5);
- issued a Tsunami Watch Information bulletin for six earthquakes in the Indian Ocean (reporting threshold Magnitude 6.5).

The West Coast / Alaska Tsunami Warning Center , covering the Pacific and Atlantic Oceans, and Gulf of Mexico (Canada, US states except for Hawaii), and Caribbean (Puerto Rico, US and British Virgin Islands):

- responded to over 4000 earthquake alarms;
- issued earthquake observatory messages for 323 earthquakes;
- issued official products for 175 earthquakes (reporting threshold Magnitude 4.0);
- issued one advisory for the US/Canada (only California / Oregon for 29 September).

SUMMARY OF INTERNATIONAL TSUNAMI WARNING ADVISORIES

1 JANUARY - 31 DECEMBER 2009
Compiled by The International Tsunami Information Center (ITIC)

Advisories issued by international tsunami warning centres. The Pacific Tsunami Warning Center (P) issues: Tsunami Information Bulletins (TIB), Fixed and Expanding Regional Warnings (FRW, ERW), and Ocean-wide Watch/Warnings (TWW) for the Pacific (PO); Tsunami Information Bulletins (TIB), Local, Regional, and Ocean-wide Tsunami Watches (LTW, RTW, TW) for the Indian Ocean (IO); Tsunami Information Statements (TIS), Local, Regional, and Ocean-wide Watches (LTW, RTW, TW) for the wider Caribbean (CAR). The Japan Meteorological Agency (J), issues: Tsunami Advisories (NWPTA) for the Northwestern Pacific; Tsunami Watch Information (TWI) for the Indian Ocean. Tthe West Coast/Alaska Tsunami Warning Center (A) issues: Tsunami Information Statements (TIS), Tsunami Advisories (TA), and Tsunami Watch/Warnings (TWW) for Canada, the US (including Puerto Rico, excluding Hawaii and US-affiliated Pacific Island countrie), and the US/British Virgin Islands. Epicenter, depth (from GCMT solution) and Mw from the USGS (G), and Mw from PTWC (P) at action time. Wave height and period measurements from sea level (SL) gauges reported as amplitude, peak to trough, or greatest value for either inundation or runup as indicated. Tsunami fatalities from World Data Center - Tsunamis / NGDC.

DATE TIME (UTC)	LOCATION	EPICENTER	DEPTH (km)	Mw	PTWC (P), JMA (J), or WC/ATWC (A) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING? FATAL?	MAXIMUM MEASUREMENT LOCATION (information source)
19-Mar 18:18	Tonga Island Region	23.046° S	50	7.7 (A, P)	TIS (A)	18:30	YES	0.15 m (amplitude SL gauge) Callao, Peru (WC/ATWC)
		174.659° W		7.6 (G, GCMT)	FRW 001 (P)	18:30	NO	
					FRW 002 (P)	19:32	NO	
					FRW 003 - Cancel (P)	20:08		
28-May 8:25	North of Honduras	16.720° N	14	7.3 (A, GCMT, P)	TIS (A)	8:03	NO	
		86.233° W		7.1 (G)	FTW 001 (P)	8:33	NO	4 m tsunami, Motagua River, Guatemal (Molina and Rosales, INSIVUMEH)
					FTW 002 - Cancel (P)	9:47	NO	
15-Jul 9:23	Off West Coast of South Island of New Zealand	45.762° S	22	7.8 (A,GCMT, P)	FRW 001 (P)	9:42	YES	0.47m (peak-to-trough, SL gauge) Jackson Bay, NZ (PTWC)
		166.562° E		7.6 (G)	TIS 01 (A)	9:44	NO	
					TIS 02 (A)	10:23	NO	
					FRW 002 (P)	10:33		
					FRW 003 - Cancel (P)	10:51		
10-Aug 19:56	Andaman Islands	14.099° N	22	7.7 (A,J,P)	(IO) RTW 001 (P)	20:05	YES	1.4 cm (peak-to-trough) DART 23401 (600 nm NNW Phuket, Thailand) (PTWC)
		92.888° E		7.6 (G)	(PO) TIS (A)	20:11	NO	
				7.5 (GCMT)	(IO) TWI (J)	20:25	NO	
					(IO) RTW 002 (P)	21:05	NO	
					(IO) RTW 003 (P)	21:24		
					(IO) RTW 004 - Cancel (P)	22:11		
2-Sep 7:55	Java Indonesia	7.782° S	53	7.1 (P)	(IO) LTW 001 (P)	8:06	NO	
		107.297° E		7.0 (G, GCMT)	(IO) TWI (J)	8:15	NO	
					(PO) TIB (P)	8:21	NO	
					(PO) TIS (A)	8:26		
					(IO) LTW 002 - Cancel (P)	8:59		
29-Sep 17:48	Samoa Islands Region	15.489° S	12	7.9 (A, P, msg 001)	ERW 001 (P)	18:04	YES	4.11 m (peak-to-trough, SL gauge) Pago Pago (PTWC) 16.3 m maximum runup, Poloa, American Samoa (Japan/PTWC/ITIC)
		172.095° W		8.3 (A msg 3, P msgs 002-004)	TIS msg 001 (A)	18:02	YES	
				8.0 (A, from msg 003)	ERW 002 (P)	18:56	YES, 192	
					TIS msg 002 (A)	18:59		
				8.1 (G, GCMT)	ERW 003 (P)	20:22		
					ERW 004 - Cancel (P)	21:36		
					TA msg 003 (A)	22:02		
					TA msg 004 (A)	23:14		
					TA msg 005 (A)	00:21 (30 Sep)		
					TA msg 006 (A)	02:24 (30 Sep)		
					TA msg 007 (A)	04:28 (30 Sep)		
					TA msg 008 (A)	06:30 (30 Sep)		
					TA msg 009 - Cancel (A)	08:28 (30 Sep)		
30-Sep 10:16	Southern Sumatra Indon	0.720° S	76	7.7 (P)	(IO) RTW 001 (P)	10:26	YES	0.27 m (amplitude, SL gauge) Padang, Indonesia (PTWC)
		99.867° E		7.5 (G, GCMT)	(PO) TIS (A)	10:30	NO	
				7.6 (A, J)	(IO) TWI 001 (J)	10:38	NO	
					(IO) RTW 002 - Cancel (P)	11:31		
					(IO) TWI 002 (J)	11:55		
7 Oct 22:03	Vanuatu Islands	13.052° S	46	8.0 (P, reduced to 7.8 ERW 003)	TIS (A)	22:14	YES	0.31 m (amplitude, SL gauge) Port Vila (WC/ATWC)
		166.187° E		7.7 (G)	ERW 001 (P)	22:17	NO	
				7.6 (GCMT)	NWPTA	22:24	NO	
					ERW 002 (P)	23:36		
					ERW 003 - Cancel (P)	00:18 (8 Oct)		

4.1 Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Seas CARIBE EWS

Building a Caribbean Tsunami Warning System will require integration of at least 100 multi-purpose sea level stations.

Since 2006 there has been considerable progress in the installation of vital earthquake and tsunami detection equipment in the Caribbean region. As of 31 December 2009, there are over 110 seismic stations with real-time seismic data exchange capabilities in the Caribbean region. These stations are operated by local, regional and global seismic networks. Earthworm and SeisComP are used for the real-time exchange of seismic data. Seismic data exchange for tsunami warning purposes is progressing well in the region. Results from the USGS Network Capability Modelling study indicate that the CARIBE-EWS minimum performance criteria can be achieved with 121 core seismic stations. Of the 121 stations, there are 10 stations for which funding has yet to be identified.

New Sea Level Station installed in Limon, Costa Rica in 2009, in support of the Caribbean network for tsunami warning
© University of Hawaii Sea Level Center

Significant improvement has been achieved in terms of sea level monitoring coverage. 100 sea level stations, including 94 coastal gauges and 6 DART buoys have been identified as part of the CARIBE-EWS core sea level network. The coastal stations have been divided into high and medium priority stations. Of the 100 stations, only 20 coastal stations, all in the north-eastern Caribbean, Bahamas and Bermuda, and 6 DART buoys are providing data within 15 minutes, the requirement for stations within the Caribbean due to the very short travel time of tsunamis to coastal areas. The CARIBE-EWS has been coordinating with regional and global seal level initiatives like the CARICOM Caribbean Centre for Climate Change, which has upgraded 11 stations in the region and IOCARIBE-GOOS and GLOSS who have long standing projects in the region. The coordination with these efforts will support the multi-purpose application of these sea level stations. The USA, with support of the University of Hawaii Sea Level Centre (UHSLC) and the Puerto Rico Seismic Network (PRSN), has offered to install 11 additional sea level stations in the region during 2009-2010.

The Fourth Session of the IOC Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS-IV, Fort-de-France, Martinque, France) approved a technical document prepared by its Working Group 1 on Technical, Logistical, and Administrative Requirements of a Regional Tsunami Warning Centre for the CARIBE EWS, which will be used as a standard to evaluate offers of Member States to host the Caribbean Tsunami Warning Centre CTWC.

On May 28, 2009, an earthquake M 7.3 struck off Honduras at 2:25 AM local time with a depth of 10 Km. PTWC issued on that occasion a Tsunami Watch for Honduras/Belize/Guatemala, 8 minutes after the earthquake. Local field surveys demonstrated later on that a small tsunami was generated, flooding some low-lying areas on the border Guatemala/Honduras.

4.2 Indian Ocean Tsunami Warning and Mitigation System (IOTWS)

Considerable progress toward a fully functional end-to-end tsunami warning system was noted 5 years after the catastrophic tsunami in the Indian Ocean on Dec 26, 2004. Autonomy of the IOTWS is presently planned for 2011, subject to confirmation at the 2010 ICG meeting, Banda Aceh, Indonesia.

Tsunami Disaster Mitigation Research Center, Banda Aceh
© IOC

Recognising the need for improvement in tsunami risk evaluation and mitigation, ICG/IOTWS Working Group 3 brought together an international group of experts to prepare and publish guidelines for assessing tsunami risk for the Indian Ocean. With support from UNDP Regional Centre Bangkok and the IOC COAST MAP IO project, a regional workshop on tsunami risk assessment and mitigation was attended by over 50 participants from 17 countries, using the methodology of the IOC guidelines.

A milestone achievement in 2009 was the conduct of the IOWave09 tsunami response exercise, the first of its kind in the Indian Ocean. More than 18 countries participated in an ocean-wide exercise on 14 October, with 5 countries taking the exercise down to community level. The exercise was designed to evaluate and improve the effectiveness of the IOTWS, its operational Regional Tsunami Watch Providers (RTWP), National Tsunami Warning Centres (NTWC), and National Disaster Management Organisations (NDMO) in responding to a potentially destructive tsunami. IOWave09 provided Indian Ocean countries a test of their operational lines of communications and a review of their tsunami warning and emergency response procedures.

Capacity building efforts continued in 2009 with a series of workshops to develop national capacity in standard operating procedures for tsunami warning and emergency response. Six workshops were organised in Indian Ocean and Southeast Asian countries, and over 100 participants received training and took part in tabletop exercises. The outcomes of this training included an increased awareness and understanding of the importance of robust standard operating procedures for quick onset events like tsunami and of the need for strong communication links between the agencies in the warning chain.

Implementation of the IOTWS continued throughout 2009, with further seismic and sea level monitoring capacity being added to the core networks. The RTWPs continued to develop their capability and to address key issues such as the watch content of RTWP bulletins, definition of coastal forecast zones, and the harmonisation of performance indicators. Significant progress has been made towards the compilation of best practices in tsunami warning dissemination.

The Sixth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS VI, Hyderabad, India) adopted the Guidelines for "Tsunami Risk Assessment and Mitigation for the Indian Ocean: Knowing Your Tsunami Risk - and What to Do About it", (IOC Manuals and Guides No. 52). The 6th ICG/IOTWS elected Prof Dr Jan Sopaheluwakan (Indonesia) as Chair, and Dr Shailesh Nayak (India) and Mr Rick Bailey (Australia) as Vice Chairs of the ICG/IOTWS for a 2 year term.

Tony **ELLIOTT**

4.3 The Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS)

Stefano **BELFIORE**

Uli **WOLF**

Progress in the installation of vital earthquake and tsunami detection equipment to adequately cover the entire area of operation in NEAMTWS has been slow. In 2009, 21 sea level stations have started contributing to NEAMTWS through the IOC Sea Level Monitoring Facility providing 1-minute data in real time. France has undertaken some tests to use the Global Telecommunication System (GTS) for sea level data transmission in the NEAM region. There has been no significant improvement with respect to new installation of deep-ocean instrumentation for tsunami-monitoring. Some sea level stations in Israel, Cyprus, Malta and Ukraine would become operational after February 2010.

