



**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)**

**Eleventh Intergovernmental Session of the IOC Sub-
Commission for the Western Pacific (WESTPAC-XI)**
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Item 3.2 of the Provisional Agenda

**REPORT BY THE HEAD OF WESTPAC ON INTERSESSIONAL ACTIVITIES AND
BUDGET OVERVIEW, INCLUDING THE OPERATION OF THE WESTPAC OFFICE
(May 2015–April 2017)**

Summary

As stated in Article 49 of the Rules of Procedure, the Regional Office shall submit to each session of the Sub-Commission a report on the work accomplished since the previous session.

The Sub-Commission is invited to consider, with a view of adopting, the Report as is or amended at the present session, and further provide guidance on the future direction and programme implementation of the Sub-Commission.

Introduction

1. The 2030 Agenda for Sustainable Development, the Paris Agreement, the post-2015 UN Disaster Risk Reduction Agenda, and the SAMOA pathway for SIDS have a strong bearing on the ocean and reinforce the mandate of IOC to develop ocean science, observations and services.
2. Since its last session (WESTPAC-X, Phuket, Thailand, 12-15 May 2015), the IOC Sub-Commission for the Western Pacific (WESTPAC), serving as the regional arm of IOC/UNESCO, has been conducting its activities in full compliance with the UNESCO and its IOC Medium-Term Strategy (2014–2021) with increasing attention and immediate response to the emerging international agreements and hotspot issues, including the 2030 Agenda for Sustainable Development, the IOC Capacity Development Strategy (2015-2021), UN-ASEAN Framework for Cooperation, UNESCO-ASEAN Framework for Cooperation and micro plastics.
3. Over the past three bienniums, WESTPAC has been operating under the significantly tight financial situation, with a limited amount of program budget allocated from IOC: i. 30K for 2012-2013, amounting to 1.498% of the IOC Regular Budget for Program; ii. 70K for 2014-2015, amounting to 2.266% of the IOC Regular Budget for Program; iii. 130K for 2016-2017, amounting to 5.026% of the whole IOC Regular Budget for Program.
4. In accordance with the approved WESTPAC Work Program and Budget for May 2015–May 2017 (Rec. SC-WESTPAC-X.4), an estimated budget of totaling US\$ 12 M was required to implement the Sub-Commission’s activities. The WESTPAC Program and Budget for May 2015-May 2017 was used mainly as guidance on the activities that Member States would like to jointly promote and seek funding from various sources in support of their implementation. Based on current information received, only US\$ 130 K has been secured from the IOC Regular Budget for the period of 2016-2017. In this sense, most activities of the Sub-Commission from May 2015-May 2017 were carried out via extrabudgetary support from Member States, either in-cash or in-kind.
5. Over the intersessional period, due to a delay in seeking the clearance of IOC on several extrabudgetary proposals, the implementation of some programs was largely delayed or suspended such as Harmful Algal Blooms, Toxic Marine Organisms, Coastal Habitat Mapping, and Coral Reef Conservation.
6. Meanwhile, the WESTPAC Office has been operating with a sole technical staff responsible to take all functions that IOC Paris Secretariat has, oversee and coordinate all program development and implementation, organize the large-scale international marine science conference, provide secretariat support to various expert groups, regional governing and advisory bodies. In addition, the Office must also respond to the IOC and UNESCO program oversight, governance, and reporting requirements. The incompatibility of the current size of the secretariat and the scope of WESTPAC activities is the main risk for proper program delivery. The main impact is the increasing difficulty to maintain IOC’s visibility and leadership in the region, the most densely populated one in the world with heavy reliance on the ocean, seas and coasts.
7. Some WESTPAC highlights in the reporting period can be concisely summarized as follows:
 - Efficient operation of regional advisory and decision-making mechanisms providing the strategic link between global and country-level programs and issues;
 - Successful organization of the triennial WESTPAC International Scientific Conference, the largest marine science event in the region to advance ocean knowledge and cooperation among individuals, institutions and countries;

- Active and sustained two regional ocean observing systems, i.e., NEAR-GOOS and SEAGOOS, including the smooth operation of SEAGOOS Ocean Forecasting System and the kicking-off of NEAR-GOOS Ocean Forecasting Systems;
- Smooth operation of the Regional Training and Research Center on Ocean Dynamics and Climate (RTRC-ODC) with its fifth and sixth training courses organized on ocean and climate models;
- Inauguration of the Regional Training and Research Center on Marine Biodiversity and Ecosystem Health (RTRC-MarBEST) with its first training course organized on Crustacean Taxonomy;
- Provision of emergency technical assistance in mitigating effects of HABs in Cambodia and Vietnam;
- Initiation of the feasibility study of the 2nd Cooperative Study of Kuroshio and its adjacent regions;
- Proactive engagement in SDG 14 implementation through the co-organization of a regional roundtable on SDG 14 with the United Nations Economic and Social Development for Asia and the Pacific (UNESCAP) at the Asia-Pacific Forum on Sustainable Development 2017;
- Solid contribution to the development of IOC Capacity Building Strategy;
- Active promotion of and engagement in the 2nd International Indian Ocean Expedition;

8. Despite diminishing financial resources from Regular Budget, WESTPAC has been trying to spearhead marine science development and cooperation in the Western Pacific and adjacent regions with substantial accomplishments made in the development, coordination and implementation of considerable activities, during the last intersessional period of May 2015- May 2017, across its four identified key thematic areas, namely: ocean processes in the Indo-Pacific region; marine biodiversity and food security; ocean ecosystem health; enhanced knowledge of emerging ocean science issues.

9. It is estimated roughly ??? marine scientists, governmental officials and resources managers DIRECTLY took part in WESTPAC activities in May 2015- May 2017, i.e. the 10th WESTPAC International Scientific Symposium, ? Joint Cruises, ?? Trainings/Summer Schools, and ?? Regional Workshops/Consultative Meetings (See Annex I).

