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Workshop Report No. 174

IOC-SOPAC Regional Workshop on Coastal Global Ocean Observing System (GOOS) for the Pacific Region

Apia, Samoa
16–17 August 2000

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ABSTRACT

GOOS is being implemented in the Pacific islands region by PacificGOOS, which was formed in Suva in 1998. In August 2000, in Apia, Samoa, PacificGOOS held a regional workshop on the development of a coastal Global Ocean Observing System (GOOS) for the Pacific region. This workshop aimed to raise the level of awareness about PacificGOOS and its value for sustainable development, to inform participants about recent coastal GOOS developments, to begin forming a regional network to take forward the development of operational oceanography in the region, to broaden participation in PacificGOOS, and to develop the outlines of some pilot projects to take forward the implementation of PacificGOOS. Three project outlines were developed, on: (i) coastal water quality; (ii) mariculture developments; and (iii) coral reef health. Partnerships were created to take forward the development of each project. Participants were introduced to the concept of the Argo float project and explored its significance for the Pacific as well as the ways in which Pacific nations could participate in and assist in the implementation of the project.

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- ❖ The Government of France;
- ❖ The Government of New Zealand;
- ❖ The Netherlands Geoscience Foundation [GOA];
- ❖ The Australian Institute of Marine Science [AIMS];
- ❖ Intergovernmental Oceanographic Commission [IOC];
- ❖ South Pacific Applied Geoscience Commission [SOPAC].

The convening of this important regional Workshop for island countries in the SOPAC region would not have been possible without their support.

1. INTRODUCTION

At the 1998 SOPAC/IOC Workshop on Pacific Regional Global Ocean Observing Systems, held in Suva, Fiji, regional participants recommended the establishment of a regional GOOS entity for the Pacific region, now known and referred to as PacificGOOS.

A further regional workshop under the *GOOS Capacity Building Programme in 2000* was recognized as being important for exploring and developing potential Coastal Global Ocean Observing System - type [C-GOOS] initiatives in the Pacific region. Consequently, the *Pacific Coastal GOOS Workshop* was convened in Apia, Samoa from 16 to 17 August 2000, and registered approximately fifty participants from twenty countries [Annex II].

The primary objective of the workshop was to focus on the identification of regional Coastal GOOS-type projects, with a view to future development and implementation under the auspices of PacificGOOS.

The general benefits for C-GOOS type projects include the ability to:

- detect and forecast the effects of climate change on coastal ecosystems and their human inhabitants;
- protect and restore healthy coastal ecosystems and manage living resources for sustainable use;
- forecast and mitigate the effects of natural hazards;
- protect public health;
- enable safer and more efficient marine operations.

The workshop was sponsored by SOPAC and the IOC (Intergovernmental Oceanographic Commission), and co-sponsored by France, New Zealand, the Netherlands Geoscience Foundation [GOA], and the Australian Institute of Marine Sciences. It was hosted by Samoa and was held at the Food and Agriculture Organization [FAO] conference rooms, in Apia.

2. WORKSHOP OBJECTIVES AND PROGRAMME

2.1 WORKSHOP OBJECTIVES

The main objectives of the workshop were to:

- raise the level of awareness of scientists, managers and policy makers to the benefits of PacificGOOS;
- inform participants of recent GOOS developments, focusing on the fast-developing design of the C-GOOS Module;
- broaden the understanding of the needs for GOOS-type of developments in the Pacific;
- begin development of a network of university, government and industry involved in operational oceanography in the Pacific to avoid overlapping of initiatives, maximize resources and foster cooperation;
- broaden participation in PacificGOOS;
- discuss the strategy for PacificGOOS, and application of best practice;
- propose joint pre-operational projects on research and training;
- propose joint operational pilot projects based on existing monitoring systems.

2.2 WORKSHOP PROGRAMME

The workshop convened on Wednesday, 16 August 2000 with an opening address by Afioa Tuisugaletau Aveau, Director of the Department of Agriculture, Forestry and Fisheries, Samoa.

This was followed by two full days of plenary and working group sessions. Day One began with plenary talks by invited speakers, the purpose being to:

- provide overviews of GOOS and PacificGOOS;
- introduce the newly completed Strategic Design Plan for the Coastal component of GOOS;

- provide background to key activity areas of coastal environments, for the Pacific region, to set the stage and stimulate discussion during working group sessions;
- introduce the International Argo Float Programme to the Pacific region, a newly-launched GOOS initiative.

Plenary talks are included in electronic format on compact disk and form part of this workshop's report.

Plenary sessions were convened throughout the duration of the workshop to allow working groups to interact and for assessment of progress. These sessions were chaired either by Nauigoa U Faasili, the Assistant Director of Agriculture, Forestry and Fisheries Department of Samoa or his elected alternate Russell Howorth, Programme Manager at the SOPAC Secretariat. All recommendations from plenary are included in Section 6 of this report.

Following the plenary talks, workshop participants were divided into three groups. Each group was charged with identifying appropriate pilot project[s] based upon criteria articulated in the Strategic Design Plan for the Coastal component of GOOS.

3. OVERVIEW OF GLOBAL OCEAN OBSERVING SYSTEM [GOOS]

3.1 GLOBAL OCEAN OBSERVING SYSTEM [GOOS]

The GOOS organization, objectives and principles were presented to the workshop by Bill Erb, Head of the IOC Perth Regional Programme Office, Australia. The workshop was advised that:

- various intergovernmental organizations (IOC-UNESCO, WMO, UNEP) and non-government agencies (SCOR/ICSU) sponsor GOOS;
- the primary objective for GOOS is to transfer data and information acquired from long-term, systematic monitoring of the ocean into products and services required by a wide range of users. These include users from public and private sector organizations, and from scientists and individuals;
- the major components of GOOS include data collection, analysis and management, telecommunication systems, modelling centres, and product development and distribution centres;
- there are four technical panels of experts, formed to address the major themes of climate, coastal, living marine resources, and health of the oceans;
- any successes for the implementation of GOOS-type activities in the Pacific will be heavily reliant upon the will and commitment of its regional stakeholders;

To review the presentation made at the workshop see GOOS.pdf included on the compact disc, which forms part of this report and is available on request from SOPAC.

3.2 PACIFIC GLOBAL OCEAN OBSERVING SYSTEM [PacificGOOS]

The progress of PacificGOOS initiatives, since *the IOC/SOPAC 1998 GOOS Capacity Building Workshop for the Pacific* were reported to the workshop by Alfred Simpson, Director of SOPAC. He advised that a review of the summary of recommendations from the 1998 Workshop Report [IOC Workshop Report No. 144, GOOS Report No. 53] indicated activity on only a few of the recommendations made.

This he attributed to resource constraints placed upon the SOPAC Secretariat, which accommodates the PacificGOOS Secretariat, to address and focus on developing and implementing regional GOOS activities. With new donor funds being directed to the Ocean Unit in SOPAC, it was envisaged that much needed attention would be directed to developing and focusing regional efforts for GOOS in the Pacific region.

The development of a Strategic Plan for PacificGOOS was identified as key to the success of GOOS activities in the region. Emphasis was also given to the need for improved monitoring and observation arrangements for areas of activity such as mariculture, coastal management [which for many SOPAC member countries comprises the entire island] and coastal fisheries in the region, to enable better management decisions. It was suggested that the *Strategic Design Plan for the Coastal Component of Global Ocean Observing System* [GOOS Report No. 90] could provide an ideal template from which to seek guidance and direction in developing pilot projects.

3.3 COASTAL GLOBAL OCEAN OBSERVING SYSTEM [Coastal GOOS]

The recently completed *Strategic Design Plan for the Coastal Component of Global Ocean Observing System* was introduced to the workshop by Julie Hall – an incumbent expert on the Technical Panel for developing the Coastal module of GOOS. She indicated that the Plan offered a mechanism for designing and implementing project initiatives for coastal waters, both in keeping with the GOOS vision and compliant with its goals. The following benefits, by adopting the C-GOOS approach, were identified as a means to addressing the following societal needs:

- detect and forecast the effects of climate change on coastal ecosystems and their human inhabitants;
- protect and restore healthy coastal ecosystems and manage natural resources for sustainable use;
- forecast and mitigate the effects of natural hazards;
- enable safer and more efficient marine operations;
- protect public health.

It was stressed that a sustained commitment will be required of C-GOOS stakeholders in the Region to establish, maintain, validate, make accessible and distribute high-quality data that meets internationally agreed upon standards. The key design principles for C-GOOS were presented and recommended to be used as the guiding template by the three working groups, for discussion and development of concept documents for regional pilot projects.

