



MARINE SURVEY AND MAPPING ACTIVITIES, 2011
SPC-SOPAC Report to the South West Pacific Hydrographic Commission (SWPHC)

11th IHO SWPHC Conference, Brisbane, Australia 15 - 16 February 2012

SPC SOPAC Division Published Report 34

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1 Introduction

The Ocean and Islands Programme (OIP) within the Applied Geoscience and Technology Division (SOPAC) of the Secretariat of Pacific Community (SPC) has four staff members that are active in hydrographic data acquisition. This team consists of one marine geophysicist, one physical oceanographer, and two senior technical officers. A technical workshop provides assistance with equipment. None of the operators are trained hydrographic surveyors.

This report is a summary of SOPAC's marine survey activities for 2011 provided to the Chair of the South West Pacific Hydrographic Commission (SWPHC) in preparation to the 11th Conference of the IHO SWPHC to be held in Brisbane, Australia from the 15th to the 16th of February 2012.

The following Pacific Island Countries and Territories (PICTs) are members of SPC: American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna.

2 Marine Survey Activities, 2011

The table below summarises SOPAC's marine survey activities during 2011.

Date	Location	Activity	Status
Nov 2011 - current	Lifuka Island, Ha'apai, Tonga	<ul style="list-style-type: none"> Beach profiling, using precision GNSS for survey control Current and wave meters deployment for oceanographic survey Australian-funded LiDAR of Lifuka will be available from April 2012 	Field work on going until September 2012
Dec 2011	Yap, Federated States of Micronesia	Singlebeam survey of Tomil Harbour	Report writing in progress
Nov 2011	Navua, Fiji	Navua reef multibeam, single beam, and topographic survey	Report writing in progress
Oct - Nov 2011	Vanua Levu, Fiji	<ul style="list-style-type: none"> Three port study, Vanua Levu, Valaga Bay, Naduri and Malau, using multibeam and single channel seismic profiling. Transit multibeam data was collected from Suva to Savuavu, Savusavu to Malau via west and north coast of Vanua Levu Approaches to Naduri via Nadamu passage west of Kia Island 	Data processing and reporting in progress
July - Dec 2011	Rangiroa, French Polynesia	<ul style="list-style-type: none"> Multibeam survey of Rangiroa atoll in partnership with French Polynesian hydrographic unit Five-month wave and current observations 	All field work completed. Data processing in progress

April - May 2011	Tongatapu, Tonga	Multibeam survey north of Tongatapu	Report in process
March 2011	Kiritimati Islands, Kiribati.	Rapid assessment of coastal processes at Port of Ronton for engineering options to improve shipping channel	Completed
March 2011	Muri lagoon, Rarotonga, Cook Islands	Benthic habitat mapping and water circulation in Muri Lagoon	Draft report submitted
March 2011	Rarotonga, Cook Islands	Single beam pre-construction hydrographic survey in conjunction with Discovery Marine Ltd, NZ, for proposed cruise ship tender landing sites	Completed
Dec - Feb 2011	Mangaia Island, Cook Islands	<ul style="list-style-type: none"> • Temporary tide gauge installation • Single beam nearshore survey along coastal areas of Mangaia • Topographic survey of intertidal and coastal areas 	Completed

3 Survey Equipment

SPC-SOPAC currently maintains and operates a wide range of marine survey and oceanographic equipment on behalf of member countries. SPC-SOPAC has replaced its 12-year old shallow water multibeam Reson 8101 system with a R2Sonic 2024 broadband multibeam echosounder. SPC-SOPAC does not operate a vessel, and relies on charters and boats of opportunities to conduct surveys. The list below is not exhaustive and focuses on hydrographic equipment only.