10. The main part of the Report follows below. It contains descriptions of specific activities and is structured according to the six IOC “functions” in the Medium-Term Strategy, 2014–2021. Titles and meaning of the functions are as follows:

- **Function A: Ocean research.** Foster ocean research to strengthen knowledge of ocean and coastal processes and human impacts upon them
- **Function B: Observing system / data management.** Maintain, strengthen and integrate global ocean observing, data and information systems
- **Function C: Early warning and services.** Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards
- **Function D: Assessment and Information for policy.** Support assessment and information to improve the science-policy interface
- **Function E: Sustainable management and governance.** Enhance ocean governance through a shared knowledge base and improved regional cooperation

- **Function F: Capacity Development.** Develop the institutional capacity in all of the functions above, as a cross-cutting function

FUNCTION A: OCEAN RESEARCH

Foster ocean research to strengthen knowledge of ocean and coastal processes and human impacts upon them.

A.1 Climate and ocean acidification

Ocean acidification

11. Given limited understanding about ecosystem responses to ocean acidification, against a critical need of Member States to develop meaningful projections on the future impacts of ocean acidification on marine ecosystems, especially on coral reefs, WESTPAC developed and conducted three consecutive regional workshops on Research and Monitoring of the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems (19-21 January 2015, 26-28 August 2015, and 29-31 August 2016). The three workshops were kindly supported by the National Commission of Thailand for UNESCO with technical assistance provided by the US's National Oceanic and Atmospheric Administration (NOAA).

12. These regional workshops stressed the need to build on existing coral reef monitoring initiatives and to develop a joint long-term monitoring program/network on the impacts of ocean acidification on coral reefs across the region. To this end, the workshop selected several pilot sites as a starting point for developing the regional monitoring program/network. The first workshop examined current monitoring capacity; identified common monitoring methods; and agreed upon the development of a consistent, comparable and cost-effective "Standard Operating Procedure (SOP)" for all pilot sites.

13. The second training workshop, consisting of invited lectures, hands-on exercises, and group discussions, aimed to assist those pilot sites to develop a "Standard Operating Procedure" for ocean acidification monitoring, building upon their existing reef monitoring systems/capacity. Regarding existing SOPs, participants decided to establish four Working Groups towards the development of regionally specific SOPs, respectively on Total Alkalinity, Spectrophotometric pH, Biology, and Carbonate Collection and Handling.

14. The third workshop reviewed and tested the draft SOPs through expert discussions, and hands-on practical demonstrations either in field or laboratory, towards the finalization of several regional SOPs for monitoring the ecological impacts of ocean acidification on coral reef ecosystems. In addition to the latest developments in ocean acidification-related research and programs at the global level, all participants from pilot sites were also engaged in hands-on exercises related to seawater collection and handling for chemistry, Total Alkalinity (TA) and pH measurement, Autonomous Reef Monitoring Structures (ARMS) and Calcification Accretion Units (CAUs) recovery and processing.

15. These regional activities were conducted in close cooperation with GOA-ON. The regional network will be contributive to the global efforts, together with solid action plans and suitable SOPs to actually monitor and tackle Ocean Acidification issues in the Member States.

Feasibility on the second Cooperative Study of Kuroshio and its adjacent Regions

16. The CSK (Collaborative Study of Kuroshio and adjacent region) was the first project of the Intergovernmental Oceanographic Commission of UNESCO (IOC) in the Western Pacific, with 12 countries participating in and supporting joint research into this current from 1965 to 1979.

17. Since the completion of the CSK, a good many multi-national, bilateral, and national projects and studies have been conducted aiming to understand more about ocean circulation and variations in the Kuroshio and its adjacent regions. Given the dramatic advance over the last four decades in observational technologies and modeling techniques, and the 40th anniversary of CSK in 2019, WESTPAC, at its 10th Intergovernmental Session in May 2015, establish an open-ended Intersessional Task Force on CSK-2 (ITF-CSK-2) with a mandate to review our current knowledge on Kuroshio, identify scientific and observational gaps, and further explore any possibilities of cooperative studies on Kuroshio and its adjacent regions.

18. Therefore, this feasibility workshop was designed, aiming to: 1) review the CSK-1 (1965-1979) and its achievements; 2) update with the present observations and research status on Kuroshio and its adjacent regions; 3) share any plan or idea for future observations and research programs on Kuroshio and its adjacent regions; 4) identify knowledge gap and new scientific themes; and 5) finally analyze the feasibility of conducting the CSK-2, with a list of associated actions/proposals to be taken shortly after the workshop.

19. This workshop took place on 19-20 January 2017, hosted by the Key Laboratory of Physical Oceanography, Ocean University of China, with the participants from Russia, Korea, Japan, China, Indonesia and Philippines. All experts were invited to review in advance their historical records in terms of their countries' involvement in CSK-I, and present their findings and the achievement of CSK-1 from their nations' perspectives at the first session. Then several reviews were provided at the second session on Kuroshio associated studies and activities after CSK-1, including these international programs/panels. The third session is dedicated to several scientific talks in order to identify knowledge gap, and common scientific issues.

Second International Indian Ocean Expedition

20. The Second International Indian Ocean Expedition is a IOC co-sponsored global scientific program, which aims to engage the international scientific community in collaborative oceanographic and atmospheric research from coastal environments to the deep sea over the period 2015-2020.

21. In response to consecutive IOC's calls since 2015, WESTPAC has been actively engaging in IIOE-2, by conducting regional consultations, deliberating on IIOE-2 Science Plan and Implementation Plan, nominating WESTPAC representatives or experts to relevant IIOE-2 Executive Committee and working groups. For instance, Drs Somkiat Khokiattiwong from Thailand and Ken Ando from Japan were nominated as WESTPAC representatives to the IIOE-2 Executive Committee. Several Experts from WESTPAC countries were also nominated to relevant science themes and working groups.

World Climate Research Program/CLIVAR

22. CLIVAR (Climate and Ocean: Variability, Predictability and Change) is one of the four core projects of WCRP, aiming to "describe and understand the dynamics of the coupled ocean-atmosphere system and to identify processes responsible for climate variability, change and predictability on seasonal, interannual, decadal, and centennial time-scales, through the collection and analysis of observations and the development and application of models of the coupled climate system, in cooperation with other relevant climate-research and observing activities".