The 6th session of Mediterranean and Black Sea Hydrographic Commission (MBSHC) of the International Hydrographic Organization (IHO) adopted two recommendations on access to sea level data and coastal bathymetry pertaining to NEAMTWS. The seismic networks of the European and Mediterranean countries reported good capacities but further efforts are needed to encourage the sharing of real-time data in North Africa and the Middle East. Potential improvements may come with the Orfeus data centre initiative and other European Commission - funded projects.

Member States nominated 23 Tsunami National Contacts (TNCs) and 23 Tsunami Warning Focal Points (TWFPs).

Tsunami preparedness assessment missions and visits were carried out in Lebanon, with the Centre for Geophysical Research, National Council for Scientific Research (NCSR), and Egypt, with the National Institute for Oceanography and Fisheries (NIOF) and the National Research Institute for Astronomy and Geophysics (NRIAG).

The sixth session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS-VI, Istanbul, Turkey) agreed to a programme of communication exercises to test the communication capability of the warning system. The programme will be implemented during 2010 by the candidate Regional Tsunami Watch Centres (RTWCs) from France, Greece, Italy, Portugal and Turkey and the data collection and backup centre in Germany and the established TWFPs. The session also established a Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and connected seas (NEAMTIC) at the IOC Secretariat.

ICG/NEAMTWS-VI confirmed the importance of the multi-hazard approach for the NEAMTWS, especially in relation to storm surges in the North-eastern Atlantic. It will improve the prediction of coastal inundation, focus existing warning practices for different sea-level related hazards and advance hazard and risk mapping.

The session elected ICG/NEAMTWS officers: François Schindelé from France (Commissariat à l'Energie Atomique - CEA) as Chairman, and Maria Ana Baptista from Portugal (Instituto Superior de Engenharia - ISEL) and Ahmet Cevdet Yalciner from Turkey (Middle East Technical University - METU) as Vice-Chairpersons.

4.4 Pacific Tsunami Warning System (PTWS)

The oldest of the four Tsunami Warning Systems now providing global cover, the PTWS, is reviewing its objectives and performance to meet new challenges. The four Pacific Regional Working Groups, the Central American Pacific Coast, the South East Pacific Region, the Southwest Pacific Region and the South China Sea Region are working to improve service delivery and rapid response to near-field tsunamis, that is sources close to the coast or an island .

The Twenty-Third Session of the IOC Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the Pacific (ICG/PTWS XXIII, Apia, Samoa) adopted the PTWS Medium-term Strategy and a new PTWS Working Group structure and reviewed the progress on the PTWS Implementation Plan. The PTWS Medium-term Strategy is based on three pillars: (i) Risk Assessment and Reduction; (ii) Detection, Warning and Dissemination; and (iii) Awareness and Response These are underpinned by the basic elements: Interoperability, which means free, open and functional exchange of tsunami information; Research, to improve and enhance understanding and improve technologies and techniques; Capacity-building, including training and technology transfer; and Funding and Sustainability to provide adequate resources to sustain an effective PTWS.

A submarine earthquake (magnitude of Mw 8.0) occurred at 06:48 Samoa Standard Time (17:48:10 UTC) on September 29, 2009 approximately 190 km south of Samoa. The earthquake was felt in much of American Samoa, Samoa and northern Tonga and as far away as Wallis and Futuna Islands and Niuas.

The earthquake generated a regional tsunami which most seriously impacted the islands of Upolu, Manono and Savai'i in Samoa, Tutuila, the main island of American Samoa, the Niuatoputapu, one of the most northerly of the islands of Tonga, Wallis and Futuna, as well as numerous locations in the central South Pacific. Wave heights (peak-to-trough) up to 314 cm were recorded at tide gauges in the region.

Workshop participants taking part in the Tsunami Risk Assessment and Mitigation Workshop held in Bangkok, Thailand

A Tsunami Warning was put into effect for American Samoa, Samoa, Niue, Wallis-Futuna, Tokelau, Cook Islands, Tonga, Tuvalu, Kiribati, Kermadec Is, Fiji, Howland-Baker, Javis Is., New Zealand, FR. Polynesia and Palmyra Is. The warning was cancelled at 21:36 UTC or 3:48 hrs after the warning.

Since the epicentre was located just over 100 km from the south coast of Upolu, Samoa, the tsunami arrived on shore in less than 15 minutes. The excellent work of the Government of Samoa in recent years to develop an effective tsunami early warning system, working with communities, to raise public awareness and practicing drills and evacuation exercises absolutely helped save many lives of the people who had been taught how to respond. However the tsunami did result in loss of life and injuries, indicating that more outreach efforts are still needed.

Bernardo **ALIAGA**

Ocean sciences

OVERVIEW 5

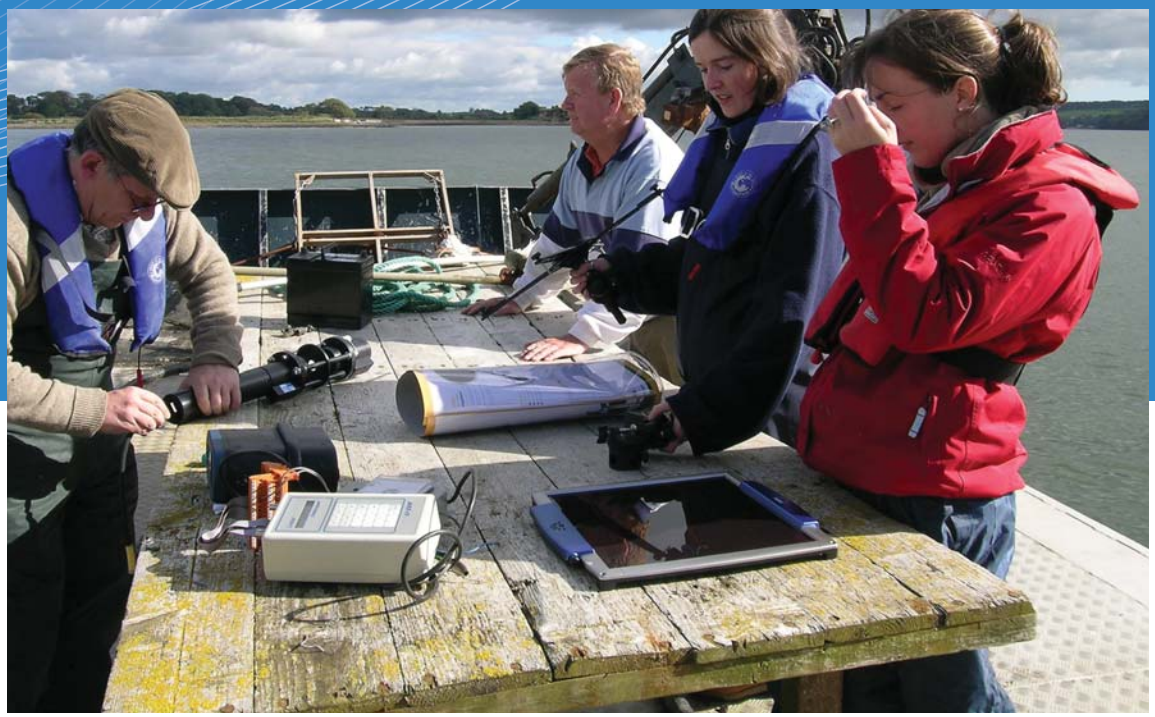
Luis **VALDÉS**

The Ocean Science Section (OSS) took responsibility for the coordination the IOC marine scientific research and related activities in 1999. Ten years later, the OSS has come a long way, and is now a dynamic team, developing ambitious programmes designed to respond to the IOC 2008-2013 high level objectives areas: climate change; ocean health and coastal research; and assessment and management. The OSS integrates work in these areas within IOC, UNESCO and Member States, but also works closely with the scientific community, UN agencies and other international scientific organizations.

An OSS workplan setting the Section's strategy and priorities for the period 2009-2013 was presented at the IOC Assembly and it was traced in coherence with the IOC Medium-term strategy and the programmatic framework of UNESCO. The OSS activities carried out during 2009 actively contributed to make all science efforts as extensive and global as possible, and to build scientific capabilities in the developing world, especially in Africa. Activities included promotion and coordination of externally funded programmes (science innovation and management), stimulating co-operation between researchers and organisations to explore new directions (science synergy) and providing scientific criteria for ecosystem management (scientific services). OSS was also at the forefront of many important international developments and events.

IOC is playing an important role in coordinating international initiatives in Climate Change aimed to produce credible and timely scientific information and to reduce the high levels of uncertainty related to mitigation alternatives and impacts associated with climate change, especially concerning CO_2 impacts in the oceans. The OSS contributed to the climate change dialogue through participation in the WCC-3, COP-15 and OceanObs'09 conferences in 2009. Several documents were presented in collaboration with other UN organizations, including *Blue carbon: the role of healthy oceans in binding carbon* with UNEP and *Ocean Acidification* with IGBP, SCOR and IAEA. During 2009 IOC OSS launched a new version of the Surface Ocean CO_2 Atlas (SOCAT) Project dataset, which contains more than 2,100 cruises from 1968-2007. The Global Ocean Ship-based Hydrographic Investigations Panel (GO-SHIP) developed a strategy that will be published as an IOC Technical Report by International Ocean Carbon Coordination Project (IOCCP) and CLIVAR. The IOCCP provided coordination support for two community white papers at OceanObs'09 related to the GO-SHIP and the Volunteer Observing Ship Program. The IOCCP co-sponsored and hosted the International Nutrients Scale System Workshop that brought together 37 participants from 11 countries. The organizers submitted a proposal for the establishment of a joint ICES-IOC working group that was approved by the 25th IOC Assembly.

A better knowledge of the role of biodiversity and ecosystem processes in ecosystem resilience (the ability of an ecosystem to recover after adverse stresses and perturbations, and minimise the effects of natural or induced variability) is necessary to understand and manage marine ecosystems and to maintain a healthy ocean environ-



ment. In this area the OSS has been active through the Harmful Algae Bloom (HAB) Programme which includes a number of medium to long-term activities such as the IOC-SCOR Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB), capacity development through training courses (Figure X) and regional working groups and networks. GEOHAB gathered more than 80 scientists (Ireland, June) to develop strategies for using observations and models in HAB research and management. The event offered student training and will result in a special issue of the Journal Limnology & Oceanography. As part of a long standing strategy to systematically offer training opportunities the IOC conducted three training workshops with focus on North Africa, Latin America and the Caribbean (with IAEA), one advanced international training course, and two meetings of regional HAB networks (Harmful Algae in North Africa, HANA) and the ROPME Sea (with ROPME). GEOHAB held its 2nd Open Science Meeting in Beijing (China), which was attended by more than 130 participants from 23 countries. ICES continued in 2009 as a key partner for international expert groups to review advances in the science on HAB dynamics and transfer of phytoplankton by ballast of ships and other vectors. IOC Manual & Guide No. 55 on *Microscopic and molecular methods for quantitative phytoplankton analysis* was finalized.

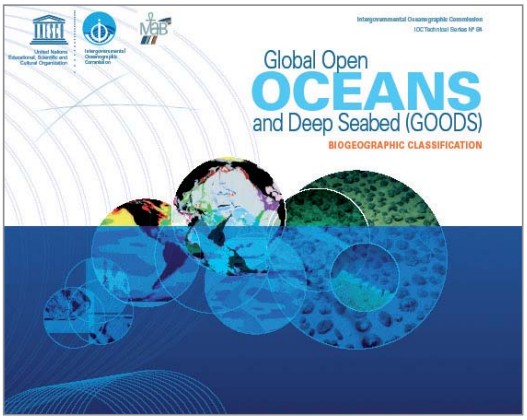
The Ninth Session of the IOC IPHAB was held at UNESCO to review progress and set priorities. The Panel noted with concern the reduced financial support, and stressed that the IOC HAB Programme will only be able to develop and be implemented in 2010-2011 if there is additional extra-budgetary financial support from Member States to fund programme staff and activities. The Panel focused on priorities of biotoxin monitoring, management and regulations, the development of the IODE Harmful Algal Information System, continued development of the IOC Taxonomic Reference List for Toxic Algae, the integration of HAB observations in the Global Ocean Observing System; and regional HAB expert network development.