To review the presentation made at the workshop see C-GOOS.pdf included on the compact disc, which forms part of this report and is available on request from SOPAC.

4. OVERVIEW OF COASTAL ACTIVITIES IN PACIFIC ISLAND COUNTRIES

Regional specialists presented a synopsis on the issues that currently face Pacific Island Countries, in the following coastal activity areas. Each presenter also addressed the important role of monitoring such activities and reported the status of monitoring of these key areas in the region:

- coastal environments;
- coastal management and engineering;
- coastal fisheries;
- mariculture;
- tourism.

A brief synopsis on the status of the Global Coral Reef Monitoring Network [GCRMN] initiative was also presented in plenary, with further explanation given on the Pacific Node of the GCRMN. As well, an introduction was made to the recently implemented Global Environment Facility-funded International Waters Programme for the Pacific. The programme will be funding several pilot projects in coastal waters and may have implications for C-GOOS in the region.

The essence of each of the presentations made have been captured on the compact disc available from SOPAC.

5. THE INTERNATIONAL ARGO PROGRAMME

The International Argo pilot Project was introduced during plenary, as being a global initiative proposing to deploy an array of 3000 profiling floats in the world's oceans, to acquire and provide real-time observations of the temperature and salinity structure in the upper layer of the global ocean. The floats will typically drift at a depth of 2000 meters, rising to the surface every ten days observing temperature and salinity profiles. After relaying its profile data and location to shore via satellite, a float will sink back to depth to begin another cycle; the lifetime of a float is projected to be four years.

These data will:

- advance our understanding of the role of the ocean in climate, as well as in other El Niño-Southern Oscillation-like [ENSO] phenomena such as the Pacific Decadal Oscillation;

- provide the broad-scale oceanographic data context for addressing coastal issues such as the health of coral reefs, inshore fisheries, and mariculture;
- contribute to improved ENSO-based atmospheric forecasts;
- enhance understanding of sea-level rise associated with inter-annual climate variability and global warming.

Workshop participants were advised that these benefits would be provided to Pacific Island Countries at effectively no cost to them. In addition, it was noted that the float-providing countries in the International Argo Programme are prepared to:

- provide advance notice of plans for ships and aircraft coming into the collective exclusive economic zone [EEZ] of Pacific Island Nations, for float deployment;
- provide space for an observer on research ships coming into the collective EEZ of the Pacific Island Nations for float deployment;
- provide on a regular basis broad-scale maps of the temperature and salinity fields in the Region, with the understanding that these maps and the Argo data from which they have been derived will be available to anyone at no cost and with no period of exclusive use;
- provide assistance, as needed, in identifying and linking with operational forecast centres, which will generate forecasts using Argo data;
- identify a point-of-contact for deployment and for science and applications.

There was a general consensus within plenary that the International Argo Project will be both important for and beneficial to PICs.

The presentation of the Argo Project is included on the compact disc that is part of this report and available from SOPAC.

6. SUMMARY AND RECOMMENDATIONS

PacificGOOS

1. Workshop participants **strongly endorsed** their continuing support of the PacificGOOS initiative and **strongly recommended** that an effective strategy be developed to plan and implement GOOS activities in the Pacific Region.

Coastal GOOS

The Workshop formulated three concept papers for C-GOOS pilot projects for the Pacific region in the areas of mariculture development, coastal water quality and coral-reef monitoring for tourism sites.

2. As GOOS is an "end-to-end user" system, developed as a sustainable, integrated, locally relevant, global scale observing system for multiple users, workshop participants **endorsed** a multi-disciplinary approach to developing and implementing C-GOOS pilot projects.
3. Workshop participants further **recommended** that regional agencies, national governments and other key stakeholders strengthen their collective efforts to support, develop and implement C-GOOS pilot projects in the region.
4. National representatives **encouraged** workshop participants from international and regional agencies to assist them in seeking funds to support C-GOOS pilot projects in the region.
5. Workshop participants **agreed** that long-term monitoring of activities in coastal waters will enhance the scientific information and advice available for all users and will assist toward better decisions being made. Consequently, workshop participants **recommended** that GOOS activities be actively promoted as an effective mechanism to assist in achieving sustainable development and good governance.

International Argo Programme

6. Workshop participants **agreed** that the International Argo Project, which is seeking to acquire data from all of Earth's oceans, would advance our understanding of the role of the ocean on climate.
7. Since the Central and Western Pacific Ocean is largely within the EEZs of Pacific Island Countries, workshop participants **recommended** that Pacific Island Countries agree to:
 - concur with plans for ships and aircraft coming into their collective EEZs for float deployment;
 - help facilitate access, as needed, for the ships and aircraft coming into their EEZs for float deployment;
 - provide assistance, as needed, in identifying and linking with regional organizations which might assist float deployment from vessels of opportunity such as fisheries and patrol craft;
 - identify a point-of-contact for deployment and for science and applications.
8. To facilitate the effective implementation of the International Argo Project in the Pacific, the Workshop **suggested** that the SOPAC Secretariat seek endorsement from the SOPAC Council of **recommendation 7**. Further, **suggested** that the SOPAC Secretariat **promote** the Argo Project in the region, to ensure the early deployment of Argo floats in the Central and Western Pacific Ocean.

ANNEX I

OPENING ADDRESSES

These addresses appear in the order that they were presented:

Keynote Address by Afioga Tuisugaletaua S Aveau

Director,

Department of Agriculture, Forestry and Fisheries, Samoa

Distinguished Guests, representatives of Pacific island governments, international and regional organizations, Ladies and Gentlemen,

On behalf of my Government I would like to take this opportunity to welcome you all to Apia to participate in this second meeting of the Pacific component of the Global Ocean Observing System or better known as Pacific GOOS.

My Government was particularly responsive to the suggestion from the South Pacific Applied Geoscience Commission (SOPAC) that the meeting be held in Apia. We understand this meeting will focus on coastal issues within the framework of GOOS, and development in the coastal area is high on our economic reform agenda.

Samoa has one of the smaller exclusive economic zones amongst its Pacific small island developing states neighbours and its land areas comprised mainly of only two large and high volcanic islands. Sustainable development and sound management of this relatively small part of the Pacific is thus critical. Data gathering information systems at the national level and linked to similar systems regionally and globally form an important tool to support management of our ocean space.

The Pacific is the largest ocean in the world covering almost a third of the globe. We in the Pacific generally live on tiny islands spread over huge areas of ocean space and provide a unique setting in the global scene. The Pacific Ocean has for generations directly impacted upon our lives and well-being and is deeply enshrined in our traditional land cultural values and practices. Over the past one hundred years the increased access to the "outside world" has had a huge influence on our aspirations for a "better quality of life".

The challenge for us now is to develop ways to better manage our ocean and its natural resources.

In 1992, at the Earth Summit in Rio de Janeiro, the international community committed itself to Agenda 21, which expresses the need to develop in such a way as not to jeopardize the security of future generations.

Special consideration was given to the importance of oceans and coastal areas and the protection, rational use and development of their living resources. It specifically called for the establishment of a global ocean observing system [GOOS] to enable effective and sustainable management and utilization of the ocean environment and its resources. The concept of GOOS is that of an integrated global network that systematically acquires and disseminates data and data products in response to the information needs of government, industry, science and the public to address marine related issues and problems in a timely fashion.

The United Nations in promoting the importance of oceans, the marine environment and its resources for life on Earth and for sustainable development, declared 1998 the International Year of the Ocean. 1998 was instrumental in raising the profile of oceans and their significance to governments, organizations and individuals and the actions needed to undertake our common responsibility to sustain the greatest common heritage that we have and without which we cannot exist. In testament to this the UN Commission for Sustainable Development 7 in 1999 and the Asia-Pacific Economic Cooperation (APEC) in 1998 have continued to highlight the need to address issues relating to the protection and sustainable development of oceans and their resources. Most recently the UN General Assembly in 1999 resolved to establish an Informal Consultative Process to address Ocean Affairs on an annual basis. This meeting convened for the first time in New York in early June and was attended by our Pacific Missions in New York as well as SOPAC.

As our ocean and coastal environments are of strategic importance, and constitute an important valuable development resource, we must recognize and participate in international initiatives such as GOOS. We also need to look for ways in which to effectively address the need for holistic, integrated approaches to managing our Pacific Ocean.