23. With the common interests in ocean and climate, a joint workshop with CLIVAR was held on 16 September 2016, aiming to take stock of previous achievements in ocean observations, modelling and ocean climate studies; build and enhance networks among ocean and climate research communities in the region; exchange strategic directions and further synergize efforts between WESTPAC and CLIVAR by identifying areas of common interest and means of cooperation.

24. The workshop generated positive results in general with WESTPAC and CLIVAR committed to keeping identifying future collaborative opportunities. Specifically: i. both sides consider co-sponsoring the Eastern Indian Ocean Upwelling Research Initiative (EIOURI); ii. WESTPAC and CLIVAR would explore any possibility to jointly advance the Indonesian Through Flow research and observations; iii. WESTPAC is invited to be one of key co-organizers for the regional stakeholders forum at the CLIVAR Open Science Meeting in 2016; iv. WESTPAC is interested in getting engaged in WCRP's regional climate study and regional sea level study with facilitation provided through CLIVAR.

A.2 Marine biodiversity conservation, ecosystem health, seafood security and safety

25. In contribution to IOC HLOs, and given the highest concentration of marine biodiversity in the region, WESTPAC endeavors to initiate, coordinate and implement its programs/activities to address the key biodiversity-related areas on: 1) biodiversity and taxonomy, 2) disturbance and current stressors, and 3) restoration and rehabilitation.

Coral reef conservation

26. An international meeting on management and rehabilitation of corals after bleaching events was organized in the collaboration and co-sponsorship with National Research Council of Thailand, Department of Marine and Coastal Resources (Thailand), and Department of Marine Science, Faculty of Science, Chulalongkorn University. A total of 60 participants from 8 countries: China, Indonesia, Japan, Malaysia, Myanmar, Philippines, Singapore, and Thailand attended the workshop.

27. The international meeting aimed to bring together scientists, government officers, students, and public to advance the understanding on coral bleaching and related management in the Western Pacific and adjacent regions; to strengthen the regional network on coral reef management and rehabilitation among countries in the region; and to share and synthesize coral restoration techniques and management response after the bleaching events. A regional network on coral reef restoration was established to identify the best practice and promote those techniques among WESTPAC Member States towards the sustainability of marine and coastal ecosystem. A book on coral rehabilitation in the Western Pacific region is under preparations. As derived from regional consultations, this book will serve as a guideline and protocol of coral rehabilitation in the Western Pacific region.

Species identification and genetic analysis on marine organisms (DRMREEF)

28. The 2nd phase of the WESTPAC implemented DRMREEF-II project was incepted in December 2016, despite some delays in seeking extrabudgetary support. The project is entitled "Enhance the Capacity for Species Identification and Genetic Analysis on Marine Organisms in the Coral Reef Ecosystems in the Western Pacific", aiming to serve as a catalyst for improving 'taxonomic impediment' in the region with the molecular technique provided as a complementary tool to classic taxonomy.

29. With intensive and extensive discussions, an action plan was agreed upon for the second phase with enhanced efforts in integrating capacity building into research. A series of trainings will be organized at both regional and national level. The regional training will be conducted at the Regional Training and Research Center on Marine Biodiversity and Ecosystem Health (RTRC-MarBEST) in 2017, and trainings at the national level will be initially organized at this phase at the WESTPAC Ocean Acidification pilot sites, respectively in Thailand and Vietnam in late 2017 and early 2018 in order to monitor the ecological impact of ocean acidification on coral reefs. The training will include the hands-on exercises on sample collection, DNA extraction, data analysis with data to be inputted to the national inventories of marine organisms living in the coral reef ecosystem and a pilot WESTPAC Biodiversity Portal Site.

Remote Sensing for Coastal Habitat Mapping

30. The WESTPAC region has been developing most rapidly in the world over the recent years with an urgent need to maintain healthy coastal habitats. Therefore, it is essential to know spatial distributions of habitats and detect changes to inform various stakeholders. Since the project inception in 2012, a regional research network was established on remote sensing studies for habitat mapping, especially for seagrass mapping. This project also aims to standardize methods to map seagrass beds, which are suitable for WESTPAC region.

31. Over the intersessional period, given the delay in seeking extrabudgetary support, tremendous efforts were made in publishing scientific findings based on the network of researchers working on coastal habitat mapping and standardized methods of radiometric correction. Meanwhile, one local training workshop on Ocean Remote Sensing for Integrated Coastal Area Management: Coastal Habitats Mapping was organized in Hat Yai, Thailand in December 2016. This workshop focused graduate students on satellite image analysis for habitat mapping. The standardized analyzing methods, including the Depth Invariant Index and the Bottom Reflectance Index were introduced together with field survey methods for collecting ground truthing data.

32. An initial attempt was also made in late 2015 to use remote sensing for monitoring the environmental changes in the Lampung Bay, Indonesia, given the frequent occurrence of harmful algal blooms. The increasing demands from countries suggest the need to expand the application of remote sensing to a wider scope for integrated coastal zone management. In response to this need, a strategic workshop was scheduled for 20 April 2017 with objectives to deliberate on future strategy of remote sensing application in the region.

Harmful Algal Blooms

33. In view of the ever-increasing algal blooms over the recent years in some of countries of the region, and the scientific uncertainties in identifying their causes, it is imperative to examine present knowledge, identify gaps and challenges, strengthen scientific collaborations and finally develop a regional research strategy for HAB studies in the future with a view to better assisting our Member States in reducing economic loss and risks to human health in the region.