In 2009 the IOC completed the start-up phase of the Regular Process for the Assessment of Assessments and the report was delivered; now the initiation of the Process is only pending of the resolution of the UNGA. Also in 2009, the Integrated Coastal Area Management (ICAM) programme, a two year project on the application of Marine Spatial Planning (funded by the Moore and Packard Foundations) published an IOC Guide on *Marine Spatial Planning – A Step by step approach towards ecosystem-based management* (IOC Manual & Guide No. 53), The Coastal Hazard Mitigation Working Group established under ICAM in collaboration with NOAA and WMO, published the *Hazard Awareness and Risk Mitigation* in ICAM guidelines (IOC Manual & Guide No. 50). At the regional level, the West Africa Adaptation to Climate Change in Coastal Zones (ACCC) Project (funded by UNDP and GEF) is pursuing the development of adaptation measures in designated pilot sites of Gambia, Senegal, Cape Verde, Mauritania and Guinea Bissau. In South America, the SPINCAM (Southeast Pacific data and Information Network in support to ICAM) project, led to the identification of a set of indicators in each participating country which will be measured and integrated in a national and regional web based atlas system, developed in collaboration with ODIN-CARSSA and IODE.

5.1 Global Open Oceans and Deep Seabed (GOODS) – Biogeographic Classification

Biogeographic classification is an important tool in meeting the World Summit on Sustainable Development target to establish representative networks of marine protected areas by 2012. It will assist us in understanding the scales for applying the ecosystem approach to area-based ocean management and identifying areas representative of major ecosystems. Biogeographic classification underpins development of comprehensive, effectively managed and ecologically representative systems of protected areas. The recent publication on "Global Open Ocean and Deep Seabed (GOODS) Biogeographic Classification" provides for a first-time-ever comprehensive biogeographic classification of these areas, based on a thorough review of existing approaches and scientific relevant literature.

The pelagic and benthic biogeographic classifications presented in the GOODS report represent the first global attempt at comprehensively classifying the open ocean and deep seafloor into distinct biogeographic regions. This biogeographic classification of the world's oceans includes pelagic waters subdivided into 30 provinces as well as benthic areas subdivided into three large depth zones consisting of 38 provinces (14 bathyal, 14 abyssal and 10 hadal). In addition, 10 hydrothermal vent provinces have been delineated. This classification has been produced by a multidisciplinary scientific expert group and is considered a basis for advancing efforts towards the conservation and sustainable use of biodiversity in marine areas beyond the limits of national jurisdiction in line with a precautionary approach. This bioregional classification uses geophysical and environmental characteristics of the benthic and pelagic environments to identify homogeneous regions of similar habitat and associated biological community characteristics. It provides a basis for discussions that can assist policy development and implementation in the context of the Convention on Biological Diversity (CBD) and other scientific,



GOODS Report Cover

conservation and management fora. An international multidisciplinary scientific expert group hs been formed to deliver the biogeographic information required by policy-makers. The GOODS report synthesized knowledge and global understanding of marine life and i)serves as a basis to identify areas representative of major marine ecosystems and habitat types to include in networks of representative marine protected areas; ii) helps to assess gaps in existing marine protected area programmes where examples of specific habitats or ecosystems are not included or not adequately represented; iii) helps to set priorities for management action in areas of high human use; and iv) guides further marine scientific research into areas where significant information gaps exist.

MARINE PROTECTED AREAS

At the present time, the world's oceans have low levels of representation in protected areas, with only approximately 0.6% of the oceans and 6% of territorial seas protected, covering only a small percentage of the different habitats within the marine domain. With few exceptions, marine protected areas are concentrated along continental coastlines, providing relatively little protec-

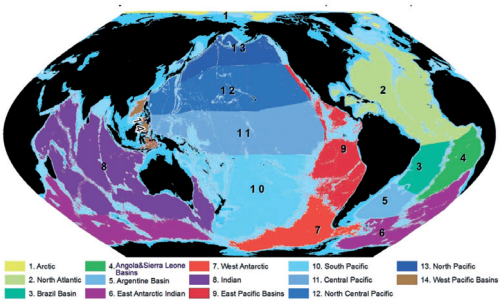
Elva **ESCOBAR BRIONES**

tion to deep sea and open ocean habitats such as seamounts (~2% of total protected). In comparison, many coastal habitats, such as mangroves (~17% of total protected) are relatively better represented in global protected areas systems (CBD, 2006a). In recent years, the Convention on Biological Diversity (CBD), the United Nations Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS) and the UN Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction devoted significant attention to the need to enhance international cooperation and action in areas beyond national jurisdiction. With the continuing decline in the status of marine resources and biodiversity, international policy has increasingly focused on calls to effectively protect a full spectrum of life on Earth, including in the world's oceans, and the services the oceans provide to mankind. The Johannesburg Plan of Implementation of the World Summit on Sustainable Development (WSSD), in 2002, called for countries to " *the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012.*"

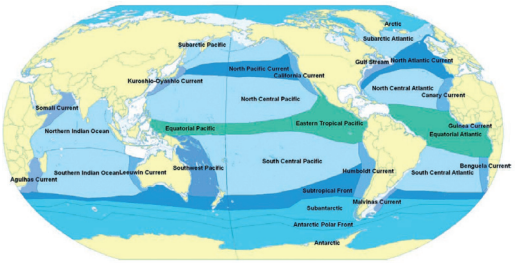
Recent policy discussions on the conservation and sustainable use of biodiversity, including genetic resources, in marine areas beyond national jurisdiction have pointed out – inter alia – the need for information on the biodiversity to be found in those areas, and for a classification of those areas to be developed according to scientific criteria. Building on this, the Conference of the Parties to the Convention on Biological Diversity (CBD) adopted in 2004 a programme of work on protected areas with an overall objective to:

" *Establish and maintain, by 2010 for terrestrial areas and by 2012 for marine areas, comprehensive, effectively managed and ecologically representative systems of protected areas that, collectively, will significantly reduce the rate of loss of global biodiversity.*"

This biogeographic classification provides a scientific basis for hypotheses and further studies on the origin and evolution of deep sea faunal assemblages. Such a classification is a neces-



Abyssal Provinces, depth range 3500-6500m, have been designated based on the deep basins in which they occur.



Pelagic Provinces have unique environmental characteristics in regards to variables such as temperature, depth and primary productivity. .

sary component when considering area-based management options, such as marine protected areas, particularly when assessing representativity of a potential network. There is a need to integrate policy demand and the scientific research generating biogeographic knowledge. Scientific research in the open and deep ocean realms is expensive and time-consuming, and the analysis of the data collected presents complex challenges. A program integrating policy demand and scientific research will strengthen political support needed to build international scientific cooperation at a global scale.

Reference: UNESCO [Vierros, M. I. Cresswell, E. Escobar Briones, J. Rice y J. Araron (Eds.)]. 2009. Paris, UNESCO-IOC. (IOC Technical Series, 84.)

Ocean observations and services

OVERVIEW 6

Too many IOC publications read like a laundry list of programs. Often lost in the resulting forest of acronyms are the real and tangible products and services that are in fact being provided. Thus, in this year's annual report, the OOS section overview is broken down into section headings highlighting actions and deliverables, rather than program titles or acronyms. Of course, reading beyond the section headings, you will find that it is by working together in the context of various programs, including GOOS, IODE, JCOMM and GLOSS that the Member States are able to collectively deliver, and benefit from, ocean related products and services.

SYSTEMATICALLY OBSERVING THE GLOBAL OCEANS

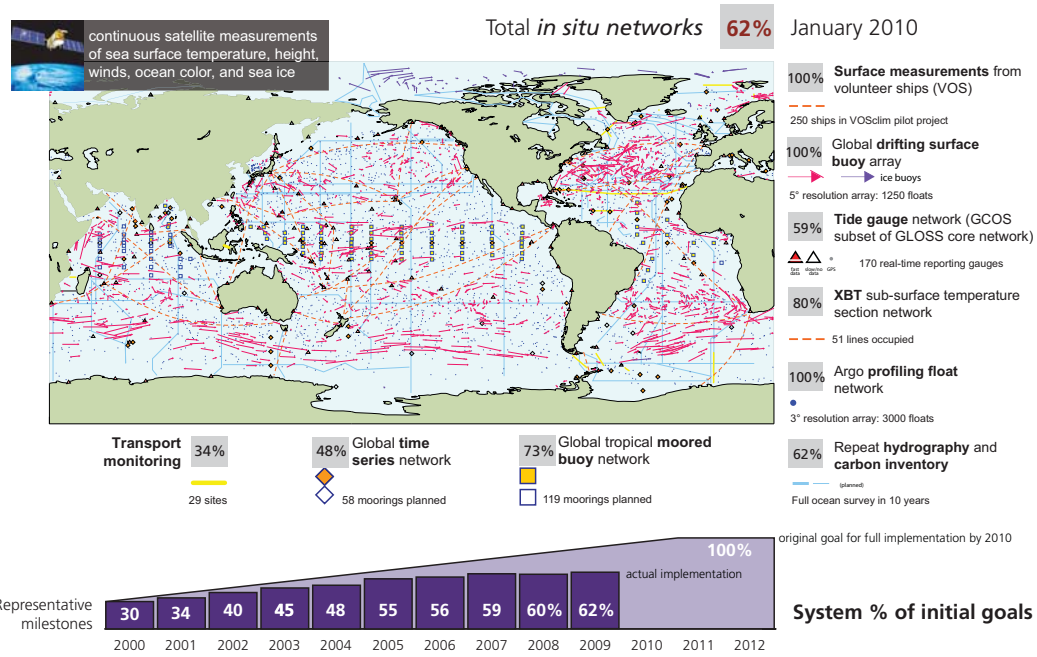
In 1999, a vision for a sustained system providing information about the global oceans was presented at OceanObs'99, the first International Conference on the Ocean Observing System for Climate. The initial physical and carbon observing system largely in place today through the efforts of IOC Member States as the open-ocean component of GOOS has documented global ocean variability and change, contributed to the assessments of the IPCC, and supported ocean forecasting.

Keith **ALVERSON**

A decade later, more than 600 participants from 36 nations attended the OceanObs'09 conference 21-25 September 2009 in Venice, Italy, to envision an enhanced system for the coming decade, able to meet a broader range of societal needs. The conference was built on 99 community white papers that described plans for specific activities that might be feasible in the coming decade. Conference participants adopted a negotiated statement (www.OceanObs'09.net/statement/) that:

- Sets a target date of 2015 for nations to fully implement the initial physical and carbon global ocean observing system,
- Calls for support to develop systematic global biogeochemical and biological observations,
- Calls for agreement on a framework for planning and taking forward an integrated system that develops new physical, biogeochemical and biological observations while sustaining present observations,
- Urges adherence to a broad range of best practices, and
- Asks for increased effort in capacity building and education to serve all potential stakeholders.

The IOC is engaged with partners in a task team of limited lifetime (www.OceanObs'09.net/tt/) that will make recommendations on an integrating framework that will help build the vision of an integrated ocean observing system on



Status of the in-situ ocean observing system for climate. For several years now planned growth targets have not been achieved. A renewed call from OceanObs'09 set the goal to complete the system by 2015.

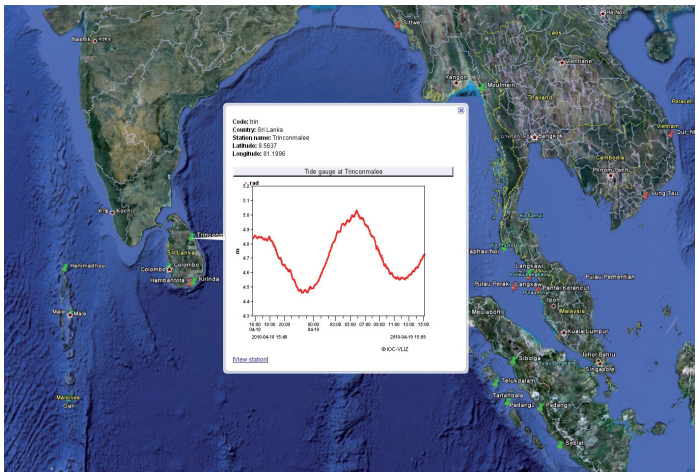
Thorkild **AARUP**

the present structures coordinating international ocean observations.