The Pacific region in confronting this challenge took the initiative of establishing PacificGOOS in February of 1998 with the aims to develop a sustained and integrated observing system to provide data and knowledge for promoting economic development, sustaining living resources, protecting and restoring ecosystem health, mitigating natural disasters and protecting public health and safety of our ocean. Notwithstanding this challenge the region cannot stretch its limited resources indefinitely. The region's global partners for example UN agencies such as WMO and UNESCO/IOC that bring GOOS need also to bring the opportunity of funding mechanisms to provide the small island developing states of the Pacific with a financial enabling environment.

PacificGOOS is still new to the region, and this workshop, which will focus on Coastal GOOS issues, I hope you will all agree will provide us with an opportunity to actively discuss and deliberate on this initiative and further develop an approach that is both relevant and affordable to the Pacific.

May I on behalf of the Government of Samoa close by acknowledging the donors who have supported this workshop, the organizers here in Samoa, the region and internationally and of course you the participants for freely giving your time to be here. I wish you every success with your deliberations over the next two days and look forward to hearing of the outcome.

Address by Mr. William Erb
*Head, Perth Regional Programme Office,
Intergovernmental Oceanographic Commission, WA Australia*

I would like to join in welcoming all the participants and government officials to the SOPAC/IOC PacificGOOS Coastal Workshop. A special thanks and appreciation go to the representatives of the Government of Samoa for their willingness to host this activity in their most beautiful country. I thank the Reverend Niutea Simanu for his opening prayer. Their decision to host the workshop is, I trust, attributed to their recognition of the importance of the Global Ocean Observing System and its potential for the well being of its people and for those of the entire region.

A number of organizations need to be thanked for their support of the workshop. We are very grateful to the Australian Institute of Marine Sciences, Holland, New Zealand, France, SOPAC and the IOC for their making the workshop possible.

In 1984, I attended one of my first SOPAC meetings in Apia and at that time SOPAC was more focused on geology and geophysics. A Samoan minister was extending his welcome to the participants when a fairly strong earthquake shook the entire building and all proceedings came to a momentary halt. From that time forward I have never questioned the ability of the Samoan people to focus on the subject at hand. Our focus on the coastal zone will not, I hope, result in any major coastal hazards.

In major developed countries at workshops such as these speakers often describe the coastal area in terms of millions of dollars of value for tourism, housing, etc. However, in the South Pacific the coastal area takes on an even more special significant value. It is the home of almost everyone in each country and it's often at the heart of the culture of an island country. Coastal GOOS perhaps offers the greatest opportunity for involvement of the South Pacific island countries in GOOS, more so than the climate/deep ocean component. While climate is important it will largely be studied and predicted by the major developed countries. The people who inhabit the islands of the South Pacific will implement coastal GOOS. We are at the very beginning of this very important venture and everyone here should feel a certain pride in being part of this very challenging task. It won't be easy but I am sure it will be worthwhile.

Address by Alfred Simpson

*Director,
South Pacific Applied Geoscience Commission (SOPAC), Suva Fiji*

(Summary)

He stressed how important it was to have a comprehensive understanding of the ocean environment and related dynamics, in the light of various issues such as population pressure, environmental damage and over fishing.

He reminded participants of the 1998 IOC-SOPAC Workshop on a Pacific, Regional Global Ocean Observing System, convened in Suva to build awareness and capacity regarding issues concerning Global Ocean Observing Systems [GOOS] and establish a regional component of GOOS, now known as, and referred to as, PacificGOOS. He advised workshop participants that although recommendations had received workshop endorsement, few of these had been achieved but should not detract from the fact that Island countries needed support for studies on sustainable resource exploitation as well as long term monitoring of these to assure sustainability.

He recalled the meeting's two main goals as being to:

- bring together regional stakeholders to discuss PacificGOOS, with a particular emphasis on the Coastal component of GOOS;
- review existing coastal environment practice, identify issues and develop potential pilot projects for the Coastal component of GOOS under the umbrella of PacificGOOS.

He asked workshop participants to be mindful of these goals and to use the workshop forum to work toward achieving these goals through, frank, open and, constructive discussion.

He thanked Samoa for agreeing to host this important regional meeting and thanked sponsors for their support and contributions to what he hoped would be a successful workshop that would result in some positive initiatives and outcomes, both for GOOS and PacificGOOS.

ANNEX II

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ANNEX III

WORKSHOP PROGRAMME

Monday 14th August

Participants arrive

Tuesday 15th August

0830 – 1700 Informal Meetings
Workshop participants to attend GCOS Workshop [Observers]
1300 – 1700 Registration
1800 – 1845 Special Seminar on ARGO
Joint presentation to both the GOOS and GCOS workshops
1845 – 2000 Reception
Joint social function for GOOS and GCOS workshop participants

Wednesday 16th August

0730 - 0830 Registration
0830 - 0900 Opening Ceremony
Opening Prayer (Reverend Niutea Simanu)
Opening Address: Representative of Samoa (Afioga Tuisugaletaua S Aveau)
Welcome Remarks: SOPAC Secretariat (Alfred Simpson)
GOOS Secretariat (William Erb)
0900 – 0915 Break for Official Photograph
0915 – 0930 Election of Chair (Nauigoa U Faasili)
Election of Co-Chair (Russell Howorth)
Workshop Arrangements
Introduction of Participants
0930 – 1030 Plenary Lectures
0930 – 0945 Overview of GOOS (William Erb)
0945 – 0955 Overview of Pacific Coastal GOOS (Alfred Simpson)
0955 – 1030 Overview of Coastal GOOS (Julie Hall)
1030 – 1050 Beverage Break
1050 – 1205 Pacific Coastal GOOS Issues – Session I
1050 – 1110 Coastal Fisheries (Tim Adams)
1110 – 1130 Mariculture (Ben Ponia)
1130 – 1150 Tourism (Ilisoni Vuidreketi)
1150 – 1155 Break
1155 – 1315 Pacific Coastal GOOS Issues – Session II
1155 – 1215 Coastal Management and Engineering (Russell Maharaj)
1215 – 1235 Coastal Environment Mary Powers
1235 – 1335 Lunch
1335 – 1415 Pacific Coastal GOOS Issues – Session III
1335 – 1355 Global Coral Reef Monitoring Network [GCRMN] (Robin South)
1355 – 1415 International Waters Programme Andrew Wright
1415 – 1535 General Discussion
Country Comments
GOOS Secretariat Comments
The Argo Float Programme and the SOPAC Region
1535 - 1550 Beverage Break
1550 - 1650 Coastal GOOS Pilot Project Design
Working Group Formations (Julie Hall)
1650 - 1700 Break
1700 - 1750 Convene Working Groups
1750 - 1800 Day one wrap-up

Thursday 17 th August

0830 – 0900	Plenary – Summary and Overview of Day II Schedule
0900 - 1030	Working Group Discussions Continue
1030 - 1050	Beverage Break
1050 - 1300	Working Group Discussions Continue and End
1300 - 1400	Lunch
1400 – 1530	Working Group Presentations of C-GOOS Pilot Projects
1530 - 1550	Beverage Break
1550 – 1650	Plenary Discussion
	The Way Forward [Concept Papers for Pilot Projects]
	PacificGOOS Coastal Strategy
	The Argo Float Programme and the SOPAC Region
1650 - 1700	Workshop Closing Remarks
	Chair
	SOPAC Secretariat
	GOOS Secretariat

ANNEX IV

COASTAL WATER QUALITY

Project Concept for Monitoring Coastal Water Quality at Selected Regional Sites

Pacific Island Countries provide typical examples of the poverty and vulnerability issues of Small Island Developing states. Water quality is fundamental to sustainable development, public health, quality of life and preservation of the environment. The economic cost of poor water quality is high in terms of diminished productivity, higher public health costs and lost development opportunities.

1. Issues & Significance

- Public health;
- Water circulation;
- Land based inputs;
- Effects on food chains;
- Cause-Effects changes such as sewage, anti-fouling and oil spills.

All of these are significant issues throughout the Region.

2. Users & Products

The users, who will also be pro-active in the implementation of the project include government departments, ports and harbour authorities and civil society.

The products will be:

- Raw data;
- Visual data, which demonstrate trends and variability in water quality such as water pollution [predictive studies];
- Memorandum Summaries of numerical and technical data;
- Maps for planning and other purposes;
- Education material for public awareness;
- Regulations and guidelines for improving water quality.

3. Relationship to C-GOOS network and other programmes

External interventions include:

- C-GOOS Coastal Strategic Design Plan;
- GCRMN, which is already a part of GOOS;
- SPREP's PacPol and International Waters Programme Projects;
- University of the South Pacific;
- Lessons learnt from BalticGOOS.