34. These needs triggered the WESTPAC workshop on the Development of a Research Strategy for Harmful Algal Blooms which took place on 19–21 December 2016. Experts' reviews were conducted on HAB current knowledge in all aspects (biology, ecophysiology, toxin, fish kill mechanism and socio-economy). It was recognized that, though tremendous studies have been done in the Western Pacific over the past 25 years to address HAB issues via WESTPAC's collaborations and capacity buildings, there are still so much more to be explored in order to thoroughly understand HABs and effectively mitigate their impacts. Lively discussions were made about the regional research strategy with a view to addressing country and/or region specific HABs and synergizing the ongoing HAB research and capacity building efforts at all levels, particularly at institutional, national and regional levels. "National and regional efforts are surely complementary to global efforts, which forms a strong and essential basis to achieve the global objectives of HAB science, for instance the GlobalHAB research program (GlobalHAB)" as all experts highlighted at the meeting.

35. Shortly after the workshop, immediate actions and enhanced efforts were on: 1. Information sharing via websites and publications, which allows Member States to benefit from existing knowledge, lesson learned from the previous occurrences and provide additional information on unknown elements; 2. Capacity development to meet the Member State needs in addressing HAB issues; 3. Technical assistance to be provided to member states who request contributions from WESTPAC HAB experts on emerging HAB occurrence.

36. Meanwhile, upon the requests of institutions and countries in the region, WESTPAC has been lending its HAB experts to assist in various national and regional trainings. In collaboration with Southeast Asian Fisheries Development Center (SEAFDEC) and the National University of Singapore (NUS), a regional training course on identification of harmful algal bloom (HABs) species in the ASEAN region was held at St. John's Island Marine Laboratory, Tropical Marine Science Institute (TMSI), from 18 to 22 July 2016. This training course, consisting of lectures and laboratory session, aimed to equip and improve the identification knowledge and skills on harmful and red tide causative species including diatoms, dinoflagellates and raphidophytes that are commonly found in ASEAN region.

Toxic marine organisms

37. WESTPAC continues to work on natural biotoxins in marine organisms through the identification of toxic marine organisms and dissemination of relevant scientific information to public. Over the previous intersessional period, a series of training courses were organized with associated activities to improve the research and monitoring capacity for toxic organisms. Some public awareness materials on common toxic marine puffers were developed in English and other local languages. Building on established cooperation, two scientific findings were published on domoic acid producers in WESTPAC region. In addition, using a protocol developed for CTXs studies in the Pacific region the first finding in Southeast Asia on the causative toxin for Ciguatera is to be published in a scientific journal.

38. Due to some delays in seeking the clearance on extrabudgetary support, a WESTPAC training workshop on chemical analysis for ciguatoxins was postponed to March-June 2017, which will take place in the Institute of Oceanography, Vietnam, in view of the institute's long established experience on toxin study, especially on DA. WESTPAC will continue to enhance the regional efforts to build research and monitoring capacity for toxic organisms, and consider the establishment of a Regional Training and Research Center/key lab for CTXs and ASP toxin analysis

FUNCTION B: OBSERVING SYSTEM / DATA MANAGEMENT

Maintain, strengthen and integrate global ocean observing, data and information systems

North East Asian-Global Ocean Observing System (NEAR-GOOS)

39. NEAR (North-East Asian Regional)-GOOS is the first regional pilot project of GOOS, implemented by China, Japan, the Republic of Korea and the Russian Federation.

40. WESTPAC coordinates the development of NEAR-GOOS mainly through the WESTPAC Coordinating Committee for NEAR-GOOS. In this intersessional period, two sessions, i.e., the 16th and 17th Session of the Coordinating Committee were held respectively on 8-9 December 2015, Tokyo, Japan, and 15-16 December 2016, Vladivostok, Russia. Extensive discussions were made covering a variety of issues concerning the improvement of the operation of these Databases, the role of regional Databases and the inclusion of more parameters into NEAR-GOOS system. Discussions were also made on three NEAR-GOOS Working Groups (product, data management and ocean forecasting system), and its two pilot projects (Cross Basin Climate Monitoring Section and Ferry Based Monitoring). The meeting accepted the kind offer of the National Marine Environmental Forecasting Center (NMEFC), China to host the 18th Session of the NEAR-GOOS Coordinating Committee in late 2017.

41. Prior to the 17th Session of NEAR-GOOS Coordinating Committee, a Workshop on the Development of Ocean Forecasting Systems was held on 14 December 2016. The workshop was organized in accordance with the decision at the NEAR-GOOS XVI (Dec 2015, Japan) , with

objectives to share experience on, review the current status of, and promote the cooperation on the joint research & development of ocean forecasting systems in the NEAR-GOOS Region.

42. Twenty representatives of four NEAR-GOOS Member States (China, Japan, Republic of Korea and Russia) attended the workshop. The workshop reviewed the present status of ocean forecasting system in each country and discussed about the initial workplan for developing ocean forecasting system in NEAR-GOOS Region. All participants agreed that technical communication could be conducted among member states in order to improve the operational ocean forecasting services in the region. To better addressing this need, the workshop called for broader involvement of scientists from each Member State. Four technical task forces were established, consisting of technical experts nominated from each country, to further focus on prioritized forecast parameters at this initial stage on circulation, temperature, wind and wave, respectively.

South East Asian Regional-GOOS (SEAGOOS)

43. WESTPAC promotes and advocates the importance of sustained ocean observations and services in the Southeast Asian region and its adjacent regions. To demonstrate their value, WESTPAC develops the SEAGOOS currently through three pilot programs, namely i. Ocean Forecasting System (OFS), initiated in 2010; ii. Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI), initiated in 2009; and iii. Monitoring of Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems, initiated in 2015.

44. SEAGOOS Ocean Forecasting System has been operationally providing 3 days' forecast products via the website (http://221.0.186.5/IOC-WESTPAC_OFDS/results.jsp), including surface wind, wave height, temperature and current. Within this framework, technical assistance was provided to countries in the region upon their requests. In Thailand, OFS was installed in the Phuket Marine Biological Center with a global eddy-resolving wave-tide-circulation coupled ocean model, the High resolution regional model for Gulf of Thailand and the particle trace model developed and validated.