MONITORING SEA LEVEL

The Global Sea Level Observing System (GLOSS) is primarily concerned with sea level data from tide gauges for scientific research. However, GLOSS has always interacted with operational centers and programs, and is committed to increased support for the tsunami warning community. In this context, GLOSS is helping to define standards for tsunami warning monitoring, and will provide recommendations for optimal network configurations. At the same time, in order to determine absolute long-term sea level change, there is a need to accurately define land motion at tide gauges. For this purpose, a workshop on Precision Observations of Vertical Land Motion at Tide Gauges, served as a starting point for a new initiative to install and upgrade GPS at critical stations in the GLOSS networks. The workshop goals included:

- Document vertical land motion rates at tide gauge locations,
- Evaluate and document the state of the art in providing these rates,
- Discuss what is necessary to further improve these analyses,
- Document the present spatial coverage afforded by tide gauges that already have pre-



GLOSS water level stations provide real-time data at locations worldwide.

cise vertical land motion rates, and
- Prioritize future expansions of the network.

The IOC web-based global sea level monitoring service for viewing sea level data received in real time from different network operators through a number of different communication channels (www.ioc-sealevelmonitoring.org) continued its growth in 2009 and now tracks 341 stations (an increase of about 17% over the last year). GLOSS organized tide gauge installations in Alexandria (Egypt) as well as in Jask (Iran) and in Mtwara (Tanzania) and has contributed considerably to the enhancement of the African Sea Level Observation Network. This work has included technical visits to several countries in Africa, provision of sea level measuring equipment, periodic geodetic leveling and training.

Boram **LEE**

Peter **PISSIERSSENS**

MAKING MORE OCEAN DATA MORE ACCESSIBLE

The Twentieth Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE) set the priorities and activities for the coming year, including a new emphasis on biodiversity and ecosystem data.

During its 25th Session the IOC Assembly decided to accept the Ocean Biogeographic Information System (OBIS) (http://www.iode.org/obis) within the IODE Programme. This represents a major expansion of the IODE remit from its traditional focus on physical oceanographic data systems into the biological information realm.

In 2009, two large scale projects were initiated, support by the Government of Flanders: (i) ODIN-AFRICA-IV (http://www.odinafrica.org) with a focus on strengthening the Pan-African network of National Oceanographic Data and Information Centres and marine related institutions as a sustained mechanism for application of data, information and products for marine and coastal management in Africa; and (ii) OceanTeacher Academy (http://www.iode.org/ota): a teaching programme of courses related to oceanographic data and information management and the development or related products and services.

PARTNERING WITH THE METEOROLOGICAL COMMUNITY

The Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM, http://www.jcomm.info) continues to be a primary mechanism for cooperation between IOC and WMO. Following on a decade of successful cooperation, Member States reviewed achievements and decided on a future workplan at the third session of JCOMM held in Marrakesh, Morocco, from 4 to 11 November 2009.

JCOMM plays a key role in supporting Member States in their efforts to provide ocean observations, data management and services in a coordinated and coherent way. JCOMM workplans are aligned with both IOC High Level Objectives and WMO Expected Results and include:

- Providing technical support for operational ocean services
- Setting measurement standards and sharing best practices
- Setting and encouraging adherence to data standards
- Contributing to multi-hazard marine and coastal warning systems

There has also been a substantial renewal and turnover amongst JCOMM leadership, which is encouraging for the future.

OUTREACH AND ADVOCACY

Informal surveys suggest that less than half of the marine community knows of the Global Ocean Observing System or its mission, while nearly all know of the IPCC and the need of ocean data for climate change science. Ocean observations are the unglamorous infrastructure of ocean climate science, and therefore there is a great urgency to become recognized and valued by our constituency. Outreach projects in 2009 put the GOOS name and image out front through displays at UNFCCC meetings and during OceanObs'09. Display and handout materials including the Gorick Poster (see figure) and a "Summary for Policy Makers" brochure were prepared as part of these outreach efforts. In addition new constituencies are being targeted through the GSSC organized "Small Sea Changes; Big Business Impacts" workshops. Liaisons with outreach programs of POGO and Ocean United have also brought increased awareness at ocean research institutes.

Glynn Gorick's artwork portrays the complexity, unity and utility of the Global Ocean Observing system to the general public, though scientists and marine policy makers are also enamored by this useful outreach tool.

Student defending teamwork at the "How to Build a Habitable Planet" workshop.

CAPACITY DEVELOPMENT WITH PRIORITY AFRICA

A grassroots, multi-stakeholders approach helped to mobilize partners and resources for a series of African-led initiatives fostering the applications of earth observation to Coastal Oceans, Water Resources, Climate Change and Global Warming. These included:

- A Data Dissemination System for Environmental Resource Management in Africa,
- A Training Workshop "How to Build a Habitable Planet" followed by an international conference on designing, planning and implementing an Operational Oceanography System for Southern Africa,
- A successful Euro-African Marine Network proposal (European Framework Programme 7) to promote exploitation of marine data streams and integrate them into the curricula of several African Universities.

Tom **GROSS**

GOOS exhibit display shown at Oceanology International '10 brought the GOOS name and image to thousands of convention goers.

6.1 Science and Politics of Climate: the Essential Role of the IOC

In 1896 the Swedish physical chemist Svante Arrhenius, building on the work of John Tyndall who in 1862 discovered that CO_2 could absorb heat radiation, suggested that the human burning of fossil fuels could increase global temperatures. Little did he know that more than 100 years later—as the leaders of 115 countries converged on Copenhagen in December 2009—that his idea would be at the center of not a scientific debate, but of a political one on what action should be taken to mitigate and adapt to climate change.

Climate science, based on observations and research in the atmospheric, oceanic, and terrestrial domains, managed to put a problem at the center of global political discourse. Scientists may now feel marginalized in the political negotiations, but climate science and IOC programmes in research and observations for climate still have an essential role to play—a role that is changing as decision-makers seek more regionally-specific and shorter-timescale information about human and natural vulnerabilities to climate change, and how to adapt in the future to our changing climate.

CLIMATE IN THE UN SYSTEM

Climate science began with Arrhenius and Tyndall in the late nineteenth century, but received little notice for decades. Since then, scientists in many fields including oceanography have contributed to a growing understanding of the human interaction with the climate system, and to improving projections of the future climate. The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 to assess climate science for policymakers.

Climate change as a political issue came into force in 1994 with the UN Framework Convention on Climate Change wherein countries ('Parties' to the Convention) consider what can be done to reduce global warming, and to cope with the temperature increases that are inevitable. Its Kyoto Protocol, negotiated in 1997, sets legally binding targets for 37 industrialized countries to reduce the emissions of greenhouse gases over the five-year period 2008-2012. The December 2009 Copenhagen Fifteenth Meeting of the UNFCCC Conference of Parties (COP-15) was the culmination of a two-year effort to negotiate a wide-ranging agreement to replace the Kyoto Protocol, which runs out in 2012.

Albert **FISCHER**

IOC AND THE UNFCCC

The global climate system is highly dependent upon ocean currents, major conveyors of heat in the climate system, making an understanding of their dynamics vital to future projections. Sea level rise from thermal ocean expansion and land ice melting threatens many small island developing states, and large unprotected populations in low-lying river deltas, again mostly in developing countries. The oceans have absorbed about a half of historical human emissions of greenhouse gases - preventing an even greater rise in temperatures, but slowly acidifying in the process, with worrying but unclear impacts on ocean ecosystems and living marine resources.

The IOC has had a longstanding engagement with the UNFCCC representing the marine scientific and observing communities. Recognizing the need for better climate research and systematic climate observations the UNFCCC engaged the climate research community including the IOC co-sponsored World Climate Research Programme, and the climate observing networks represented by the IOC co-sponsored Global Climate Observing System (GCOS) and directly with the Global Ocean Observing System (GOOS). A series of requirements-setting activities, captured in GCOS reports to the UNFCCC on the adequacy of observing systems and an implementation plan (GCOS No. 92, 2004), helped to mobilize the development of the open-ocean / climate component of GOOS. At the international level the in situ ocean observing networks in the GCOS implementation plan are coordinated in large part by the Joint IOC-WMO Technical Commission for Oceanography and Marine Meteorology (JCOMM), and satellite observing networks through the Committee on Earth Observing Satellites (CEOS) of which IOC and GOOS are both associate members.

At COP-15 GCOS reported to the UNFCCC progress made in implementing a global observing system for climate, including atmospheric, oceanic, and terrestrial components.

In the oceanic domain, slow but steady progress has been made in the last five years. However much of the ocean observing system for climate, both in situ and satellite, depends on short time horizon research funding, and very little progress has been made in establishing national agencies with mandates for sustained ocean observations. One of the few decisions the COP-15 did manage to adopt was one on systematic observations, asking Parties to address priorities and gaps and to ensure the sustained long-term operation of essential observing networks, especially for the oceanic and terrestrial domains. The decision also invited GCOS to develop an updated implementation plan that would take into account emerging needs, in particular those relating to adaptation to climate change and variability.

THE COPENHAGEN CLIMATE CHANGE CONFERENCE

COP-15 took place amidst a riot of political and media attention, with the 115 world leaders and Party delegations far outnumbered by the 40,000 registered participants representing observer organizations and civil society, all stakeholders in the outcomes. The IOC was represented by the Executive Secretary, and OOS organized an exhibit focused on the importance of ocean observations for climate. The UN system had pressured delegates to «Seal the Deal» in a new agreement that would set ambitious emissions reductions for developed countries, involve major developing countries in mitigation of emissions, develop action

© L. A. Brooks.

Mangrove seedlings planted to increase coastal resilience in Kuala Gula, Perak, Malaysia.

for adaptation to climate change, and develop financial and technology transfer mechanisms to support the most vulnerable countries. The Danish hosts renamed their city 'Hopenhagen' in a campaign to further raise pressure.

In the end 108 Parties and the European Union supported the Copenhagen Accord, which targets a maximum 2 degrees C rise in global

UN Secretary-General Ban Ki-moon during his closing press conference after delegates adopt a decision taking note of the Copenhagen Accord

© Syndi

The president of the Maldives held an underwater cabinet meeting in November 2009 to dramatize the threat of sea level rise to the lowest-lying country in the world.

temperatures above pre-industrial levels. It asks both developed and developing countries to submit pledges for mitigation of climate change, and contains clear promises to fund mitigation and adaptation actions in developing countries.

The UNFCCC is now continuing its work towards an agreement under the Convention, and will take this up at COP-16 in Cancún, Mexico (December 2010), where GOOS will report to the parties on the adequacy of the ocean component of the Global Climate Observing System.

OTHER IMPORTANT CLIMATE-RELATED DEVELOPMENTS IN 2009

The Copenhagen conference was the culmination of a busy year in climate. The World Climate Conference - 3 declaration decided

© NASA

The Nile River Delta was identified by the IPCC as one of the most vulnerable areas to sea level rise due to its high population and lower capacity for adaptation.

© 350.org

High tides flooding the low-lying nation of Tuvalu will become more frequent in the future - local residents campaigned for a solution at COP-15 in Copenhagen

to establish a Global Framework for Climate Services (GFCS) to strengthen production, availability, delivery and application of science-based climate prediction and services. GCOS, GOOS, and WCRP will respond with a new emphasis on delivery of regional climate products, in particular relating to adaptation and mitigation on the country level. The IOC and UNESCO are actively involved in the development of this GFCS. The Executive Secretary remains in the lead of UNESCO Intersectoral Platform on Climate Change and will help shape the UNESCO Director-General's announced Climate Initiative.

Criticism of the IPCC grew in the media of some countries in 2009, over charges of conflicts of interest for the IPCC chair, some admitted factual errors in the IPCC's 2007 assessment, and over charges of biased science in part based on hacked e-mails from a UK university climate group. The WCRP Joint Scientific Committee responded in an open letter to the heads of its three sponsors with full support for the IPCC Fourth Assessment Report (2007) main conclusions, that «warming of the climate system is unequivocal» and that «most of the observed increase in global average temperatures since the mid-20th century is very likely [>90% probability] due to the observed increase in anthropogenic greenhouse gas concentrations».

WHAT IS THE ONGOING ROLE OF THE IOC?

The political negotiations over climate do not change the central role of the IOC - although they do flavor it. The fundamental service science must provide to society is constant: ensuring continuity and quality of ocean climate observations, and delivering unbiased research results and climate projections to underpin society's needs for information to support climate mitigation and adaptation. IOC Member States must find ways to continue supporting these activities, that will be monitored and coordinated through IOC programmes.

There is however a clear and growing need to provide locally-relevant information to aid planning for climate change mitigation and adaptation. Sustained IOC Member State actions in global research and observations for climate, through the WCRP and GCOS, GOOS and JCOMM, provide a firm global basis for developing locally-relevant information, that no one nation can provide on its own. The coming challenge is to support regional ocean climate monitoring networks, regional and decadal-scale climate models and projections that will provide information and understanding relevant to individual states and communities.