4. Project Design

4.1 Issues to be addressed

Pacific Island Countries provide typical examples of the poverty and vulnerability issues facing all Small Island Developing States. The water quality of their coastal waters is fundamental to sustainable development, public health, quality of life and preservation of the environment. The project will seek to address the following issues: public health, water circulation, land-based inputs, effects on food chains and the cause-effects changes such as sewage, anti-fouling and oil spills.

4.2 Final prediction and lead-time

Key project activities to be conducted at selected sites in the region include:

- Identifying key sites in the region;

- Monitoring conditions and disseminating data and information;
- Identifying what types of parameters should be measured;
- Identifying the frequency of data collection;
- Identifying change;
- Identifying capacity building requirements.

The lead-time to collect and assess data, and establish a template for long-term monitoring would be approximately three years.

4.3 Parameters to be measured

- The HOTO Report and the IMO [and other] standards, will be used to determine and guide data measurement protocols;
- Water column and sediment surface sampling will be carried out, with the following parameters being measured:
 - pH; CTD; Nutrients [nitrates and phosphates]; Faecal coliform;
 - Trace and heavy metals [TBT, Hg, Cr, Fe, Zn, Cu];
 - BOD, COD, TOC, DOC;
 - Hydrocarbons [PAAHs, dissolved and dispersed poly-aromatics];
- The identification of sources of discharge from industry and housing will also be carried out.

4.4 Models to be used

The following models, model variables and outputs will be used:

- Two and three dimensional modelling;
- Point source sampling parameter concentrations;
- Linear regression and least square analysis;
- Statistical modelling such as Monte-Carlo simulation modelling;
- A GIS will be developed for data management and dissemination of products.

4.5 Feasibility

Project feasibility is reliant upon sound regional and national coordination to ensure long-term sustainability. This is a mandatory requisite for an activity to be considered part of C-GOOS.

4.6 Research and development

There is no requirement for research and development for the implementation of the project. Guidelines and technology are well established and developed.

4.7 Data and information management

Data will be managed within a GIS framework in regional and national data repositories. ICT links will provide the communications and access requirements to transfer and access data. It is envisaged that the SOPAC Secretariat will be the GOOS link for accessing data on their website.

4.8 Capacity building

Training attachments and on-the-job training will be a fundamental component of the project to ensure sustainability and promote ownership. Training activities will encompass aspects of sample collection, analysis and interpretation; laboratory analysis; data use, processing and GIS management; and, instrument maintenance. Public awareness campaigns will also be important toward building capacity.

5. Project implementation

A detailed project document will need to be drafted.

Project Champions

SOPAC, SPREP, WERI

Vanuatu; Fiji; PNG; Tonga; Samoa; Solomon Islands; Marshall Islands; Cook Islands; Nauru.

ANNEX V

MARICULTURE DEVELOPMENTS

Project Concept for Monitoring Pearl Culture and Seaweed Farming in Kiribati and the Marshall Islands

1. Issues and Significance

The project seeks to use GOOS-type observations to maximize economic returns from mariculture in an environmentally friendly and sustainable manner.

Special attributes of the projects include:

- | Seaweed Farming | Pearl Culture |
|---|--|
| <ul style="list-style-type: none">• Non-gender biased• Environmentally friendly• 3rd largest foreign earner [Kiribati]• High demand• Non-perishable• Prevents urban drift• Energy saving• Low technical skills required | <ul style="list-style-type: none">• Non-gender biased• Environmentally friendly• Premier foreign earner [Cook Islands]• High demand• Non-perishable• Energy saving• Technical expertise needed |

2. Users and Products

The primary users of the project outputs will be the farmers and the Government.

Other beneficiaries of the project include academic research institutions and other countries.

3. Relationship of GOOS Network and Other Programmes

The projects seek to use broad-scale observation [GOOS] and to link with observations being acquired in other countries and territories such as the Cook Island Pearl Culture Industry that is well established. Further, data and local experiences from the projects will contribute to regional mariculture community.

4. Project Design

4.1 Issues to be addressed and

4.2 Final Predictions and Lead-times

Early warning system required for shifts in direction of trade winds to westerly, with a lead-time of at least 2 months.

- Government [Fisheries Department] uses this information to collect seed stock for safe keeping, for future stock replenishment;
- Farmers use this information to harvest their crops before they are destroyed;
- The change in wind direction has a close link with climate prediction and consequently is closely linked to GCOS.

Understanding the influence of environmental parameters on production [such as harvest weight]. As production varies from island to island the measurement of selected parameters at selected sites at different island locations will verify their influence upon production.

- The link between physical variability [temperature, salinity and current direction, winds and rain] and production need to be researched after the fact;
- Need to understand that interaction between rabbit fish and seaweed production;
- Need to measure the stress [incidence of ice-ice] on seaweed.

4.3 Models to be Used, Model Variables and Outputs

A hydrodynamic model of the lagoon needs to be developed to understand dynamics of water circulation within the lagoon[s] and the primary drivers for the circulation.

4.4 Feasibility

Project sustainability will be dependent upon the costs for data acquisition and the maintenance costs of equipment required for data collection. Capacity to operate equipment for data acquisition will also influence the success of the project. For all-intents and purposes it would be preferable for the equipment to be automated.

The project will be reliant upon external expertise to provide assistance for developing and implementing methodology and acquiring baseline data.

- The Meteorological Service for the provision of a 2 month early warning system;
- SOPAC and other CROP agencies to provide hydrodynamic model and other information.

4.5 Research and Development [Refer 4.1 and 4.2]

4.6 Data and Information Management

- Wind forecasts will need to be disseminated to farmers;
- Fisheries will provide the link between the Meteorological Service and the farmers;
- Observing information will need to be combined with the production data for assessment and forecasting.

4.7 Capacity Building

Capacity building activities are needed, particularly in the area of equipment operations and maintenance. Training opportunities will need to be offered to all stakeholders, to ensure that the products are utilized and result in more sustainable management and development of the resource.

5. Project Implementation

A more detailed project document needs to be developed and funding sought to launch pilot projects toward developing long-term monitoring systems for seaweed and pearl culture farming developments.

Project Champions
SOPAC SPREP SPC
Kiribati Marshall Islands

ANNEX VI

CORAL REEF HEALTH

**Project Concept for Monitoring
Reef Health at Pacific Island Dive Tourism Sites**

Healthy coral reefs are the major drawing card for the rapidly growing dive tourism and eco-tourism niche markets in the Pacific Islands; the long-term monitoring of coral reefs is therefore of special importance to the dive tourism industry. The purpose of this project is to facilitate reef monitoring through a partnership between the Global Coral Reef Monitoring Network, the International Ocean Institute - Pacific Islands, the South Pacific Regional Environment Programme, the South Pacific Tourism Organization, and the Dive Industry.

1. Issues & Significance

Healthy coral reefs are the mainstay of the rapidly growing dive tourism and eco-tourism industries in the Pacific Islands. The long-term monitoring of reefs utilized by the tourism industry will serve as a valuable marketing tool for the South Pacific Tourism Organization. It will also greatly expand the database of the GCRMN, and it will have a significant spin-off in awareness raising in the tourism industry, among dive operators and tourists.

2. Users & Products

The users (who will also be project participants) will be the dive tourism industry, tourists, and the GCRMN. The products will be:

- A database on the health of coral reef dive sites around the region;
- A biannual state of the coral reefs reports, to be published by the Australian Institute of Marine Science GCRMN Co-ordination Unit;
- A management tool for dive operators;
- A set of guidelines on responsible diving practices for the use of the dive tourism industry and their clients.

3. Relationship to C-GOOS network and other programmes

- GCRMN is already a part of GOOS, and Reef Check (the methodology recommended for this project) is a part of GCRMN.
- The project is linked to, and adds a new dimension to, the existing GCRMN Nodes in the Pacific Islands. It is also linked to SPREP's Coastal Programme, and to IOI-Pacific Island's existing awareness raising activities. The project also enhances activities already planned by the Pacific Tourism Organization, and the dive operators.

4. Project Design

4.1 Issues to be addressed

Healthy coral reefs are the mainstay of the rapidly growing dive tourism and eco-tourism industries in the Pacific Islands.

4.2 Final prediction and lead-time

- Data obtained will be fed in the two-yearly *State of Coral Reefs* Reports. These in turn are linked to the International Coral Reef Symposia;
- Actual data will be collated and posted on the GCRMN Web-site for IOI-Pacific Islands on a regular basis. These would be available within a three-month timeframe.