45. In view of the pressing need to provide a clear roadmap guiding OFS future development, the WESTPAC Technical Workshop on SEAGOOS Ocean Forecasting System Strategy Development was held on 14-16 December 2015, Guangzhou, China. All participating institutions reviewed the recent development status of SEAGOOS Ocean Forecasting System at regional and national level, developed the action plan of OFS development for the period of 2016-2017, and shared perspectives on the future development of OFS, and finally decide to develop a long-term strategy of OFS for the region.

46. WESTPAC organized its 6th MOMSEI Summer School on 26-30 October 2015, Phuket, Thailand with the 33 young scientists received from countries within and outside the region. Training contents covered the basics of oceanography and climate over the tropical Indo-Pacific region, marine zooplankton ecology, physical-biological interaction, marine CO₂ system and ocean acidification, coral reefs and climate change. In addition, MOMSEI conducted a joint cruise was conducted in Spring time on 18-24 April 2016, in Andaman Sea, with a focus on the ocean-shelf interaction during the pre-monsoon critical time window, and its impact on the benthic and coastal ecosystem such as coral reefs.

Pilot Project of Ocean Data and Information Network for the Western Pacific (ODINWESTPAC)

47. WESTPAC assisted in the establishment of the ODINWESTPAC Pilot Project in 2007. ODINWESTPAC PP was set up primarily to develop a number of products that will promote communication and collaboration between WESTPAC member states, and between WESTPAC member states and other partners in the fields of ocean observation, data and information management, and product/service delivery; implement relevant capacity building activities,

specifically related to ocean data and information management; and prepare a proposal for the draft recommendation to establish an Ocean and Data Information Network for the WESTPAC region (ODINWESTPAC).

48. WESTPAC contributed to the First Session of the Advisory Group for ODINWESTPAC, which was held in Tianjin, China, 27-28 January 2016. The meeting discussed the status of data and information management in the region, as well as the future development of the project. The meeting drafted an action plan for 2016-2017 based on the work plan developed for 2014-2016 and reached consensus on some new initiatives proposed by the host center, NMDIS. The focuses of ODINWESTPAC for the 2016 would be addressing the capacity building needs of the Member States on a regional metadata base, e-repository, ocean data assimilation technique, assistance with the development of NODCs and ADUs, as well as share the standards and best practice on oceanographic data quality control.

FUNCTION C: EARLY WARNING AND SERVICES

Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards

49. Since IOC has been coordinating the development of tsunami early warning and mitigation system for the Pacific Ocean and Indian Ocean, respectively through its Intergovernmental Coordination Groups, i.e., ICG/IOTWS and ICG/PTWS, there is no much activities conducted by WESTPAC on the development of early warning systems and preparedness to mitigate the risks of tsunamis. However, Despite human and financial resource limitation, WESTPAC has been able to provide data and other service, such as NEAR-GOOS data service and SEAGOOS Ocean Forecasting System, to assist in preparedness for other ocean hazards.

50. Furthermore, in response to the outbreak of HABs in Cambodia in May 2016, upon the request from the Ministry of Environment (MoE) of Cambodia through PEMSEA (Partnership in Environmental Management for the Sea of East Asia), WESTPAC provided emergency technical assistance by sending an expert to assist Cambodian technicians in identify the cause of massive fish mortality and HABs causative species. The field survey and analysis of preserved plankton samples collected from red tide water clarified that the causative organism was a dinoflagellate *Noctiluca scintillans*, one of the most common dinoflagellates in the Gulf of Thailand. In April 2016, massive fish mortalities happened in Vietnam with a large negative impact on livelihoods and social stability, WESTPAC sent a group of experts to join the national technical team in the efforts to identify the cause.

FUNCTION D: ASSESSMENT AND INFORMATION FOR POLICY

Support assessment and information to improve the science-policy interface

World Ocean Assessment (WOA) report under the UN Regular Process

51. The 1st World Ocean Assessment report under the United Nations was finalized in December 2015. Hundreds of scientists from many countries, representing various disciplines and steered by a 22-member Group of Experts, examined the state of knowledge of the world's ocean and the ways in which humans benefit from and affect it.

52. WESTPAC actively engaged in the first WOA, including its initial phase on the Assessment of Assessments, by encouraging WESTPAC experts to the UN Pool of Experts, organizing regional workshop on WOA and trainings on integrated assessment tools, together with UNEP NOWPAP and COBSEA. A new cycle of assessment (2016–2020) was endorsed by the UNGA in December 2015. As solicited by the co-chairs of the Ad Hoc Working group (governing body of WOA), upon

the request of IOC, WESTPAC provided its assessment on lessons learned in the implementation of the first cycle, which was finally accommodated by IOC Secretariat, Paris.

FUNCTION E: SUSTAINABLE MANAGEMENT AND GOVERNANCE

Enhance ocean governance through a shared knowledge base and improved regional cooperation

Tenth WESTPAC International Scientific Conference

53. Upon the kind offer of the Government of China, the 10th WESTPAC International Scientific Conference entitled “Advancing Ocean Knowledge, Fostering Sustainable Development: from the Indo-Pacific to the Globe” will take place in Qingdao, China, 17-20 April 2017. This Conference offers an essential opportunity in the region for marine scientists, ocean institutions and their countries to advance marine scientific knowledge, and catalyze multi- and cross-disciplinary collaborations with a view to addressing challenges that countries in this region are facing, including these in achieving the Sustainable Development Goals, particularly the dedicated Goal 14 for the ocean: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

54. This Conference is hosted by the State Oceanic Administration of China (SOA), and jointly organized by the First Institute of Oceanography, SOA and the IOC Sub-Commission for the Western Pacific (WESTPAC).

55. Close to 600 scientists, governmental officials and policy makers from 25 countries from within and outside the region will gather at the Conference. The Conference features: 6 keynote speeches, 22 sessions, and 8 workshops, which are structured around four themes: (1) Understanding ocean processes in the Indo-Pacific; (2) Ensuring marine biodiversity, food safety and security; (3) Maintenance of ocean health; and (4) Enhancing knowledge of cross-cutting and emerging issues.