ANNEXES

7

Funding for IOC programmes

INTRODUCTION: GENERAL OVERVIEW

This Annual Report describes a wide spectrum of activities that highlight the relevance of the Intergovernmental Oceanographic Commission of UNESCO's programmes in 2009. Together with national and non-governmental initiatives implementation and related staff costs during 2009 were financed through income from UNESCO as parts of its regular programme allocation, as approved by the UNESCO General Conference, and from extrabudgetary resources, notable those provided by IOC Member States and partner organizations through their contributions to the Intergovernmental Oceanographic Commission of UNESCO Special Account and contributions for specific projects through the creation of UNESCO Funds-in-Trust. This financial report does not consider other contributions (either direct or in-kind) provided by Member States. More detailed financial information, including the very substantial to the IOC Offices in Ostend, Perth and Vigo, for which official information was provided to the Executive Secretary, can be found in the 'Report on budget execution 2008-2009' prepared for the Forty-third Session of the IOC Executive Council (document IOC/EC-XLIII/2 Annex 2).

Chart 1. *2009 Expenditure (disbursements) by source (Regular Budget vs Extrabudgetary -Total: USD 12,737,121*

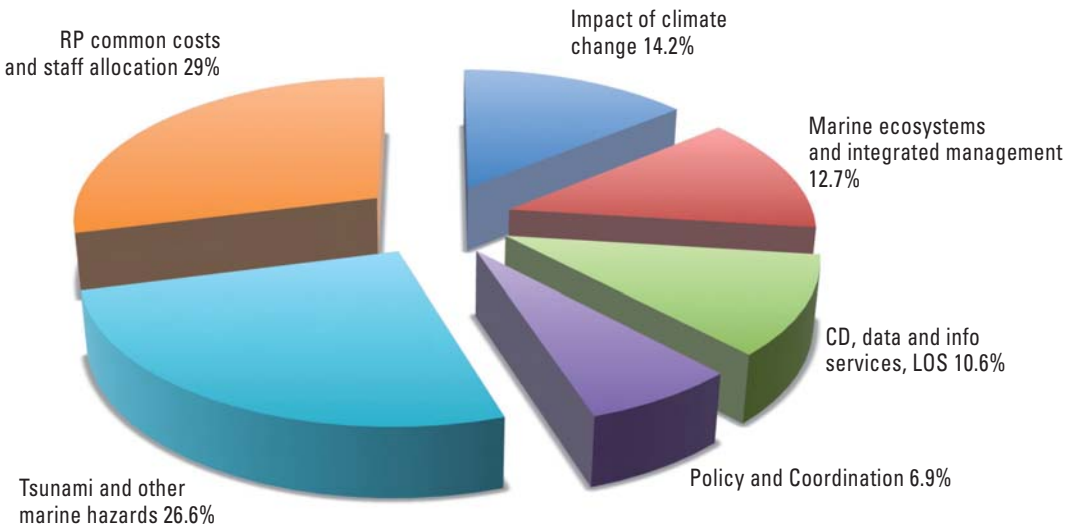


Chart 2. *2009 Total expenditure (disbursements) by main programme areas and RP common costs – Total USD 12,737,121*

1. REGULAR PROGRAMME

The IOC Assembly at its 24th session (`19-28 June 2007) considered the Draft Programme and Budget for the biennium 2008-2009 as presented by the Executive Secretary in document IOC-XXIV/2 Annex 11. The Executive Secretary explained that while the 176th Executive Board of UNESCO converged towards the Zero Real Growth scenario for the UNESCO's Programme and budget for 2008-2009, some key Member States still supported a Zero Nominal Growth Scenario, which in real terms represented a diminution of the budget. Given the uncertainty in the approval of the UNESCO's 34 C/5, the IOC Programme and Budget for 2008-2009 had been conceived around three scenarios.

The Financial Committee considered the implications of the different scenarios at the level of IOC. Following the recommendations of the Committee, the Assembly adopted Resolution XXIV-15 'IOC Programme and Budget 2008-2009', in which it stressed 'the importance of the regular funds provided by UNESCO, as an efficient and effective intergovernmental means to generate additional actions and support from Member States, and urged Member States 'to support the IOC programme proposals when the Draft 34 C/5 is being considered by the UNESCO Executive Board and General Conference'.

The Committee agreed that, in the event that the budget agreed at the General Conference of UNESCO would partly or totally cover real growth, the additional resources to IOC should be allocated as follows:

- Additional investment in the area of climate change and impacts and adaptation strategies for coastal regions, specifically for the benefit of Africa, Small Island Developing States and Least-Developed Countries
- Additional support for the response to the risks posed by tsunami
- New support to provide additional actions in the prevention and mitigation of natural hazards and, in particular, to extend the level o activity, across all lines of IOC.
- The global reporting process for assessment of the marine environment

The 34th General Conference of UNESCO (Paris, 16 October – 3 November 2007) endorsed the $631M budget for the Organisation for 2008-2009. During the discussions on the budget there was unanimously strong support for the Commission, allowing the Commission to maintain approximately the same budget allocation for the activities as in the previous biennium, as requested by the Assembly at its 24th Session through Resolution XXIV-15. The adopted appropriation for activities for 2008-2009, inclusive of indirect programme costs, was $4,052,100, of about 5% more than for the biennium 2006-2007. The General Conference also encouraged the Director-General to look for ways to reinforce the IOC budget through an additional allocation.

2. EXTRABUDGETARY FUNDING

IOC's extrabudgetary resources include voluntary contributions to the IOC Special Account and contributions to specific projects under Funds-in-Trust agreements.

Details on contributions to and expenditures from the IOC Special Account and Funds-in-Trust can be found in the 'Report on budget execution 2008-2009' prepared for the Forty-third Session of the IOC Executive Council (document IOC/EC-XLIII/2 Annex 2).

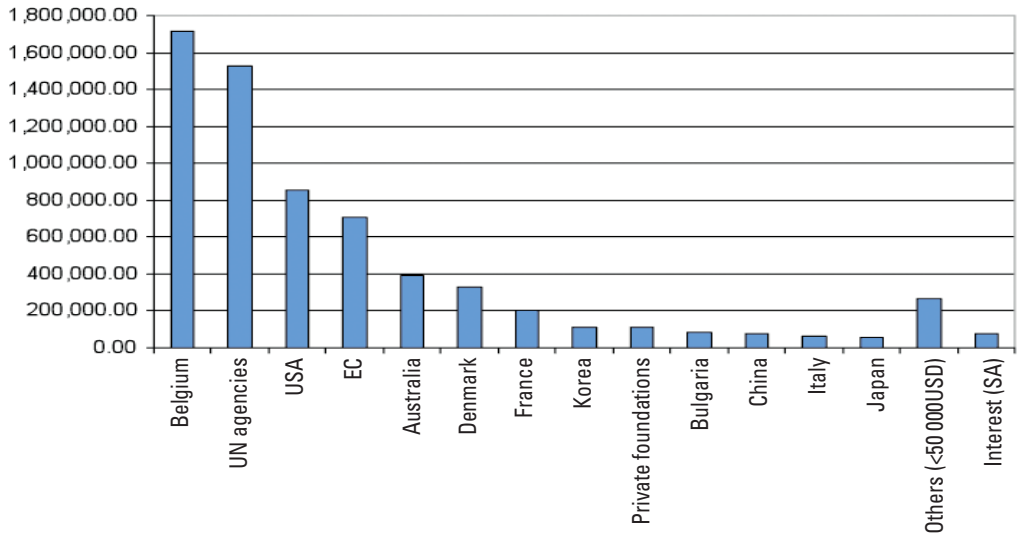


Chart 3. *Main extrabudgetary donors – based on 2009 revenue/contributions to the IOC Special Account and to the Funds-in-Trust (Total of US$ 6,586,016).*

3. OVERVIEW OF THE IOC STAFFING SITUATION

The most relevant fraction of the fixed cost of the IOC's operation is personnel, with core staff funded by UNESCO's regular budget allocation for staff representing 28% of the total 2009 expenditure. In addition, another 24% of expenditure covers all types of temporary assistance, including short-term consultancies and fee contractors. During 2009, the IOC counted approximately 62 employees (55.7person/year) of which 42 were at Headquarters and 20 in the Field (respectively 39 and 17 in 2008). Of these, 45 were professional staff and 17 provided administrative and secretarial assistance. 1 (one) professional, Mr Lee, Kyung-Koo, was seconded to the IOC Secretariat by the Republic of Korea. 22 established posts were funded by UNESCO's regular budget staff allocation (34 C/5 Approved): 10 professional staff and 12 administrative and secretarial assistants. The rest of the IOC personnel are funded by other sources, mainly extrabudgetary.