4.3 Models to be used

- The Reef Check system of monitoring coral reefs will be employed. This is an accepted and well tested methodology, and is formally recognized as a sub-component of GCRMN, focused at the community level. The users and their clients will be a part of the data gathering network;
- Reef Check is flexible and can be modified to suit conditions and users. The data sets will therefore be tailored to the actual needs of the users.

4.4 Feasibility

The project is completely feasible as it is already up and running.

4.5 Research and development

There is no need for research and development for the implementation of this project.

4.6 Data and information management

Data will be managed by the GCRMN Node for the Pacific Islands, headquartered at the Marine Studies Programme of the University of the South Pacific in Suva, Fiji. Transfer of data from those countries with USP Centres will be enhanced through the use of the new USNet2000 dedicated satellite communications system, which allows real time audio, video and data transfer to the twelve USP member countries.

After collation, data are transferred to Reef BASE located at the International Centre for Living Aquatic Resources Management in the Philippines, and to the GCRMN Co-ordination Unit at the Australian Institute of Marine Science. Data will also be posted on the IOI-Pacific Islands GCRMN Web Site.

4.7 Capacity building

Training in Reef Check methodology will be coordinated through IOI-Pacific Islands. The involvement of the Marine Studies Programme's MSPTRAIN unit will be encouraged where necessary.

5. Project implementation

- The project will be implemented through a partnership between GCRMN (IOI-Pacific Islands), SPREP, the South Pacific Tourism Organization [SPTO] and the Pacific Islands Dive Tourism Industry;
- The SPTO, together with SPREP, will be responsible for country coordination and for liaison with the dive tourism industry, governments, and others involved;
- IOI-PI will directly coordinate with those countries in the IOI-PI GCRMN Node (Fiji, New Caledonia, Nauru, Samoa, Tuvalu, Solomon Islands and Vanuatu). IOI-PI will be responsible for coordinating training in Reef Check Methodology, data transfer from the participants to GCRMN, Reef BASE and the IOI-PI Web Site;
- The Dive Tourism industry will be responsible for carrying out monitoring at their dive sites, and for the gathering and transmission of data to IOI-Pacific Islands.

Project Champions

GCRMN IOI-PI SPTO SPREP
Dive Industry

ANNEX VII

ARGO FLOAT PROJECT

The International Argo Project proposes to deploy an array of 3000 profiling floats to provide real-time observations of the temperature and salinity structure in the upper layer of the global ocean. This corresponds to an approximate spacing between floats of 300 kilometres.

Floats will typically drift at a depth of 2000 meters, rising to the surface every ten days observing temperature and salinity profiles. After relaying its profile data and location to shore via satellite, a time span no longer than one day, a float will sink back to depth to begin another cycle; the lifetime of a float is projected to be four years.

The workshop noted the potential of the Argo Project to advance our understanding of the role of the ocean in climate, as well as other ENSO-like phenomena such as the Pacific Decadal Oscillation. In addition, it will provide the broad-scale oceanographic data context for addressing coastal issues such as the health of coral reefs, inshore fisheries, and mariculture. It will also contribute to improved ENSO-based atmospheric forecasts, as well as better understanding of sea level rise associated with inter-annual climate variability and global warming. These benefits are to be provided effectively at no cost to the Pacific Island Nations.

The workshop further noted that the float-providing countries working in the Argo Project are prepared to:

- provide advance notice of plans for ships and aircraft coming into the collective EEZ of the Pacific Island Nations for float deployment;
- provide space for an observer on research ships coming into the collective EEZ of the Pacific Island Nations for float deployment;
- provide on a regular basis broad-scale maps of the temperature and salinity fields in the Region, with the understanding that these maps and the Argo data from which they have been derived will all be available to anyone at no cost and with no period of exclusive use;
- provide assistance, as needed, in identifying and linking with operational forecast centres which will generate forecasts using Argo data;
- identify a point-of-contact for deployment and for science and applications.

Since the Central and Western Pacific Ocean is largely within the EEZs of Pacific Islands Nations, the workshop **recommended** that Pacific Islands Nations agree to:

- concur with plans for ships and aircraft coming into their collective EEZs for float deployment;
- help facilitate access, as needed, for the ships and aircraft coming into their EEZs for float deployment;
- provide assistance, as needed, in identifying and linking with regional organizations which might assist float deployment from vessels of opportunity (e.g., fisheries and patrol craft);
- identify a point-of-contact for deployment and for science and applications.

To facilitate effective implementation of the Argo Project, the Workshop suggested that the SOPAC Secretariat:

- seek SOPAC Council endorsement of this **recommendation**;
- further promote the Argo Project in the region, in order to ensure the early deployment of Argo floats in the Central and Western Pacific Ocean.

ANNEX VIII

LIST OF ACRONYMS

AIMS	Australian Institute of Marine Science
APEC	Asia Pacific Economic Cooperation
BalticGOOS	Baltic Operational Oceanographic System
BOD	Biochemical Oxygen Demand
C-GOOS	Coastal Global Ocean Observing System
COD	Chemical Oxygen Demand
CROP	Council of Regional Organizations of the Pacific
Cr	Chromium
CTD	Conductivity, Temperature and Depth
Cu	Copper
DOC	Dissolved Organic Carbon
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
Fe	Iron
GCOS	Global Climate Observing System
GIS	Geographic Information System
GOA	Netherlands Science Foundation
GOOS	Global Ocean Observing System
GCRMN	Global Coral Reef Monitoring Network
GPS	Global Positioning System
Hg	Mercury
HOTO	Health of the Ocean
ICT	Information and Communication Technology
ICRI	International Coral Reef Initiative
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission [of UNESCO]
IOI -PI	International Oceans Institute – Pacific Islands
MOU	Memorandum of Understanding
NOAA	National Oceanic and Atmospheric Administration [USA]
NSF	National Science Foundation (US)
PacificGOOS	Pacific Global Ocean Observing System
PacPol	Pacific Pollution Programme
PH	Measure of hydrogen gas in solution
PIC	Pacific Island Countries
SOPAC	South Pacific Applied Geoscience Commission
SPC	Secretariat of the Pacific Community
SPREP	South Pacific Regional Environment Programme
SPTO	South Pacific Tourism Organization
TBT	Tributyltin
TOC	Total Organic Carbon
TOGA	Topical Oceans and Global Atmosphere
UNESCO	United Nations Educational, Scientific and Cultural Organization
USP	University of the South Pacific
WERI	Water and Environmental Research Institute
WMO	World Meteorological Organization
Zn	Zinc