56. WESTPAC will awarded its “WESTPAC Outstanding Scientist Award” to three scientists from the region in honor scientists for their long-term dedication to regional marine science development and cooperation. Winners for the WESTPAC Best Young Scientist Award 2017 will be also selected on 20 April 2017 from young scientists participating in this event in order to encourage young scientists to devote themselves to marine science

57. To nurture young science leaders and heighten international exposure of young scientists under the age of thirty-five, the WESTPAC Young Scientist Travel Grant was established with generous financial support from the State Oceanic Administration of China. Forty young scientists were provided with partial or full financial support to enable their participation in the Conference.

Asia-Pacific Forum on Sustainable Development and its roundtable discussion on SDG 14

58. UN Member States adopted in late 2015 the new 2030 Agenda for Sustainable Development, and in particular the Sustainable Development Goal 14 calling to “conserve and sustainably use the oceans, seas and marine resources for sustainable development”. This new international framework constitutes an essential point of reference for IOC’s engagement with its Member States as well as for its programmatic presence at the global, regional and country levels.

59. Several targets of SDG 14 are directly relevant to the work IOC, particularly in the areas of marine pollution, ocean acidification, ecosystem based management, and marine research capacity and transfer marine technology, as a cross-cutting element to all SDG 14 targets.

60. In tandem with global efforts, WESTPAC is also playing an active role, along with other UN agencies in the region, in supporting countries’ implementation of SDG 14, particularly its specific targets (14.1, 14.2, 14.3, and 14.a).

61. The APFSD, initiated by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in 2014, is an inclusive regional intergovernmental forum, aiming to engage Member States, United Nations and other institutions, and major groups and other stakeholders in dialogue on (1) Regional perspectives on the implementation, follow-up and review of the 2030 Agenda for Sustainable Development; and (2) Strengthening implementation of the 2030 Agenda for Sustainable Development in the Asia-Pacific, including the consideration of a draft regional road map for implementing the 2030 Agenda in Asia and the Pacific.

62. Partnering with UNESCAP, WESTPAC takes a lead in running a roundtable discussion in close cooperation with UNEP, UNDP and FAO, on the SDG 14 at the Asia-Pacific Forum on Sustainable Development (APFSD) 2017, 29-31 March 2017. The round tables are a modality for follow up and review, aiming to establish a shared understanding of the outlook/progress on the goal and underlying reasons for the levels of optimism observed; identify key issues to be addressed; and point out where policy coherence with implementation efforts. The conclusions of the round table were presented to the APFSD, and will feed into the APFSD's final report.

FUNCTION F: CAPACITY DEVELOPMENT

Develop the institutional capacity in all of the functions above, as a cross-cutting function

63. The IOC Assembly adopted at its 28th Session the IOC Capacity Development Strategy, 2015–2021 through Resolution XXVIII-2. The Strategy was published as IOC/INF-1332. It is recalled that it was agreed that, by the next session of the IOC Assembly in 2017, the following actions should be taken: (i) develop programmatic and regionally relevant capacity development work plans based on this strategy and related needs assessments conducted in a consistent manner, building on ongoing activities and making use of existing training and education facilities; (ii) mobilize resources in order to reinforce the Secretariat staffing of the regional Sub-Commissions, other subsidiary bodies and global programmes; (iii) catalyze capacity development through global, regional, and national programme development, including projects prepared in consultation with Member States with a view to raise extra-budgetary resources; and (iv) enhance collaboration and communication between its global programmes and Regional Subsidiary Bodies, to contribute to (i) and (ii) above.

64. WESTPAC significantly contributed to the development of IOC Capacity Building Strategy through sharing its capacity building practices in the region and evaluation of lessons learnt from the past. WESTPAC considers that capacity, essential to the success of any development objectives, could be only more effective and sustained over the long term if people are best empowered to realize their full potential with a combination of capacity building tools that are sustainable – home-grown, long-term, and generated and managed collectively by those who stand to benefit.

65. As a primary regional mechanism in the implementation of the new strategy, WESTPAC continues to employ its adaptive and self-driven approaches to meeting regional and national requirements for capacity building, and to linking trainings to the attainment of research goals for sustainable development in the region.

66. WESTPAC has been endeavoring to develop the IOC Regional Network of Training and Research Centers (RTRCs) on Marine Sciences, as demonstrated by the renewed commitment of the IOC Regional Training and Research Center (RTRC) on Ocean Dynamics and Climate for the next six years (2015–2020), and the strong commitments made by Indonesia to hosting a Regional Training and Research Center RTRC on Marine Taxonomy and Ecosystem Health.

67. The RTRCs initiative was developed in 2008, and further endorsed by the Intergovernmental Oceanographic Commission at its forty-first session of Executive Council (24 June-1 July 2008, Paris, France).

Regional Training and Research Center on Ocean Dynamics and Climate (RTRC-ODC)

68. In accordance with approved Guidelines and Procedures (contained in the Recommendation SC-WESTPAC-VII.3), The IOC Regional Training and Research Center on Ocean Dynamics and Climate was officially established through an Agreement signed by the Intergovernmental Oceanographic Commission of UNESCO and the host institute, the First Institute of Oceanography, State Oceanic Administration (FIO, SOA) of China, at the Eighth Intergovernmental Session of IOC Sub-Commission for the Western Pacific (WESTPAC-VIII) in Bali, Indonesia on 11 May 2010.

69. Being the first IOC Regional Training and Research Center, the ODC Center aims to enhance regional research capacity and capability on ocean dynamics, air-sea interactions, climate change and numerical modeling through, among others, the provisions of regular training courses in English once a year to around 15-20 junior scientists and doctoral/master students mainly from the developing member states within and outside the region.

70. Since its inauguration in 2011, the ODC Center has been organizing regular training annually with a total of 260 young scientists from 33 countries having participated in. The regular training at the ODC Center attracts great interests of young researchers on ocean dynamics, and numerical modeling, which could be demonstrated by the ever-increasing number of applicants from wider geographical coverage.