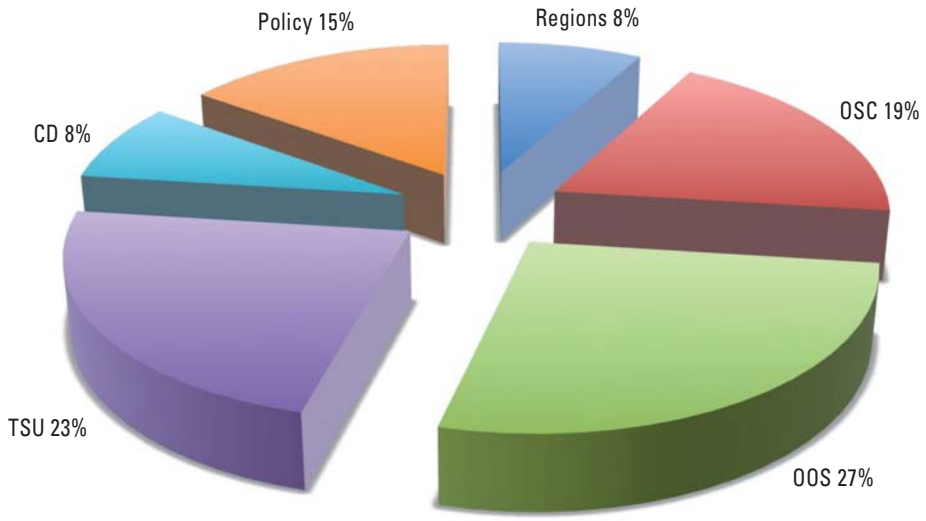
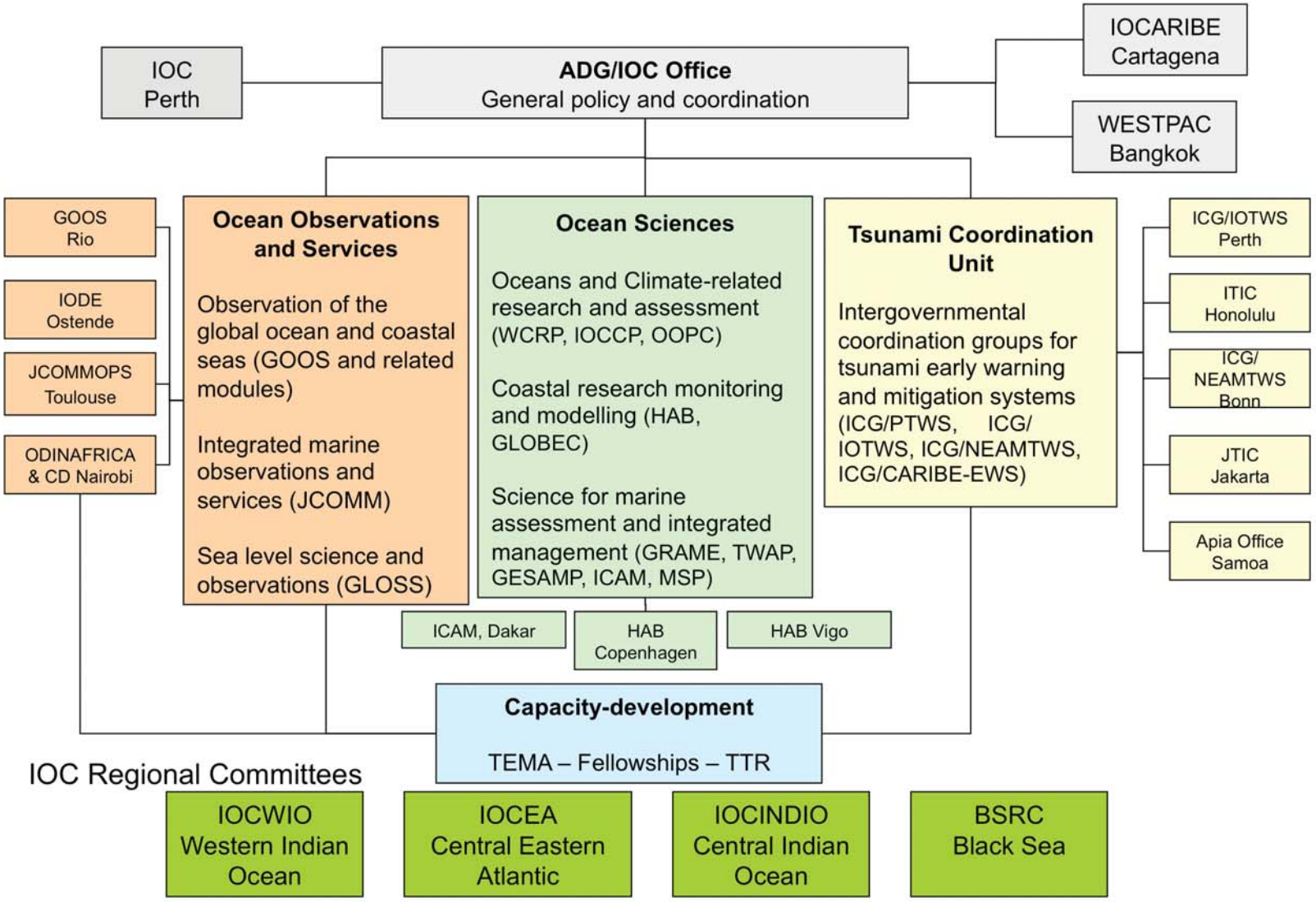
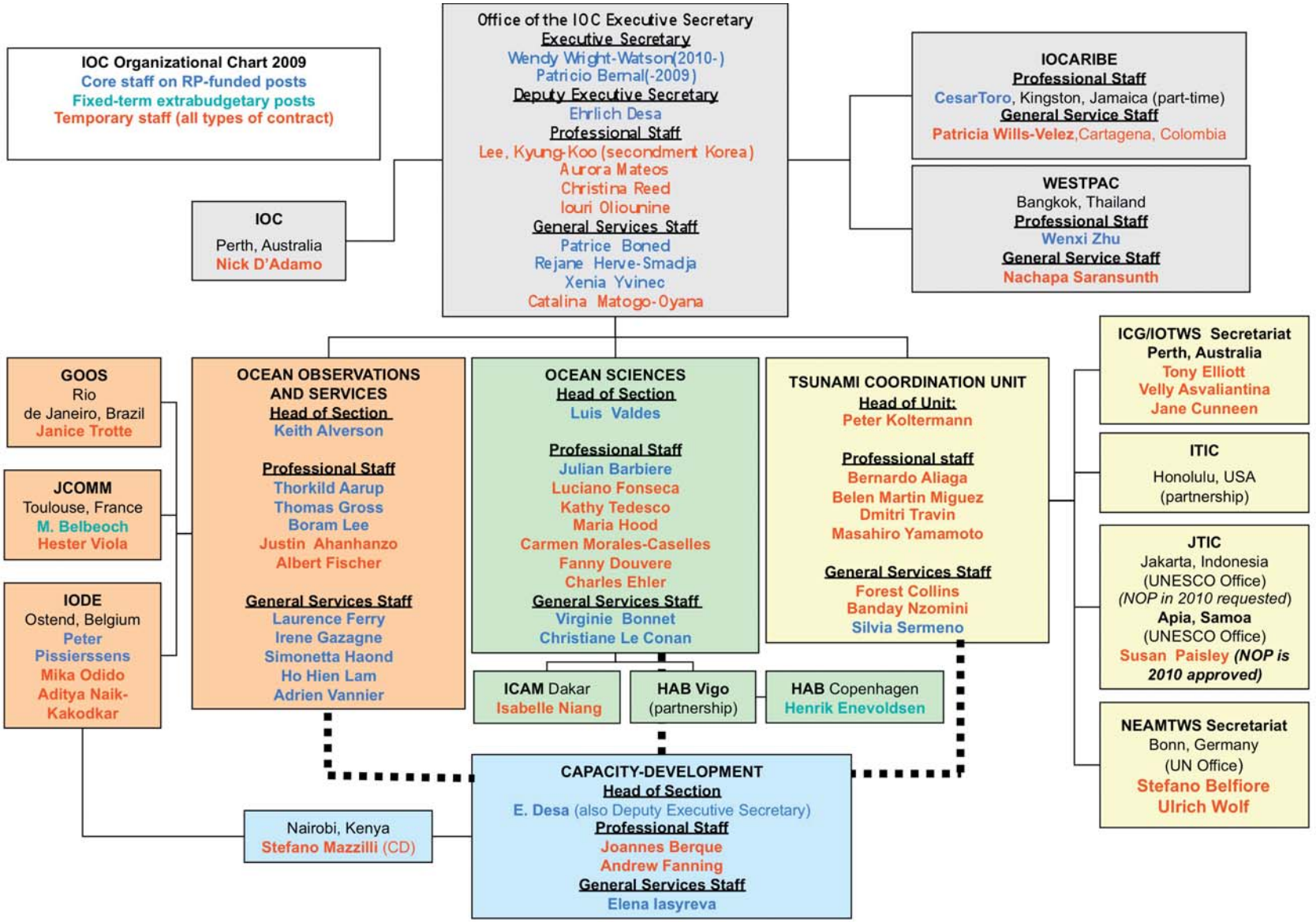


Chart 4. *IOC Staff by Main Structural Groupings.*

Structure of the IOC Secretariat



IOC Staff


IOC Organizational Chart 2009
Core staff on RP-funded posts
Fixed-term extrabudgetary posts
Temporary staff (all types of contract)
IOC
Perth, Australia
Nick D'Adamo
Office of the IOC Executive Secretary
Executive Secretary
Wendy Wright-Watson(2010-)
Patricio Bernal(-2009)
Deputy Executive Secretary
Ehrlich Desa
Professional Staff
Lee, Kyung-Koo (secondment Korea)
Aurora Mateos
Christina Reed
Iouri Oliounine
General Services Staff
Patrice Boned
Rejane Herve-Smadja
Xenia Yvinec
Catalina Matogo-Oyana
IOCARIBE
Professional Staff
CesarToro, Kingston, Jamaica (part-time)
General Service Staff
Patricia Wills-Velez,Cartagena, Colombia
WESTPAC
Bangkok, Thailand
Professional Staff
Wenxi Zhu
General Service Staff
Nachapa Saransunth
GOOS
Rio
de Janeiro, Brazil
Janice Trotte
JCOMM
Toulouse, France
M. Belbeoch
Hester Viola
IODE
Ostend, Belgium
Peter
Pissierssens
Mika Odido
Aditya Naik-
Kakodkar
OCEAN OBSERVATIONS
AND SERVICES
Head of Section
Keith Alverson
Professional Staff
Thorkild Aarup
Thomas Gross
Boram Lee
Justin Ahanhanzo
Albert Fischer
General Services Staff
Laurence Ferry
Irene Gazagne
Simonetta Haond
Ho Hien Lam
Adrien Vannier
OCEAN SCIENCES
Head of Section
Luis Valdes
Professional Staff
Julian Barbiere
Luciano Fonseca
Kathy Tedesco
Maria Hood
Carmen Morales-Caselles
Fanny Douvere
Charles Ehler
General Services Staff
Virginie Bonnet
Christiane Le Conan
TSUNAMI COORDINATION UNIT
Head of Unit:
Peter Koltermann
Professional staff
Bernardo Aliaga
Belen Martin Miguez
Dmitri Travin
Masahiro Yamamoto
General Services Staff
Forest Collins
Banday Nzomini
Silvia Sermeno
ICAM Dakar
Isabelle Niang
HAB Vigo
(partnership)
HAB Copenhagen
Henrik Enevoldsen
Nairobi, Kenya
Stefano Mazzilli (CD)
CAPACITY-DEVELOPMENT
Head of Section
E. Desa (also Deputy Executive Secretary)
Professional Staff
Joannes Berque
Andrew Fanning
General Services Staff
Elena Iasyreva
ICG/IOTWS Secretariat
Perth, Australia
Tony Elliott
Velly Asvaliantina
Jane Cunneen
ITIC
Honolulu, USA
(partnership)
JTIC
Jakarta, Indonesia
(UNESCO Office)
(NOP in 2010 requested)
Apia, Samoa
(UNESCO Office)
Susan Paisley (NOP is 2010 approved)
NEAMTWS Secretariat
Bonn, Germany
(UN Office)
Stefano Belfiore
Ulrich Wolf

IOC Meetings Calendar 2009

January 2009		
27 - 30	GE-BICH-IV: 4th Session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices.	Oostende, Belgium
February 2009		
2 - 4	Workshop on: Coastal Eutrophication: Linking Nutrient Sources to Coastal Ecosystem Effects and Management. The intersection of several UNESCO-IOC Programmes Related to Nutrients	Paris, France
9 - 13	OceanTeacher Academy Planning Workshop	Oostende, Belgium
13	Tenth Meeting of the IOC Editorial Committee of the Bathymetric Chart for the Caribbean and the Gulf of Mexico (IBCCA)	La Havana, Cuba
16 - 18	ICG/PTWS-XXIII: Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System	Apia, Samoa
23 - 24	GSSC-XII Workshop: Global and Regional Operational Oceanographic Systems: A Workshop to Explore Collaborative Benefits in the Indian, Asian, Southern Pacific and Australian Oceanic regions	Perth, Australia
24 - 26	PICO-II: Second session of the Panel for Integrated Coastal Observations	Perth, Australia
25 - 27	GSSC-XII: 12th Session of GOOS Scientific Steering Committee Meeting	Perth, Australia
25 - 26	ICG/IOTWS WG5 Intersessional Meeting: Working Group 5: A System of Interoperable Advisory and Warning Centres Intersessional Meeting	Melbourne, Australia
27	ICG/IOTWS Steering Group Meeting: IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System Steering Group Meeting	Melbourne, Australia
March 2009		
5 - 6	Pilot project development meeting for the South East Asian Global Ocean Observing System (SEAGOOS): Enhancing regional ocean observations for better understanding climate change in South East Asia (including the The First MOMSEI Expert Workshop).	Phuket, Thailand
9 - 11	TT-MSI: JCOMM/ETMSS Task Team on Maritime Safety Information	Geneva, Switzerland
9 - 11	JCOMM OCG-III: Third meeting of the JCOMM Observations Programme Area Coordination Group	Paris, France
9 - 11	Second SCOR/IODE Workshop on Data Publishing	Oostende, Belgium
11 - 13	SCG-IV: Fourth session of the JCOMM Services Programme Area Coordination Group	Geneva, Switzerland
16 - 20	Workshop on the creation of the ODIN-PIMRIS web portal	Oostende, Belgium
16 - 17	Oceanographic Data Management for University Students: Introduction to Ocean Data Management for Students of the Environment Group I	Oostende, Belgium
18 - 19	Workshop on the IODE Ocean Data Portal (v.1.) and WIGOS Pilot Project for JCOMM	Obninsk, Russian Federation
18 - 19	Oceanographic Data Management for University Students: Introduction to Ocean Data Management for Students of the Environment Group II	Oostende, Belgium
19 - 20	First ODIN BlackSea Planning Workshop	Obninsk, Russian Federation
19 - 20	NEAMTWS TT-III: 3rd NEAMTWS Task Team meeting on the TWS architecture	Paris, France
20	Australian Integrated Marine Observing System National Advisory Board 5th meeting	IOC Perth office, Australia
20 - 21	Training Course on the Establishment of National OceanDataPortal nodes in the Black Sea region (ODINBlackSea)	Obninsk, Russian Federation
23 - 24	Technical Conference on the WMO Integrated Global. Observing Systems (TECO-WIGOS)	Dubrovnik, Croatia
24 - 27	Global ICGs Meeting: Global Meeting of the Intergovernmental Coordination Groups for Tsunami Warning Systems (GLOBAL TWS)	Paris, France
27	TOWS WG-II: 2nd meeting of the TOWS Working Group	Paris, France
30 Mar - 3 Apr	IOC/ABE-LOS IX: Ninth Session of the IOC Advisory Body of Experts on the Law of the Sea.	Paris, France
30 Mar - 2 Apr	Workshop on assessment of ocean information requirements for coastal management in Africa	Oostende, Belgium
31 Mar - 2 Apr	ICES-IOC WGHABD: ICES-IOC Working Group on Harmful Algal Bloom Dynamics	El Rompido (Huelva), Spain