IOC Workshop Reports

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No.	Title	Languages	No.	Title	Languages	No.	Title	Languages
1	CCOP-IOC, 1974, Metallogenesis, Hydrocarbons and Tectonic Patterns in Eastern Asia (Report of the IDOE Workshop on); Bangkok, Thailand, 24-29 September 1973 UNDP (CCOP), 138 pp.	E (out of stock)	18	IOC/UNESCO Workshop on Syllabus for Training Marine Technicians; Miami, U.S.A., 22-26 May 1978 (UNESCO reports in marine sciences, No. 4 published by the Division of Marine Sciences, UNESCO).	E (out of stock), F, S (out of stock), R	36	IOC/FAO Workshop on the Improved Uses of Research Vessels; Lisbon, Portugal, 28 May-2 June 1984. Papers submitted to the IOC/FAO	E
2	CICAR Ichthyoplankton Workshop, Mexico City, 16-27 July 1974 (UNESCO Technical Paper in Marine Sciences, No. 20).	E (out of stock) S (out of stock)	19	IOC Workshop on Marine Science Syllabus for Secondary Schools; Llantwit Major, Wales, U.K., 5-9 June 1978 (UNESCO reports in marine sciences, No. 5, published by the Division of Marine Sciences, UNESCO).	E (out of stock), E, S, R, Ar	36 Suppl.	Workshop on the Improved Uses of Research Vessels; Lisbon, Portugal, 28 May-2 June 1984.	E
3	Report of the IOC/GFCM/ICSEM International Workshop on Marine Pollution in the Mediterranean; Monte Carlo, 9-14 September 1974.	E, F E (out of stock)	20	Second CCOP-IOC Workshop on IDOE Studies of East Asia Tectonics and Resources; Bandung, Indonesia, 17-21 October 1978.	E	37	IOC/UNESCO Workshop on Regional Co-operation in Marine Science in the Central Indian Ocean and Adjacent Seas and Gulfs; Colombo, 8-13 July 1985.	E
4	Report of the Workshop on the Phenomenon known as 'El Niño'; Guayaquil, Ecuador, 4-12 December 1974.	E (out of stock) S (out of stock)	21	Second IDOE Symposium on Turbulence in the Ocean; Liège, Belgium, 7-18 May 1979.	E, F, S, R	38	IOC/ROPME/UNEP Symposium on Fate and Fluxes of Oil Pollutants in the Kuwait Action Plan Region; Basrah, Iraq, 8-12 January 1984.	E
5	IDOE International Workshop on Marine Geology and Geophysics of the Caribbean Region and its Resources; Kingston, Jamaica, 17-22 February 1975.	E (out of stock) S	22	Third IOC/WMO Workshop on Marine Pollution Monitoring; New Delhi, 11-15 February 1980.	E, F, S, R	39	CCOP (SOPAC)-IOC-IFREMER-ORSTOM Workshop on the Uses of Submersibles and Remotely Operated Vehicles in the South Pacific; Suva, Fiji, 24-29 September 1985.	E
6	Report of the CCOP/SOPAC-IOC IDOE International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Suva, Fiji, 1-6 September 1975.	E	23	WESTPAC Workshop on the Marine Geology and Geophysics of the North-West Pacific; Tokyo, 27-31 March 1980.	E, R	40	IOC Workshop on the Technical Aspects of Tsunami Analysis, Prediction and Communications; Sidney, B.C., Canada, 29-31 July 1985.	E
7	Report of the Scientific Workshop to Initiate Planning for a Co-operative Investigation in the North and Central Western Indian Ocean, organized within the IDOE under the sponsorship of IOC/FAO (IOFC)/UNESCO/EAC; Nairobi, Kenya, 25 March-2 April 1976.	E, F, S, R	24	WESTPAC Workshop on Coastal Transport of Pollutants; Tokyo, Japan, 27-31 March 1980.	E (out of stock)	40 Suppl.	First International Tsunami Workshop on Tsunami Analysis, Prediction and Communications, Submitted Papers; Sidney, B.C., Canada, 29 July - 1 August 1985.	E
8	Joint IOC/FAO (IPFC)/UNEP International Workshop on Marine Pollution in East Asian Waters; Penang, 7-13 April 1976.	E (out of stock)	25	Workshop on the Inter calibration of Sampling Procedures of the IOC/ WMO UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters; Bermuda, 11-26 January 1980.	E (superseded by IOC Technical Series No. 22)	41	First Workshop of Participants in the Joint FAO/IOC/WHO/IAEA/UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region (WACAF/2); Dakar, Senegal, 28 October-1 November 1985.	E
9	IOC/CMG/SCOR Second International Workshop on Marine Geoscience; Mauritius, 9-13 August 1976.	E, F, S, R	26	IOC Workshop on Coastal Area Management in the Caribbean Region; Mexico City, 24 September-5 October 1979.	E, S	43	IOC Workshop on the Results of MEDALPEX and Future Oceanographic Programmes in the Western Mediterranean; Venice, Italy, 23-25 October 1985.	E
10	IOC/WMO Second Workshop on Marine Pollution (Petroleum) Monitoring; Monaco, 14-18 June 1976.	E, F E (out of stock) R	27	CCOP/SOPAC-IOC Second International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Nouméa, New Caledonia, 9-15 October 1980.	E	44	IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities; Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986.	E (out of stock) S
11	Report of the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976.	E, S (out of stock)	28	FAO/IOC Workshop on the effects of environmental variation on the survival of larval pelagic fishes. Lima, 20 April-5 May 1980.	E	44 Suppl.	IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities, Submitted Papers; Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986.	E
11 Suppl.	Collected contributions of invited lecturers and authors to the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976.	E (out of stock), S	29	WESTPAC Workshop on Marine Biological Methodology; Tokyo, 9-14 February 1981.	E	45	IOCARIBE Workshop on Physical Oceanography and Climate; Cartagena, Colombia, 19-22 August 1986.	E
12	Report of the IOCARIBE Interdisciplinary Workshop on Scientific Programmes in Support of Fisheries Projects; Fort-de-France, Martinique, 28 November-2 December 1977.	E, F, S	30	International Workshop on Marine Pollution in the South-West Atlantic; Montevideo, 10-14 November 1980.	E (out of stock) S	46	Reunión de Trabajo para Desarrollo del Programa "Ciencia Oceánica en Relación a los Recursos No Vivos en la Región del Atlántico Sud-occidental"; Porto Alegre, Brazil, 7-11 de abril de 1986.	S
13	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area; Port of Spain, Trinidad, 16-18 January 1978.	E, S	31	Third International Workshop on Marine Geoscience; Heidelberg, 19-24 July 1982.	E, F, S	47	IOC Symposium on Marine Science in the Western Pacific: The Indo-Pacific Convergence; Townsville, 1-6 December 1966.	E
14	IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas; Abidjan, Côte d'Ivoire, 2-9 May 1978.	E, F	32	UNU/IOC/UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the context of the New Ocean Regime; Paris, France, 27 September-1 October 1982.	E, F, S	48	IOCARIBE Mini-Symposium for the Regional Development of the IOC-UN (OETB) Programme on 'Ocean Science in Relation to Non-Living Resources (OSNLR)'; Havana, Cuba, 4-7 December 1986.	E, S
15	CCPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-East Pacific; Santiago de Chile, 6-10 November 1978.	E (out of stock)	32 Suppl.	Papers submitted to the UNU/IOC/UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the Context of the New Ocean Regime; Paris, France, 27 September-1 October 1982.	E	49	AGU-IOC-WMO-CCPS Chapman Conference: An International Symposium on 'El Niño'; Guayaquil, Ecuador, 27-31 October 1986.	E
16	Workshop on the Western Pacific, Tokyo, 19-20 February 1979.	E, F, R	33	Workshop on the IREP Component of the IOC Programme on Ocean Science in Relation to Living Resources (OSLR); Halifax, 26-30 September 1963.	E	50	CCALR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill (organized in collaboration with SCAR and SCOR); Paris, France, 2-6 June 1987.	E
17	Joint IOC/WMO Workshop on Oceanographic Products and the IGOS Data Processing and Services System (IPSS); Moscow, 9-11 April 1979.	E	34	IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa); Tenerife, 12-17 December 1963.	E, F, S	51	CCOP/SOPAC-IOC Workshop on Coastal Processes in the South Pacific Island Nations; Lae, Papua-New Guinea, 1-8 October 1987.	E
17 Suppl.	Papers submitted to the Joint IOC/WMO Seminar on Oceanographic Products and the IGOS Data Processing and Services System; Moscow, 2-6 April 1979.	E	35	CCOP/SOPAC-IOC-UNU Workshop on Basic Geo-scientific Marine Research Required for Assessment of Minerals and Hydrocarbons in the South Pacific; Suva, Fiji, 3-7 October 1983.	E			