Survey Equipment Category	Details
Single beam echosounder	<ul style="list-style-type: none"> • Echotrac CVM with 200kHz transducer
Multibeam echosounder	<ul style="list-style-type: none"> • Reson SeaBat 8160, 50kHz • R2Sonic 2024, 200kHz to 400kHz
Motion sensors	<ul style="list-style-type: none"> • TSS DMS • VRU motion sensor
Heading	<ul style="list-style-type: none"> • Surveyor Meridian gyro • SCAN 2000 gyro
Conductivity, temperature, depth sensors	<ul style="list-style-type: none"> • Seabird SBE 19-03, 600m • Seabird SBE plus, 3500m • Seabird SBE 19-01, 1024m
Tide gauge	<ul style="list-style-type: none"> • RBR TWR-2050 submersible pressure sensor • Interocean WTF 904 submersible sensor
Positioning	<ul style="list-style-type: none"> • Trimble RTK R8 • Thales Aquarius LRK GPS • Trimble DSM12 GPs • Trimble 5800 • Trimble SPS 852 with Fugro G2 license • MarineSTAR 9200 G2-H for horizontal positioning and heading with Fugro G2 license
Software	<ul style="list-style-type: none"> • Hypack • Surfer • Fledermaus

3.1 Training

The Australian Hydrographic Service partnered with SPC-SOPAC in a proposal entitled “Pacific Regional Hydrographic Capability Improvement Programme” to AusAID under the Pacific Public Sector Linkages Program (PSLP) 2011-12. This concept sought funding for a SPC-SOPAC staff member to undergo CAT-B training in Australia. Unfortunately the concept was not successful.

A week-long multibeam mobilisation and data acquisition training was conducted in Papeete in July 2011 upon purchase of the new multibeam sonar. This training was conducted by R2Sonic, USA. The training was attended by five staff from SOPAC and one staff from the French Polynesian hydrographic division in Papeete.

4 Associated Activities

4.1 Maritime Boundaries

Funded by AusAID and NZAid through OIP’s recurrent programmatic budget the Regional Maritime Boundaries sector work has been implemented by OIP since 2001 at which time the project was transferred from the Forum Fisheries Agency (FFA). Subsequent work under this sector had until 2007 been mainly concerned with the development of PIC baselines including archipelagic baselines where applicable and computation of subsequent marine zones (territorial seas 12 nautical miles (M); contiguous zone 24M and exclusive economic zone 200M) in accordance with the provisions of the UN Convention on the Law of the Sea (UNCLOS). Much of this work started at first principles in 2001 and by 2005 OIP had developed data reports suitable for declaration purposes for Cook Islands, Nauru, Niue and Tuvalu. Irrespective, at September 2011 only one of these countries, Nauru, has used this information to declare its maritime zones and as at October 2011 only Fiji, Nauru and Palau have declared their maritime baselines, zones and outer limits in accordance with UNCLOS. Additionally, Papua New Guinea, Solomon Islands and Vanuatu have declared only their archipelagic baselines and of these countries, Fiji, Palau, Solomon Islands and Papua New Guinea are all in the process of updating those respective baselines and maritime limits with the assistance of the OIP Maritime Boundaries Sector. Vanuatu lodged its new archipelagic baseline in November 2010.

Eight PICTs submitted extended continental shelf (eCS) claims before their respective deadlines in 2009 to the United Nations Commission on Limits of the Continental Shelf (UNCLCS) and others are working towards later deadlines in 2013. Recent UNCLCS rulings allowed countries to submit partial claims with the opportunity to update and complete these before technical review by UNCLCS over the coming years. In many cases these submissions are also dependent on the clear definition of baselines and maritime zones and the absence of these in many PICTs will present challenges to the finalisation and successful defence of eCS submissions.

A further highlight of the last 12 months has been recent and exciting development and availability of satellite-borne imagery with a very high level of positional accuracy. This has brought a powerful new tool to bear on the issue of boundaries development in PICs as whilst imagery of adequate resolution has been available for some years its positional accuracy was not reliable, necessitating lengthy and often expensive and logistically difficult (due to the remote and far flung nature of many island groups in the Membership) geodetic control surveys. New imagery products combined high resolution (ca 0.5m) and excellent positional accuracy (<15m error) in affordable image packages can now be used to derive baselines with an unparalleled level of accuracy and confidence negating the need for *in situ* survey. Such products and opportunities are already being used by OIP;

for example with respect to the remote Rotuma Islands in the Fiji Group and Phoenix Group Islands, Kiribati. The Government of Kiribati developed their baseline solutions for the Phoenix Group collaboratively with OIP over the last quarter by using such imagery. In this case the purchases have been supported by the Commonwealth Secretariat with logistic and subsequent processing support of OIP and the Division's GIS and Remote Sensing (GIS & RS) sector. Similar approaches are now being adopted by other PICs which will expedite regional maritime boundary development."