April 2009		
7 - 9	ICG/IOTWS-VI: Sixth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System	Hyderabad, India
14 - 30	UNESCO EXB: 181st session of the UNESCO Executive Board	Paris, France
20 - 23	IOC/WESTPAC Workshop on Oil Spill Responses and Monitoring: IOC/WESTPAC International Training Workshop on Monitoring Technique and Emergency Response of Marine Oil Spills	Qingdao, China
20 - 23	IOC/WESTPAC International Training Workshop on Monitoring Techniques and Emergency Responses of Marine Oil Spills	Qingdao, China
22 - 24	IPHAB-IX: Ninth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms	Paris, France
May 2009		
1	IOC/WESTPAC Workshop on Coral Reefs: First IOC/WESTPAC Workshop on the Coral Reef under Climate and Anthropogenic Perturbations (CorReCAP)	Shanghai, China
4 - 8	IODE-XX: 20th Session of the IOC Committee on International Oceanographic Data and Information Exchange	Beijing, China
11 - 15	Eleventh Session of the GLOSS Group of Experts: GLOSS GE XI and associated Workshop on Precision Observations of Vertical Land Motion at Tide Gauges.	Paris, France
11 - 15	WOC2009: World Ocean Conference organized by the Government of Indonesia	Manado, Indonesia
11 - 12	PP-WET SC: PP-WET Steering Committee meeting of Pilot Project on Wave measurement Evaluation and Test (PP-WET)	La Jolla, United States
12 – 14	Fifth Meeting of The Regional Alliance for the Upper Southwest and Tropical Atlantic (OCEATLAN)	Montevideo, Uruguay
13 - 14	PP-WMD SC: PP-WMD Steering Committee meeting. The JCOMM Technical Workshop on Wave Measurements from Buoys	La Jolla, United States
18 - 22	SOT-V: Fifth Meeting of the JCOMM Ship Observations Team (SOT)	Geneva, Switzerland
23 - 26	First IOC/WESTPAC Workshop on the Coral Reef under Climate and Anthropogenic Perturbations (CorReCAP)	Shanghai, China
June 2009		
2 - 4	ICG/CARIBE EWS-IV: Fourth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions	Fort-de-France, Martinique, France
3 - 5	IOP-6: 6th Session of the CLIVAR/GOOS Ocean Panel	Sainte-Clothilde, La Reunion, France
4 - 5	2nd GODAE-OOPC Observing System Evaluation Workshop: Towards Routine Monitoring	Toulouse, France
4 - 6	IOC/WESTPAC Workshop on Marine Invasive Species and Management in the Western Pacific Region	Bangkok, Thailand
8 - 10	First meeting of the GODAE Ocean View Science Team	Toulouse, France
8	World Oceans Day: The United Nations General Assembly decided that, as from 2009, 8 June would be designated by the United Nations as "World Oceans Day"	New York, United States
9 - 13	I-GOOS Board-V: Fifth Meeting of the I-GOOS Board	Paris, France
10 - 12	I-GOOS-IX: 9th Session of the IOC-WMO-UNEP Intergovernmental Committee for GOOS	Paris, France
11 - 12	ET-OOFS-2: Second meeting of the JCOMM Expert Team on Operational Ocean Forecast Systems	Toulouse (Ramonville St Agne), France
14	Chairpersons of IOC Regional Subsidiary Bodies Meeting in conjunction with the XXV Session of the IOC Assembly	Paris, France
15	EC-42: 42nd Session of the IOC Executive Council	Paris, France
15 - 19	IOC-SCOR GEOHAB Modelling Workshop	Galway, Ireland
15 - 26	OceanTeacher Academy: Training Course on website development	Oostende, Belgium
16 - 25	IOC-XXV: 25th Session of the IOC Assembly	Paris, France
22 - 25	The Second IOC/WESTPAC Officer's Meeting	Paris, France
29 June - 1 July	CIFDP: Coastal Inundation Forecasting Demonstration Project meeting	Geneva, Switzerland

July 2009		
7 - 10	OceanObs'09 Program Committee Meeting	Paris, France
7 – 11	A training course focusing on data dissemination systems for environmental resource management	Cape Town, South Africa
8-22	How to Build a Habitable Planet Workshop, International Science Conference on Operational Modelling of Oceanographic Coastal Zones	Cape Town, South Africa
13 - 17	COAST-MAP-IO Coastal Mapping, Modeling and Risk Assessment (CoMMRA)	Bangkok, Thailand
14 - 17	Advisory workshop on Enhancing forecasting capabilities for North Indian Ocean Storm Surges	Delhi, India
19 - 29	IAMAS/IAPSO/IACS Joint Assembly 2009	Montreal, Canada
August 2009		
8 - 9	Second Expert Workshop on the Pilot Project of SEAGOOS on the Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI)	Qingdao, China
10 - 11	RTT Meeting: Regional Tsunami Watch Providers Task Team Intersessional Meeting	Jakarta, Indonesia
11	WG6 Intersessional Meeting: ICG/IOTWS Working Group 6 on Mitigation, Preparedness and Response: Intersessional Meeting and Scoping Workshop	Jakarta, Indonesia
12 - 14	IOWave09 SOP Workshop and Tabletop Exercise	Jakarta, Indonesia
25 - 26	First Brainstorming Workshop of WESTPAC Drafting Group on the Regional Ocean Research Priority Plan (RORP)	Bangkok, Thailand
31 Aug. - 4 Sept.	World Climate Conference – 3: Climate prediction for decision-making: focusing on seasonal to interannual time scales.	Geneva, Switzerland
31 Aug. - 4 Sept.	WESTPAC Training Course for IODE Ocean Data Portal data providers	Seoul, Korea Rep
31 Aug. - 5 Sept.	Modelling for Stakeholders: Hydrodynamic Modelling for Stakeholders of the WIO Region 1	Quelimane, Mozambique
September 2009		
7 - 23	UNESCO EXB: 182nd session of the UNESCO Executive Board	Paris, France
7 - 12	Modelling for Stakeholders: Hydrodynamic Modelling for Stakeholders of the WIO Region 2	Mombasa, Kenya
15 - 16	ODINBlackSea Steering Group Meeting	Oostende, Belgium
17 - 18	User Consultation Meeting on European Space Agency (ESA) Storm Surge Project.	Venice, Italy
17 - 19	OceanSITES 2009 Meeting of the Steering and the Data Management Teams of the OceanSITES programme	Venice, Italy
21 - 25	OceanObs'09: Ocean information for society: realizing the potential, sustaining the benefits.	Venice, Italy
26 - 27	ITP-5: Fifth meeting of the International Tsunameter Partnership	Paris, France
27 Sept. - 1 Oct.	35th IAMSLIC Conference and 13th Biennial EURASLIC Conference	Brugge, Belgium
28 Sep - 1 Oct	DBCP-XXV: Twenty-fifth Session of the Data Buoy Cooperation Panel	Paris, France
28 - 30	CLME Steering Committee: First Caribbean Large Marine Ecosystem Project Steering	Cartagena de Indias, Colombia
October 2009		
1	IOCARIBE Board: IOC Sub-Commission for the Caribbean and Adjacent Regions Board of Officers Meeting	Cartagena de Indias, Colombia
2 - 7	OceanTeacher Academy: Training Course on Digital Asset Management	Oostende, Belgium
6 - 23	UNESCO GC: 35th UNESCO General Conference	Paris, France
12 - 14	African Marine Atlas Task Team	Oostende, Belgium
12 - 13	Ministerial Round Table on Oceans: Building stewardship for the Ocean: The contribution of UNESCO to responsible ocean governance.	Paris, France
13	Training Course on the establishment of IODE Ocean Data Portal data providers	Oostende, Belgium
14	IOWave09: Indian Ocean-wide Tsunami Exercise	Various member states
14	Workshop on cooperation between the IMOS Ocean Portal (Australia) and the IODE OceanDataPortal	Oostende, Belgium

15 - 16	Second meeting of Joint Steering Group for the IODE Ocean Data Portal and the WIGOS Pilot Project for JCOMM	Oostende, Belgium
15 - 16	ICG/NEAMTWS/TT-IV: Fourth Meeting of the ICG/NEAMTWS Task Team on the TWS Architecture	Rome, Italy
17 - 21	IOC-SCOR GEOHAB Open Science Meeting: Second Open Science Meeting on HABs and Eutrophication	Shandong, China
19 - 23	MetOcean Modeling Jamboree-III	Oostende, Belgium
19 - 20	PTWS Task Team Seismic Data Exchange: First Meeting of the PTWS Task Team on Seismic Data Exchange in the South West Pacific	Port Vila, Vanuatu
19	IODE SEMINAR 1: MetOcean Modeling To deal with coastal hazards	Oostende, Belgium
26 - 29	Technical training workshop on metadata and data management for upgrade BlackSeaScene, Caspinfo and SeaDataNet	Oostende, Belgium
27 - 30	GCOS-SC-XVII: 17th session of the WMO-IOC-UNEP-ICSU Global Climate Observing System Steering Committee	Paris, France
November 2009		
3 - 9	Tsunami Risk Assessment Workshop: Regional Seminar and Workshop on Tsunami Risk Assessment and Mitigation for Indian Ocean Countries	Bangkok, Thailand
4 - 11	JCOMM-III: Third session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology	Marrakech, Morocco
4 - 6	PTWS WG Central America: First Meeting of the PTWS Regional Working Group on Tsunami Warning and Mitigation in Central America	Managua, Nicaragua
4 - 7	Coast-map-io project development workshop - country-driven projects in nearshore mapping for coastal safety	Hyderabad, India
9-21	Modelling coastal change workshop – ReCoMaP project modelling workshop	Zanzibar, Tanzania
11 - 13	ICG/NEAMTWS-VI: Sixth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas	Istanbul, Turkey
16 - 17	OBIS managers committee meeting	Oostende, Belgium
16-20	Future coastal change workshop – ReCoMaP project 1st Stakeholder workshop	Zanzibar, Tanzania
18 - 20	OBIS Strategy and Workplan meeting	Oostende, Belgium
23 - 27	Gestion de la zone côtière: les outils d'appui à la décision. COI/UNESCO-CERECOMA/IRAD/MINRESI	Kribi, Cameroon
25 - 27	WESTPAC-MOMSEI: Third Expert Workshop of WESTPAC on Monsoon Onset Monitoring and its Social & Ecosystem Impacts	Manila, Philippines
26 - 28	WESTPAC-FluSed: Second Workshop of WESTPAC on the Fluvial Sediments to the South China Sea	Shanghai, China
December 2009		
1 - 2	ICG/IOTWS Working Group 5 Intersessional Meeting on a "System of Interoperable Advisory and Warning Centres"	Perth, Australia
3 - 4	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System Steering Group Meeting	Perth, Australia
5 - 6	Second WESTPAC Scientific Workshop "Responses of Marine Hazards to Climate Change in the Western Pacific" (WESTPAC-ROSE-MaHaz)	Qingdao, China
7 - 18	COP-15: 15th Session of the Conference of the Parties of the UN Framework Convention on Climate Change and Sessions of the Subsidiary Bodies	Copenhagen, Denmark
7 - 10	ODINCARSA Latin America Strategic Planning Meeting	Ensenada, Mexico
14 - 18	EUMETSAT/NOAA /IODE Training Course on the Use of Satellite Wind and Wave Products for Marine Forecasting	Oostende, Belgium
14 - 17	GEF TWAP: GEF Transboundary Water Assessment Programme (TWAP)	Paris, France
21 - 23	Training Course on the Establishment of National OceanDataPortal nodes in the Black Sea region (ODINBlackSea) for Georgian and Turkish NODCs	Turkey

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PUBLICATIONS AND PUBLIC AWARENESS
IOC publications

Each year the IOC publishes numerous documents and other publications. These publications support its programme activities and communicate the scientific and organizational information resulting from the various conferences, meetings, training courses and other activities that have benefited from IOC's support. Many of these publications are available on the internet; certain titles are also available in print where the internet is not an option.