Regional Training and Research Center on Marine Biodiversity and Ecosystem Health (RTRC-MarBEST)

71. Inspired by the unwavering commitments of the Indonesian Institutes of Sciences (LIPI), 17 October 2016 was another important day to witness the inauguration of another Regional Training and Research Center on Marine Biodiversity and Ecosystem Health (RTRC-MarBEST) in LIPI. More than 100 representatives from relevant Indonesian ministries, research institutions, UNESCO and foreign embassies gathered at LIPI to celebrate the centre's launch, with addresses delivered by Dr Zainal Arifin, Deputy Chair of LIPI; Iskandar Zulkarnaen; Prof Dr Arief Rahman, Executive Chairman of the Indonesian National Commission for UNESCO; Dr Vladimir Ryabinin, UNESCO/IOC Executive Secretary; and Dr Somkiat Khokiattiwong, UNESCO/IOC Vice Chair and WESTPAC Chair.

72. Shortly after the inauguration ceremony, a two-week long training course on Crustacean Taxonomy was conducted at the MarBEST Centre Building on Pari Island, Jakarta, Indonesia from 17 to 29 October 2016. More than 30 trainees from 10 countries in the region joined the training, which aimed to enhance the capacity of young scientists in taxonomic research on tropical marine biota, especially for crustacean taxonomy, in view of the dramatically declining numbers of taxonomic specialists on specific organisms.

Regular Topic-Specific Training Courses/Summer School

73. In addition to the regular training opportunities provided in the IOC Regional Training and Research Centers, a series of training courses/ summer schools were designed and conducted in WESTPAC Member States on a rotational basis in order to enhance the capacity of its Member States for conservation and sustainable development of their coasts and marine biodiversity and resources. Notably,

74. To understand the causes, predict the occurrences and mitigate the effects of Harmful Algal Blooms, WESTPAC has been organizing regular trainings on Harmful Algal Blooms since 1980s. Responding to massive fish kill at aquacultures areas and shellfish poisonings in Malaysia and Singapore over recent years, WESTPAC offered technical assistance to both countries through the transfer of technology on various sampling techniques in HAB monitoring, species identification,

and rapid molecular detection of HABs species. In partnership with the National University of Singapore, an international training workshops were conducted at the National University of Singapore during 18 to 22 July 2016.

75. Coastal and marine habitats are among the most important ecosystems in the region. To develop adaptive remote sensing methods to map the distribution of coastal habitats, one training course on ocean remote sensing for integrated coastal zone management was organized in Hat Yai, Thailand in December 2016 in collaboration with Core-to-Core Program of Japan Society for Promotion of Science. Given the increasing jellyfish blooms in the region and the lack of information on this emerging issue, WESTPAC organized a training Workshop on the Identification of Box Jellyfish in the Eastern Indian Ocean and the Gulf of Thailand (13 - 17 June 2016, Phuket, Thailand) with objectives to enhance the regional research network on harmful jellyfish; provide identification techniques on venomous jellyfish with a focus on box jellyfish species in the eastern Indian Ocean and the Gulf of Thailand.

76. To build the capacity and improve the knowledge of MOMSEI participating countries, particularly their young scientists on monsoon climate, the role of the ocean in the monsoon system, and relevant ocean observation techniques, Following the previous five MOMSEI summer schools (in Qingdao, China, 26-30 July 2010; Phuket, Thailand, 15-19 August 2011; Qingdao, China, 6-10 August 2012; Terengganu, Malaysia, 19-23 August 2013; and Jakarta, Indonesia, 9-13 September 2014), the sixth MOMSEI Summer Schools (MOMSEI SS-V) have been organized in Phuket, Thailand, during 26-30 Oct. 2015 with the kind co-host by Phuket Marine Biological Center and China-Thailand Joint Laboratory for Climate and Marine Ecosystem, in Phuket, Thailand; with focus on Monsoon climate, air- sea interaction, impact of climate variability on coral reef ecosystem.

List of WESTPAC Activities May 2015 - April 2017

Total of participants: >1,000

30 Regional workshops/consultative meetings

11 Trainings/Summer Schools

1 Joint cruises

1 International Scientific Conference

Black: Regional workshop/consultative meeting; **Red:** Trainings/Summer School; **Blue:** Joint cruise; **Green:** International Scientific Conference