Significant technical, policy and diplomatic work remains and it is critical that PICTs embrace obligations under UNCLOS and deposit and declare their existing maritime boundary information. SOPAC has already made significant advances in regional access to accurate technical data in support of regional boundary solutions. In the next few years it will continue to support Members in the technical development of eCS submissions as well as baselines, maritime zones and shared boundaries.

4.2 South Pacific Sea Level and Climate Monitoring Project

The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) is an AusAID-funded project which has been ongoing since 1991. It initiated the establishment of the SEAFRAME array (Sea Level Fine Resolution Acoustic Measuring Equipment) or sea-level monitoring stations in Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. The Project is managed by the Bureau of Meteorology, Australia (BoM) and implemented via a partnership between the National Tidal Facility of BoM; Geoscience Australia (GA); and SOPAC. All Pacific stations are currently undergoing upgrades through the Observation Network Upgrade Project (ONUP), which is scheduled for completion by mid-2013. As of February 2012, 5 of the 12 stations have been upgraded, namely Tonga, Fiji, Samoa, Kiribati and Solomon Islands.

SPC-SOPAC's role under this project is as follows:

- Ongoing provision of technical services to maintain and calibrate the gauges
- Precision levelling surveys of the gauge sites in collaboration with GA
- Regional coordination and communication of the project
- Advocacy of the SPSLCMP

4.3 Data and Information Management through the GeoNetwork Server

SPC-SOPAC has made significant ongoing efforts towards improved, more systematic method of collating and providing access to its historical and newly collected data via the OIP, web accessible, Geonetwork system (<http://geonetwork.sopac.org/geonetwork/srv/en/main.home>). Geonetwork is an open source database platform which can handle large and complex datasets associated with the different technical sectors of OIP but has made particular improvement with the collation, accessibility and security of data from the Marine, Coastal Science and Survey Sector. Geonetwork became operational in 2008 and today boasts some 334GB of uploaded data representing a 42% increase over that reported in 2010. Geonetwork use statistics for the reporting period indicate: the total number of downloads has increased 60%; total number of web "hits" has increased from 212,435 to 756,490 (356%); of these hits 57% were from Member nations, 15% were internal SOPAC requests and the remaining 28% were international, spanning some 90 Nations.

In summary, Geonetwork is proving successful, appropriate to needs and appears to be servicing the requirements of multiple stakeholders groups including, internal, regional and international users. For example, bathymetry from Geonetwork was made available

to participants in the Tsunami inundation modelling workshop held in Sydney in February 2012, organised by the Centre for Australian Weather and Climate Research (CSIRO/BoM).

5 Agreements

In April 2011, a Memorandum of understanding was signed between the International Hydrographic Organization (IHO) and SPC. The purpose of the MOU is to provide a framework for cooperation between the IHO and SPC to support the efficient and effective development and coordination of hydrographic and nautical charting programmes for the Pacific Island Countries and territories. This is in accordance with the requirements of the international treaty obligations.

Additionally the MOU is to promote the widespread use of hydrographic data collected by the two organizations or their members for the benefit of safety of navigation and life at sea, protection of the marine environment, nautical infrastructure development, coastal zone development, marine exploration and resource exploitation, maritime boundary delimitation and policing, maritime defense and security, and natural disaster management.

In addition to the above MOU signing, the United Kingdom Hydrographic Office (UKHO) and SPC are in process of signing a Cooperation Arrangement whereby data collected by SOPAC could be used to great effect in modernising nautical charting in the Pacific.