No.	Title	Languages	No.	Title	Languages	No.	Title	Languages
52	SCOR-IOC-UNESCO Symposium on Vertical Motion in the Equatorial Upper Ocean and its Effects upon Living Resources and the Atmosphere; Paris, France, 6-10 May 1985.	E	74	IOC-UNEP Review Meeting on Oceanographic Processes of Transport and Distribution of Pollutants in the Sea; Zagreb, Yugoslavia, 15-18 May 1989.	E	96	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Zanzibar, United Republic of Tanzania, 17-21 January 1994.	E
53	IOC Workshop on the Biological Effects of Pollutants; Oslo, 11-29 August 1986.	E	75	IOC-SCOR Workshop on Global Ocean Ecosystem Dynamics; Solomons, Maryland, U.S.A., 29 April-2 May 1991.	E	96	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; <i>Submitted Papers</i>	E
54	Workshop on Sea-Level Measurements in Hostile Conditions; Bidston, UK, 28-31 March 1988.	E	76	IOC/WESTPAC Scientific Symposium on Marine Science and Management of Marine Areas of the Western Pacific; Penang, Malaysia, 2-6 December 1991.	E	Suppl. 1	1. Coastal Erosion; Zanzibar, United Republic of Tanzania 17-21 January 1994.	E
55	IBCCA Workshop on Data Sources and Compilation, Boulder, Colorado, 18-19 July 1988.	E	77	IOC-SAREC-KMFRI Regional Workshop on Causes and Consequences of Sea-Level Changes on the Western Indian Ocean Coasts and Islands; Mombasa, Kenya, 24-28 June 1991.	E	96	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; <i>Submitted Papers</i>	E
56	IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Cleveland, Australia, 24-30 July 1988.	E	78	IOC-CEC-ICES-WMO-ICSU Ocean Climate Data Workshop Goddard Space Flight Center; Greenbelt, Maryland, U.S.A., 18-21 February 1992.	E	Suppl. 2	2. Sea Level; Zanzibar, United Republic of Tanzania 17-21 January 1994.	E
57	IOC Workshop on International Co-operation in the Study of Red Tides and Ocean Blooms; Takamatsu, Japan, 16-17 November 1987.	E	79	IOC/WESTPAC Workshop on River Inputs of Nutrients to the Marine Environment in the WESTPAC Region; Penang, Malaysia, 26-29 November 1991.	E	97	IOC Workshop on Small Island Oceanography in Relation to Sustainable Economic Development and Coastal Area Management of Small Island Development States; Fort-de-France, Martinique, 8-10 November, 1993.	E
58	International Workshop on the Technical Aspects of the Tsunami Warning System; Novosibirsk, USSR, 4-5 August 1989.	E	80	IOC-SCOR Workshop on Programme Development for Harmful Algae Blooms; Newport, U.S.A., 2-3 November 1991.	E	98	CoMSBlack '92A Physical and Chemical Inter-calibration Workshop; Erdemli, Turkey, 15-29 January 1993.	E
Suppl.	Second International Workshop on the Technical Aspects of Tsunami Warning Systems, Tsunami Analysis, Preparedness, Observation and Instrumentation. <i>Submitted Papers</i> ; Novosibirsk, USSR, 4-5 August 1989.	E	81	Joint IAPSO-IOC Workshop on Sea Level Measurements and Quality Control; Paris, France, 12-13 October 1992.	E	99	IOC-SAREC Field Study Exercise on Nutrients in Tropical Marine Waters; Mombasa, Kenya, 5-15 April 1994.	E
59	IOC-UNEP Regional Workshop to Review Priorities for Marine Pollution Monitoring Research, Control and Abatement in the Wider Caribbean; San José, Costa Rica, 24-30 August 1989.	E, F, S	82	BORDOMER 92: International Convention on Rational Use of Coastal Zones. A Preparatory Meeting for the Organization of an International Conference on Coastal Change; Bordeaux, France, 30 September-2 October 1992.	E	100	IOC-SOA-NOAA Regional Workshop for Member States of the Western Pacific - GODAR-II (Global Oceanographic Data Archeology and Rescue Project); Tianjin, China, 8-11 March 1994.	E
60	IOC Workshop to Define IOCARIBE-TRODERP proposals; Caracas, Venezuela, 12-16 September 1989.	E	83	IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 12-13 October 1992.	E	101	IOC Regional Science Planning Workshop on Harmful Algal Blooms; Montevideo, Uruguay, 15-17 June 1994.	E
61	Second IOC Workshop on the Biological Effects of Pollutants; Bermuda, 10 September-2 October 1988.	E	84	Workshop on Atlantic Ocean Climate Variability; Moscow, Russian Federation, 13-17 July 1992.	E	102	First IOC Workshop on Coastal Ocean Advanced Science and Technology Study (COASTS); Liège, Belgium, 5-9 May 1994.	E
62	Second Workshop of Participants in the Joint FAO-IOC-WHO-IAEA-UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region; Accra, Ghana, 13-17 June 1988.	E	85	IOC Workshop on Coastal Oceanography in Relation to Integrated Coastal Zone Management; Kona, Hawaii, 1-5 June 1992.	E	103	IOC Workshop on GIS Applications in the Coastal Zone Management of Small Island Developing States; Barbados, 20-22 April 1994.	E
63	IOC/WESTPAC Workshop on Co-operative Study of the Continental Shelf Circulation in the Western Pacific; Bangkok, Thailand, 31 October-3 November 1989.	E	86	International Workshop on the Black Sea; Varna, Bulgaria 30 September - 4 October 1991.	E	104	Workshop on Integrated Coastal Management; Dartmouth, Canada, 19-20 September 1994.	E
64	Second IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Phuket, Thailand, 25-31 September 1989.	E	87	Taller de trabajo sobre efectos biológicos del fenómeno «El Niño» en ecosistemas costeros del Pacífico Sudeste; Santa Cruz, Galápagos, Ecuador, 5-14 de octubre de 1989.	S only (Summary in E, F, S)	105	BORDOMER 95: Conference on Coastal Change; Bordeaux, France, 6-10 February 1995.	E
65	Second IOC Workshop on Sardine/Anchovy Recruitment Project (SARP) in the Southwest Atlantic; Montevideo, Uruguay, 21-23 August 1989.	E	88	IOC-CEC-ICES-ICES Regional Workshop for Member States of Eastern and Northern Europe (GODAR Project); Obninsk, Russia, 17-20 May 1993.	E	Suppl.	Conference on Coastal Change: Proceedings; Bordeaux, France, 6-10 February 1995	E
66	IOC <i>ad hoc</i> Expert Consultation on Sardine/Anchovy Recruitment Programme; La Jolla, California, U.S.A., 1989.	E	89	IOC-ICES-ICES Regional Workshop for Member States of Eastern and Northern Europe (GODAR Project); Obninsk, Russia, 17-20 May 1993.	E	106	IOC/WESTPAC Workshop on the Paleographic Map; Bali, Indonesia, 20-21 October 1994.	E
67	Interdisciplinary Seminar on Research Problems in the IOCARIBE Region; Caracas, Venezuela, 28 November-1 December 1989.	E (out of stock)	90	IOC-ICES-ICES Regional Workshop for Member States of the Indian Ocean - GODAR-III; Dona Paula, Goa, India, 6-9 December 1994.	E	107	IOC-ICES-ICES Regional Workshop for Member States of the Indian Ocean - GODAR-III; Dona Paula, Goa, India, 6-9 December 1994.	E
68	International Workshop on Marine Acoustics; Beijing, China, 26-30 March 1990.	E	91	IOC Seminar on Integrated Coastal Management; New Orleans, U.S.A., 17-18 July 1993.	E	108	UNESCO-IHP-IOC-IAEA Workshop on Sea-Level Rise and the Multidisciplinary Studies of Environmental Processes in the Caspian Sea Region; Paris, France, 9-12 May 1995.	E
69	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E	92	Hydroblack'91 CTD Inter-calibration Workshop; Woods Hole, U.S.A., 1-10 December 1991.	E	Suppl.	UNESCO-IHP-IOC-IAEA Workshop on Sea-Level Rise and the Multidisciplinary Studies of Environmental Processes in the Caspian Sea Region; <i>Submitted Papers</i> ; Paris, France, 9-12 May 1995.	E
69	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; <i>Submitted Papers</i> ; Leningrad, USSR, 28-31 May 1990.	E	93	IOC-UNEP Workshop on Impacts of Sea-Level Rise due to Global Warming. Dhaka, Bangladesh, 16-19 November 1992.	E	109	First IOC-UNEP CEPOL Symposium; San José, Costa Rica, 14-15 April 1993.	E
70	IOC-SAREC-UNEP-FAO-IAEA-WHO Workshop on Regional Aspects of Marine Pollution; Mauritius, 29 October - 9 November 1990.	E	94	BMTC-IOC-POLARMAR International Workshop on Training Requirements in the Field of Eutrophication in Semi-Enclosed Seas and Harmful Algal Blooms, Bremerhaven, Germany, 29 September - 3 October 1992.	E	110	IOC-ICES-CEC Regional Workshop for Member States of the Mediterranean - GODAR-IV (Global Oceanographic Data Archeology and Rescue Project) Foundation for International Studies, University of Malta, Valletta, Malta, 25-28 April 1995.	E
71	IOC-FAO Workshop on the Identification of Penaeid Prawn Larvae and Postlarvae; Cleveland, Australia, 23-28 September 1990.	E	95	SAREC-IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 23-25 November 1993.	E			
72	IOC/WESTPAC Scientific Steering Group Meeting on Co-Operative Study of the Continental Shelf Circulation in the Western Pacific; Kuala Lumpur; Malaysia, 9-11 October 1990.	E						
73	Expert Consultation for the IOC Programme on Coastal Ocean Advanced Science and Technology Study; Liège, Belgium, 11-13 May 1991.	E						