No.	Activity	Location/Date	Activity Type	No. of participant		
				Male	Female	Total
1	UNESCO/Japanese Funds-in-Trust (JFIT) Proposal Development Workshop on Marine Science	Tokyo, Japan 31 May-1 June 2015	Regional workshop/ consultative meeting	4	3	7
2	First Training Course on Ocean Forecasting System for Thailand	Phuket, Thailand, 6-7 August 2015	Training/Summer School	8	2	10
3	Second WESTPAC Training Workshop on Research and Monitoring of the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems	Phuket, Thailand 26-28 August 2015	Training/Summer School	26	16	42
4	WESTPAC Training Course on Climate Change - IOC Regional Training and Research Center on Ocean Dynamics and Climate in conjunction with a joint workshop with CLIVAR	Qingdao, China 7-18 September 2015	Training/Summer School	31	14	45
5	Second Training Course on Ocean Forecasting System for Thailand	Phuket, Thailand, 15-22 October 2015	Training/Summer School	12	4	16
6	Trial of Cooperative Study between HAB and ORSP project on Harmful Algal Blooms	Lampung Bay, Sumatra Island, 19-24 October 2015	Regional workshop/ consultative meeting	6	4	10
7	Sixth WESTPAC Summer School on the Monsoon Onset Monitoring and its Social & Ecosystem Impacts (MOMSEI)	Phuket, Thailand 26-30 October 2015	Training/Summer School	32	13	45
8	Eighth IOC/WESTPAC International Workshop on the Fluvial Sediment Supply to the South China Sea (FluSed)	Hanoi, Vietnam 29-31 October 2015	Regional workshop/ consultative meeting	27	8	35
9	First International Workshop on Scientific Drilling in the Sunda Shelf	Jogyakarta, Indonesia, 25-27 November 2015	Regional workshop/ consultative meeting	13	1	14
10	Sixteenth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional-Global Ocean Observing System (NEAR-GOOS-CC-XVI)	Tokyo, Japan 8-9 December 2015	Regional workshop/ consultative meeting	27	4	31
11	WESTPAC JFIT Consultative Meeting	Tokyo, Japan 10 December 2015	Regional workshop/ consultative meeting	10	1	11
12	Ocean Forecasting System (OFS) Strategy Development Workshop	Guangzhou, China 14-16 December 2015	Regional workshop/ consultative meeting	11	3	14
13	WESTPAC Advisory Group Meeting 2016	Yogyakarta, Indonesia 13-15 January 2016	Regional workshop/ consultative meeting	34	9	43
14	Joint Cruise on Ocean-Shelf Interaction in Andaman Sea	Andaman Sea, 18-24 April 2016	Joint Cruise	12	2	14
15	Harmful Algal Bloom (HAB) Regional Strategic Development Meeting	Bangkok, Thailand 10-11 May 2016	Regional workshop/ consultative meeting	6	7	13
16	First WESTPAC Editing Team Meeting on the Development of a Commemorative Book of the 25th Anniversary of WESTPAC	Bangkok, Thailand 12-13 May 2016	Regional workshop/ consultative meeting	3	2	5
17	Second WESTPAC Editing Team Meeting on the Development of a Commemorative Book of the 25th Anniversary of WESTPAC	Bangkok, Thailand 20-25 June 2016	Regional workshop/ consultative meeting	2	1	3
18	WESTPAC Training Workshop on the Identification of Box Jellyfish in the Eastern Indian Ocean and the Gulf of Thailand	Phuket, Thailand 13-17 June 2016	Training/Summer School	16	12	28
19	Training Course on Health Assessment of Marine Endangered Species	Trang, Thailand, 23-30 June 2016	Training/Summer School	14	21	35
20	Second International Workshop on Scientific Drilling in the Sunda Shelf	Shanghai, China, 11-13 July 2016	Regional workshop/ consultative meeting	19	1	20
21	Regional Training Course on Identification of Harmful Algal Bloom Species in the ASEAN Region	Singapore, 18-22 July 2016	Training/Summer School	10	10	20
22	Third WESTPAC Training Workshop on Research and Monitoring of the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems	Phuket, Thailand 29-31 August 2016	Training/Summer School	26	20	46
23	WESTPAC Training Course on Ocean Dynamics and Multi-Scales Interaction - IOC Regional Training and Research Center on Ocean Dynamics	Qingdao, China, 5-16 September 2016	Training/Summer School	31	15	46
24	International Seminar on Management and Rehabilitation of Corals after the Bleaching Events	Bangkok, Thailand 15-17 September 2016	Regional workshop/ consultative meeting	34	26	60
25	WESTPAC Training Course on Crustacean Taxonomy – Regional Training and Research Center on Marine Biodiversity and Ecosystem Health (RTRC-MarBEST)	Jakarta, Indonesia 17-29 October 2016	Training/Summer School	25	17	42
26	Ninth International Workshop on the Fluvial Sediment Supply to the South China Sea	Bangkok, Thailand 24-26 November 2016	Regional workshop/ consultative meeting	32	5	37
27	WESTPAC Advisory Group Meeting 2016	Qingdao, China 28-30 November 2016	Regional workshop/ consultative meeting	19	11	30
28	WESTPAC Inception Workshop of DRMREEF-II	Qingdao, China 1-2 December 2016	Regional workshop/ consultative meeting	8	4	12
29	WESTPAC Workshop on the Development of Ocean Forecasting Systems for the North East Asia	Vladivostok, Russia, 14 December 2016	Regional workshop/ consultative meeting	19	2	21
30	Seventeenth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional-Global Ocean Observing System (NEAR-GOOS-CC-XVII)	Vladivostok, Russia, 15-16 December 2016	Regional workshop/ consultative meeting	19	2	21
31	WESTPAC workshop on the development of a research strategy for Harmful Algal Blooms "What we know, and what we do not know on HABs"	Nha Trang, Vietnam 19-22 December 2016	Regional workshop/ consultative meeting	15	7	22
32	First WESTPAC Feasibility Study Workshop on the 2nd Cooperative Study of the Kuroshio and its Adjacent Regions	Qingdao, China, 19-20 January 2017	Regional workshops/ consultative meetings	11	3	14
Sub-total				562	250	812
33	10th WESTPAC International Scientific Conference	Qingdao, China, 17-20 April 2017	International Scientific Symposium			
34	WS-1: Workshop on Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI) Project	Qingdao, China	Regional workshops/ consultative meetings			
35	WS-2: Workshop on from coastal habitat mapping to sustainability science for realizing SDG 14	Qingdao, China	Regional workshops/ consultative meetings			

36	WS-3: WESTPAC-HAB Workshop 2017	Qingdao, China	Regional workshops/ consultative meetings			
37	WS-4: Workshop on the Indo-Pacific ocean environment variation and air-sea interaction (IPOVAI)	Qingdao, China	Regional workshops/ consultative meetings			
38	WS-5: Workshop on Coastal Marine Biodiversity and Conservation	Qingdao, China	Regional workshops/ consultative meetings			
39	WS-6: Workshop on DRMREEF-II project	Qingdao, China	Regional workshops/ consultative meetings			
40	WS-7: Workshop on Deoxygenation in Coastal and Oceanic Waters in the Western Pacific Region	Qingdao, China	Regional workshops/ consultative meetings			
41	WS-8: Workshop on monitoring the ecological impacts of ocean acidification on coral reef ecosystems	Qingdao, China	Regional workshops/ consultative meetings			
42	Voice of WESTPAC Young Scientist Forum	Qingdao, China	Regional workshops/ consultative meetings			
43	11th Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-XI)	Qingdao, China, 21-23 April 2017	Regional workshops/ consultative meetings			