IOC ANNUAL REPORT SERIES
Annual Report 2008. Paris, UNESCO, 2008. 54 p. (Annual Report Series, 15) (English.)
IOC TECHNICAL SERIES
Global Open Oceans and Deep Seabed (GOODS) Bio-geographic Classification. 2009. 96 p. + corrigendum, maps (Technical Series, 84.) (English.)
Tsunami Glossary. 2009. 40 p., illus., maps (Technical Series, 85.) (English.)
Pacific Tsunami Warning System (PTWS) Implementation Plan. (Technical Series, 86.) (English.) (Evolving document only available in electronic form)
Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – January 2009. 2009. 150 p., illus., maps (Technical Series, 87.) (English.)
Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009. 100 p. (Technical Series, 88.) (English.)
Ship-based Repeat Hydrography: A Strategy for a Sustained Global Programme. 2009. 48 p., illus., maps (Technical Series, 89.) (English.)
IOC WORKSHOP REPORTS
Geo-marine Research on the Mediterranean and European-Atlantic Margins. International Conference and TTR-17 Post-cruise Meeting of the Training-through-research Programme, Granada, Spain, 2–5 February 2009. 2009. 64 p., illus., maps (Workshop Reports, 220) (English.)
Surface Ocean CO_2 Atlas Project Pacific Regional Workshop, Tsukuba, Japan, 18–20 March 2009. 2009. 22 p. (Workshop Reports, 221; IOCCP Report Number 12) (English.)
Surface Ocean CO_2 Atlas Project Atlantic and Southern Oceans Regional Meeting, Norwich, UK, 25–26 June 2009. 2009. 24 p. (Workshop Reports, 222; IOCCP Report Number 13) (English.)
Advisory Workshop on enhancing forecasting capabilities for North Indian Ocean Storm Surges, Indian Institute of Technology (IIT), New Delhi, India, 14–17 July 2009. 2009. 36 p., illus. (Workshop Reports, 223) (English.)
2009 International Nutrients Scale System (INSS) Workshop Report, Paris, France, 10–12 February 2009. 2009. 53 p. (Workshop Reports, 224) (English.)
IOC MANUALS AND GUIDES
Tsunami risk assessment and mitigation for the Indian Ocean; knowing your tsunami risk – and what to do about it. 2009. 84 p., illus., maps (Manuals and Guides, 52.) (English.)
Marine Spatial Planning. A Step-by-step Approach. 2009. 99 p., illus., maps (Manuals and Guides, 53; ICAM Dossier No. 6.) (English).
Hazard Awareness and Risk Mitigation in Integrated Coastal Area Management. 2009. 145 p., illus. (Manuals and Guides, 50; ICAM Dossier No. 5.) (English.)
INFORMATION DOCUMENTS
IOC/INF-1254. *EXERCISE PACIFIC WAVE '08. SUMMARY REPORT*. 2009. 63 P., MAPS. (ENGLISH.)
IOC/INF-1255. *African oceans and coasts*. Nairobi, UNESCO/IOC Office Nairobi, 2009. (ISBN 92-9158-017-1.) 162 p., illus., maps. (English.)
IOC/INF-1256. *An Assessment of Assessments: findings of the Group of Experts pursuant to UNGA Resolution 60/30: summary for decision makers; towards a regular process for global reporting and assessment of the state of the marine environment including socio-economic aspects*. UNESCO/IOC-PNUE, 2009. (ISBN 978-92-807-2976-4.) 44 pp., illus. (Arabic, Chinese, English, French, Russian, Spanish.)
IOC/INF-1257. *Progress in the preparation for the 50th anniversary of the Intergovernmental Oceanographic Commission of UNESCO*. 2009. 7 p. (English.)
IOC/INF-1258. *Ocean Biogeographic Information System (OBIS): programme proposal, business plan*. 2009. 36 p. (English.)
IOC/INF-1259. *The Ocean sciences section functions, activities and work plan within the IOC medium term strategy 2008-2013*. 2009. 13 p. (English.)

IOC/INF-1260. *A Joint ICES-IOC Study Group on Nutrient Standards (SGONS)*. 2009. 5 p. (English.)

IOC/INF-1261. *Coastal eutrophication: linking nutrient sources to coastal ecosystem effects and management: NEWS2USE*. 2009. 31 p. (English.)

IOC/INF-1262. [Cancelled]

IOC/INF-1263. *Draft strategy and plan 2009-2010 for the Regional TEWS's within the Framework for a Global Ocean-related Hazards Warning and Mitigation System Framework (GOHWMS) and implementation of TOWS-WG recommendations*. 2009. 13 p. (English.)

IOC/INF-1264. [Cancelled]

IOC/INF-1265. *Progress Report on WESTPAC Activities since its Seventh Session (May 2008–May 2009)*. 2009. 10 p. (English.)

IOC/INF-1266. *WMO-IOC-ICSU World Climate Research Programme (WCRP): report and review*. 2009. 14 p. (English.)

IOC/INF-1268. *Pollution in the open oceans: a review of assessments and related studies*. GESAMP 2009 (Reports and Studies No. 79.) 64 p. (English.) ISSN 1020-4873, ISBN 978-92-807-2996-2. (UNEP-UNESCO/IOC publishers.)

REPORTS OF GOVERNING AND MAJOR SUBSIDIARY BODIES

Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Apia, Samoa, 16–18 February 2009. 88 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 134.) (English.)

Twentieth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Beijing, China, 4–8 May 2009. 126 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 135.) (English.)

Tenth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Puerto La Cruz, Bolivarian Republic of Venezuela, 22–25 October 2008. 58 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 136.) (English.)

Seventh Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26–29 May 2008. 77 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 137.) (English.)

Ninth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, France, 10–12 June 2009. 38 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 138; GOOS report, no. 176).) (English, French, Spanish.)

Fifth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Athens, Greece, 3–5 November 2008. 41 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 139.) (English.)

Fourth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Fort-de-France, Martinique, France, 2–4 June 2009. 64 p. (Executive Summary available separately in E, F, S & R.) (Reports of Governing and Major Subsidiary Bodies, 140.) (English.)

Twenty-fifth Session of the Assembly, Paris, 16–25 June 2009. 197 p. (Reports of Governing and Major Subsidiary Bodies, 140.) (English, French, Russian, Spanish.)

REPORTS OF MEETINGS OF EXPERTS AND EQUIVALENT BODIES

Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group, Jena, Germany, 14 September 2009. 28 p. (Reports of Meetings of Experts and Equivalent Bodies, 222; IOCCP Reports, 15.) (English.)

NEWSLETTERS

Argonautics. Newsletter of the Argo Project, Argo Information Centre, No. 11, September 2009. (English.)

Harmful Algae News, Paris, No. 40, November 2009; No. 39, May 2009. (English.) ISSN 0020-7918.

IOCCP e-Newsletter. The International Ocean Carbon Coordination Project. A joint project of SCOR and IOC and an affiliate programme of the Global Carbon Project, Paris, No. 24, June 2007; No. 23, February 2009. (English.) http://ioc3.unesco.org/ioccp/NewsArchives.html

JCOMM Newsletter. WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology [no issue in 2009].

Tsunami News. UNESCO/IOC electronic newsletter. No. 4, May 2009; No. 3, January 2009. (English) http://www.ioc-tsunami.org/

Tsunami Newsletter. International Tsunami Information Centre, Honolulu, Hawaii, USA; Vol. XXXXI, No. 1, Jan.-Jun. 2009. (English.)

Vai Pacifika. Joint newsletter of the Pacific Islands Observing Systems, Suva, Fiji, Issue No. 6, June 2009; No. 7, October 2009. (English.) With the IOC sponsorship.

Corrosive seas may prove costly for fisheries. *A World of Science*, Paris, pp. 12–13, Vol. 7, No. 1, Jan.-Mar. 2009, (UNESCO Natural Sciences Quarterly Newsletter) (English, French, Russian, Spanish.)

Ten years to save coral reefs. *A World of Science*, Paris, p. 11, Vol.7, No. 2, Apr.-Jun. 2009,
UNESCO Natural Sciences Quarterly Newsletter) (English, French, Russian, Spanish.)

A pinch of salt. *A World of Science*, Paris, pp. 21-23, Vol.7, No. 3, Jul.-Sep. 2009, UNESCO Natural Sciences Quarterly Newsletter) (English, French, Russian, Spanish.

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BROCHURES

Surviving a Tsunami – Lessons to Learn from Aceh and Pangandaran Tsunamis. 2009. 24 p. illus. (IOC Brochure 2009-1 (IOC/BRO/2009/1).) (English.)

Marine Spatial Planning—A step by step approach. IOC-MAB Publication 2009; 4 p., illus. (IOC Brochure 2009-2 (IOC/BRO/2009/2).) (English.)

The UNESCO Strategy for Action on Climate Change. UNESCO Intersectoral Platform on Climate Change Publication; 2009. 12 pp., illus. (IOC Brochure 2009-3 (IOC/BRO/2009/3).) (English, French.)

Five years after the tsunami in the Indian Ocean: From strategy to implementation. 2009. 24 p., illus. (IOC Brochure 2009-4 (IOC/BRO/2009/4).) (English.)

The Global Ocean Observing System: A summary for policy makers. 2009. 16 p., illus. (IOC Brochure 2009-5 (IOC/BRO/2009/5).) (English.)

SALES PUBLICATIONS

UNESCO Publishing

The IOC was committed to the creation of two series of the UNESCO Publishing House:
IOC Ocean Forum series *and* Oceanographic Methodology series

[no title in 2009]

Geoffrey Holland. 2009. *Observer et comprendre la planète océan*. In : « Soixante ans de science à l'UNESCO, 1945-2005 », pp. 369-409. UNESCO 2009. ISBN: 978-92-3-204005-3. Original title: « Sixty years of science at UNESCO, 1945–2005 », UNESCO 2006

OTHERS WITH IOC PARTICIPATION

Climate change and coral reefs–Consequences of inaction. GCRMN-ICRI 2009. Brochure 6 p., illus. (English.)

Blue Carbon–A rapid response Assessment. UNEP-GRID-Arendal 2009, Nellemann, C. et al. (Eds). 78 p., illus. ISBN : 978-82-7701-060-1. (English.)

An Assessment of Assessment – Findings of the Group of Experts pursuant to UNGA Resolution 60/30. UNEP 2009. Kit containing three publications: 1- AoA report. 208 pp. (English); 2- Regional and supra-regional Summaries and Technical Annexes. 432 pp. (English); 3- Summary for decision makers. 44 p., illus. (IOC/INF-1256) (Arabic, Chinese, English, French, Russian, Spanish.)

UNESCO PRESS RELEASES AND MEDIA ADVISORIES

30 January 2009. "Leading scientists from all over the world call for immediate action to stop ocean acidification" (Press release No. 2009-08)

3 June 2009. Patricio Bernal, IOC Executive Secretary and Philippe Vallette, Director of Nausicaá, gave a press conference on World Ocean Day international scope.

5 June 2009. "World Ocean Day 2009 – Maud Fontenoy appointed spokesperson for the oceans" (Press release). Renowned French navigator Maud Fontenoy has been named UNESCO-IOC and World Ocean Network Spokesperson for the Ocean. The nomination was announced on the occasion of the first United Nations World Ocean Day, which will be celebrated every June 8.

19 June 2009. Opening address by Mr Koïchiro Matsuura, Director-general of UNESCO, on the occasion of the 25th Session of the IOC general Assembly (Director-General's speech DG/2009/080.)

EXHIBITIONS AND EVENTS

Paris, 8–10 June 2009. Celebrating the UN World Ocean Day. A photo exhibition on the underwater cultural heritage. UNESCO Headquarters.

Paris, 16 June 2009. The IOC Anton Bruun Memorial Lecture, 2009: M. Trevor J. McDouglas, CSIRO Fellow, CSIRO Marine and Atmospheric Research, Hobart, Australia, on Thermodynamics and Equation of State of Seawater. On this occasion, the Chairman presented M. McDouglas with the IOC Anton Bruun Medal.

Paris, 18 June 2009. The N.K. Panikkar Memorial Lecture, 2009: Dr Venu Ittekkot, Director at the Leibniz Centre for Tropical Marine Ecology, Bremen, Germany, on "Research: an Effective Tool in Capacity-development". On this occasion, the Chairman presented Professor Ittekkot with the first-ever IOC N.K. Panikkar Medal.

Paris, 12–13 October 2009. Ministerial Round Table on Oceans—Building stewardship for the ocean: the contribution of UNESCO to responsible ocean governance held during the 35th General Conference of UNESCO. On the occasion of the Ministerial Round Table on oceans, thirty-two ministers and twenty-five national delegations gathered to discuss and highlight the vital role of oceans in understanding climate change, in providing ecological services to human well-being, and in particular to coastal communities, as well as the role of UNESCO and its Intergovernmental Oceanographic Commission (IOC) in supporting global governance of the oceans. (Report 35 C/INF.29.)

Intergovernmental Oceanographic Commission (IOC)

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