No.	Title	Languages	No.	Title	Languages	No.	Title	Languages
111	Chapman Conference on the Circulation of the Intra-Americas Sea; La Parguera, Puerto Rico, 22-26 January 1995.	E	128	Atelier IOC-Banque Mondiale-Sida/SAREC-ONE sur la Gestion Intégrée des Zones Côtières ; Nosy Bé, Madagascar, 14-18 octobre 1996.	E, F	150	First IOC/ARIBE-ANCA Workshop Havana, Cuba, 29 June-1 July 1998	E
112	IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials (GESREM) Workshop: Miami, U.S.A., 7-8 December 1993.	E	129	Gas and Fluids in Marine Sediments, Amsterdam, the Netherlands; 27-29 January 1997.	E	151	Taller Pluridisciplinario TEMA sobre Redes del Gran Caribe en Gestión Integrada de Áreas Costeras Cartagena de Indias, Colombia, 7-12 de septiembre de 1998	S
113	IOC Regional Workshop on Marine Debris and Waste Management in the Gulf of Guinea; Lagos, Nigeria, 14-16 December 1994.	E	130	Atelier régional de la COI sur l'océanographie côtière et la gestion de la zone côtière ; Moroni, RFI des Comores, 16-19 décembre 1996.	F	152	Workshop on Data for Sustainable Integrated Coastal Management (SICOM) Maputo, Mozambique, 18-22 July 1998	E
114	International Workshop on Integrated Coastal Zone Management (ICZM) Karachi, Pakistan; 10-14 October 1994.	E	131	GOOS Coastal Module Planning Workshop; Miami, USA, 24-28 February 1997.	E	153	IOC/WESTPAC-Sida (SAREC) Workshop on Atmospheric Inputs of Pollutants to the Marine Environment Qingdao, China, 24-26 June 1998	E
115	IOC/GLOSS-IAPSO Workshop on Sea Level Variability and Southern Ocean Dynamics; Bordeaux, France, 31 January 1995.	E	132	Third IOC-FANSA Workshop; Punta-Arenas, Chile, 28-30 July 1997	S/E	154	IOC-Sida-Flanders-SFRI Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA project) Capetown, South Africa, 30 November-11 December 1998	E
116	IOC/WESTPAC International Scientific Symposium on Sustainability of Marine Environment: Review of the WESTPAC Programme, with Particular Reference to ICAM Bali, Indonesia, 22-26 November 1994.	E	133	Joint IOC-CIESM Training Workshop on Sea-level Observations and Analysis for the Countries of the Mediterranean and Black Seas; Birkenhead, U.K., 16-27 June 1997.	E	155	Science of the Mediterranean Sea and its applications UNESCO, Paris 29-31 July 1997	E
117	Joint IOC-CIDA-Sida (SAREC) Workshop on the Benefits of Improved Relationships between International Development Agencies, the IOC and other Multilateral Intergovernmental Organizations in the Delivery of Ocean, Marine Affairs and Fisheries Programmes; Sidney B.C., Canada, 26-28 September 1995.	E	134	IOC/WESTPAC-CCOP Workshop on Paleogeographic Mapping (Holocene Optimum); Shanghai, China, 27-29 May 1997.	E	156	IOC-LUC-KMFRI Workshop on RECOSCIX-WIO in the Year 2000 and Beyond Mombasa, Kenya, 12-17 April 1999	E
118	IOC-UNEP-NOAA-Sea Grant Fourth Caribbean Marine Debris Workshop; La Romana, Santo Domingo, 21-24 August 1995.	F	135	Regional Workshop on Integrated Coastal Zone Management; Chabahar, Iran; February 1996.	E	157	'98 IOC-KMI International Workshop on Integrated Coastal Management (ICM) Seoul, Republic of Korea 16-18 April 1998	E
119	IOC Workshop on Ocean Colour Data Requirements and Utilization; Sydney B.C., Canada, 21-22 September 1995.	E	136	IOC Regional Workshop for Member States of Western Africa (GODAR-VI); Accra, Ghana, 22-25 April 1997.	E	158	The IOC/ARIBE Users and the Global Ocean Observing System (GOOS) Capacity Building Workshop San José, Costa Rica, 22-24 April 1999	E
120	International Training Workshop on Integrated Coastal Management; Tampa, Florida, U.S.A., 15-17 July 1995.	E	137	GOOS Planning Workshop for Living Marine Resources, Dartmouth, USA; 1-5 March 1996.	E	159	Oceanic Fronts and Related Phenomena (Konstantin Fedorov Memorial Symposium) - Proceedings Pushkin, Russian Federation, 18-22 May 1998	E
121	Atelier régional sur la gestion intégrée des zones littorales (ICAM); Conakry, Guinée, 12-22 décembre 1995.	F	138	Gestión de Sistemas Oceanográficos del Pacífico Oriental; Concepción, Chile, 9-16 de abril de 1996.	S	160	Under preparation	
122	IOC-EU-BSH-NOAA-(WDC-A) International Workshop on Oceanographic Biological and Chemical Data Management Hamburg, Germany, 20-23 May 1996.	E	139	Sistemas Oceanográficos del Atlántico Sudoccidental, Talier, TEMA; Furg, Rio Grande, Brasil, 3-11 de noviembre de 1997.	S	161	Under preparation	
123	Second IOC Regional Science Planning Workshop on Harmful Algal Blooms in South America; Mar del Plata, Argentina, 30 October - 1 November 1995.	E, S	140	IOC Workshop on GOOS Capacity Building for the Mediterranean Region; Valletta, Malta, 26-29 November 1997.	E	162	Under preparation	
124	GLOBEC-IOC-SAHFOS-MBA Workshop on the Analysis of Time Series with Particular Reference to the Continuous Plankton Recorder Survey; Plymouth, U.K., 4-7 May 1993.	E	141	IOC/WESTPAC Workshop on Co-operative Study in the Gulf of Thailand: A Science Plan; Bangkok, Thailand, 25-28 February 1997.	E	163	Under preparation	
125	Atelier sous-régional de la COI sur les ressources marines vivantes du Golfe de Guinée ; Cotonou, Bénin, 1-4 juillet 1996.	F	142	Pelagic Biogeography ICoPB II. Proceedings of the 2nd International Conference. Final Report of SCOR/IOC Working Group 93; Noordwijkerhout, The Netherlands, 9-14 July 1995.	E	164	IOC-Sida-Flanders-MCM Third Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA Project) Cape Town, South Africa 29 November-11 December 1999	E, F
126	IOC-UNEP-PERSGA-ACOPS-IUCN Workshop on Oceanographic Input to Integrated Coastal Zone Management in the Red Sea and Gulf of Aden Jeddah, Saudi Arabia, 8 October 1995.	E	143	Geosphere-biosphere coupling: Carbonate Mud Mounds and Cold Water Reefs; Gent, Belgium, 7-11 February 1998.	E	165	An African Conference on Sustainable Integrated Management; Proceedings of the Workshops. An Integrated Approach, (PACSIOM), Maputo, Mozambique, 18-25 July 1998	
127	IOC Regional Workshop for Member States of the Caribbean and South America GODAR-V (Global Oceanographic Data Archeology and Rescue Project); Cartagena de Indias, Colombia, 8-11 October 1996.	E only	144	IOC-SOPAC Workshop Report on Pacific Regional Global Ocean Observing Systems; Suva, Fiji, 13-17 February 1998.	E	166	IOC-SOA International Workshop on Coastal Megacities: Challenges of Growing Urbanization of the World's Coastal Areas; Hangzhou, P.R. China, 27-30 September 1999	E
			145	IOC-Black Sea Regional Committee Workshop: 'Black Sea Fluxes' Istanbul, Turkey, 10-12 June 1997	E	167	Under preparation	
			146	Living Marine Resources Panel Meeting, Paris, France, 23-25 March 1998	E	168	Geological Processes on European Continental Margins; International Conference and Eighth Post-Cruise Meeting of the Training-Through-Research Programme, Granada, Spain, 31 January - 3 February 2000	
			147	IOC-SOA International Training Workshop on the Integration of Marine Sciences into the Process of Integrated Coastal Management, Dalian, China, 19-24 May 1997	E	169	International Conference on the International Oceanographic Data and Information Exchange in the Western Pacific (IODE-WESTPAC) 1999, ICIWP '99 Langkawi, Malaysia, 1-4 November 1999	Under preparation
			148	IOC/WESTPAC International Scientific Symposium - Role of Ocean Sciences for Sustainable Development Okinawa, Japan, 2-7 February 1998	E	170	IOC/ARIBE-GODAR-I Cartagenas, Colombia, February 2000	Under preparation
			149	Workshops on Marine Debris & Waste Management in the Gulf of Guinea, 1995-97	E	171	Ocean Circulation Science derived from the Atlantic, Indian and Arctic Sea Level Networks Toulouse, France, 10-11 May 1999	E
						172	(Under preparation)	
						173	(Under preparation)	
						174	IOC-SOPAC Regional Workshop on Coastal Global Ocean Observing System (GOOS) for the Pacific Region, Apia, Samoa, 16-17 August 2000	E