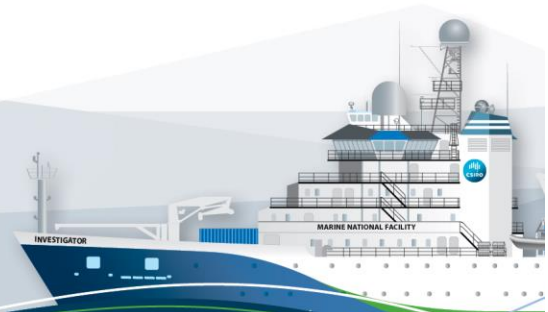


HYDROCHEMISTRY DATA PROCESS REPORT

Voyage:	IN2015_c01
Chief Scientist:	Dr Andrew Ross
Voyage title:	GAB deep water geological and benthic ecology program
Report compiled by:	Peter Hughes



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1 Itinerary

Depart	Date	Time
Hobart	25 th October 2015	1800
Arrive	Date	Time
Port Lincoln	28 th November 2015	0830

2 Key personnel list

Name	Role	Organisation
Dr Andrew Ross	Chief Scientist	CSIRO
Stephen McCullum	Voyage Manager	CSIRO
Peter Hughes	Hydrochemist	CSIRO

3 Summary

All finalized data can be obtained from the CSIRO data centre.

3.1 Hydrochemistry

Analysis	Sampled
Salinity (Guildline Salinometer)	75
Dissolved Oxygen (automated titration)	75
Nutrients (AA3)	81

3.2 Rosette and CTD

- 16 CTD stations were completed with the 36 x 12L bottle rosette.
- Sampling done by the voyage hydrochemist, Peter Hughes.

3.3 Procedure

The procedure for data processing is outline in Figure 1.

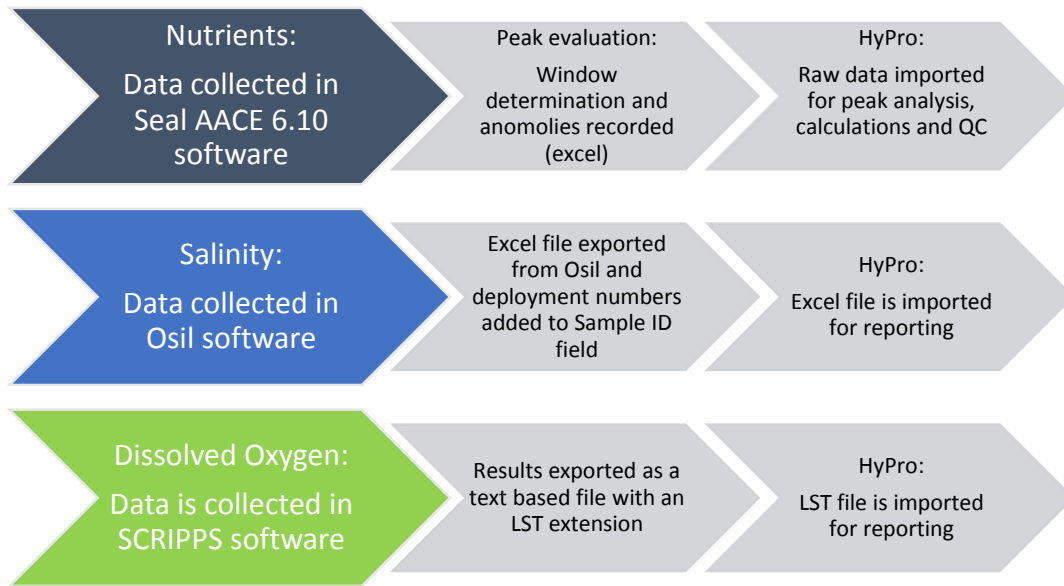


Figure 1: The process above shows the data trail procedure from the initial data generated to output via HyPro for reporting.

3.4 Nutrients

Details					
HyPro Version	4.40				
Instrument	SEAL AA3HR segmented flow analyser				
Software	Seal AACE 6.10				
Methods	AA3 Analysis Methods internal manual				
Nutrients analysed	<input checked="" type="checkbox"/> Silicate	<input checked="" type="checkbox"/> Phosphate	<input checked="" type="checkbox"/> Nitrate + Nitrite	<input checked="" type="checkbox"/> Nitrite	<input checked="" type="checkbox"/> Ammonia
Concentration range	126 µmol/L	3 µmol/L	35 µmol/L	1.4 µmol/L	2.0 µmol/L
Method Detection Limit* (MDL)	0.2 µmol/L	0.02 µmol/L	0.02 µmol/L	0.02 µmol/L	0.02 µmol/L
Matrix Corrections	N	N	N	N	N
Analyst(s)	Peter Hughes				
Lab Temperature (±1°C)	Variable, 19 - 21°C				
Reference Material	RMNS – lot CA				
Sampling Container	10 ml PP tube neutral screw cap, Sarstedt p/n 60.9921.889				
Sample Storage	< 2 hrs at room temperature or < 24hrs @ 4°C				
Pre-processing of Samples	None				
Comments	<p>Main points to note.</p> <p>(1) AA3 Instrumentation.</p> <p>A CSIRO designed sample rack was used on the AA3 XY2 sampler for the nutrient calibration solutions and the RMNS reference material. The custom-rack is configured so that the RMNS reference material is sampled from the original container it is supplied in.</p> <p>(2) Nutrient Analysis.</p> <p>Silicate: No issues with analysis.</p> <p>NOx (nitrate + nitrite): No issues with analysis.</p> <p>Phosphate: No issues with analysis.</p> <p>Nitrite: No issues with analysis.</p> <p>Ammonia: Blockages in the detector's sample flow-cell and the heating component of the chemistry manifold required repeat assays of frozen samples.</p> <p>(2) Accuracy</p> <p>KANSO reference nutrient seawater (RMNS lot CA) solutions were assayed at the start and end of each AA3 instrument run. A new bottle was opened and used for each run.</p> <p>RMNS lot CA assayed results were generally within 1.5% of the issued standard deviation range of the stated values.</p> <p>RMNS does not have a value for ammonium.</p> <p>CTD Deployment vs RMNS results tabulated in section 4.3.</p> <p>(3) Processing, Hypro ver 4.4</p> <p>Preliminary processing occurred during the voyage to monitor quality of analysis.</p> <p>Final hydrology processing completed post-voyage. No issues with Hypro processing.</p>				

3.5 Salinities

Details	
HyPro Version	4.4
Instrument	Guildline Autosal Laboratory Salinometer 8400(B) – SN 71613
Software	Osil Data Logger ver1
Methods	Hydrochemistry Operations Manual + Quick Reference Manual
Accuracy	± 0.001 salinity units
Analyst(s)	Peter Hughes
Lab Temperature (±0.5°C)	Variable: 20-23°C
Bath Temperature	24°C
Reference Material	Osil IAPSO - Batch P157
Sampling Container type	OSIL 200ml bottles with plastic inserts.
Sample Storage	Samples held in Salt Room for 24 hrs before analysis. Samples assayed within 48 hrs.
Comments	No issues with analysis. Minor formation of bubbles formed on the conductivity measurement coils due to sample out-gassing.

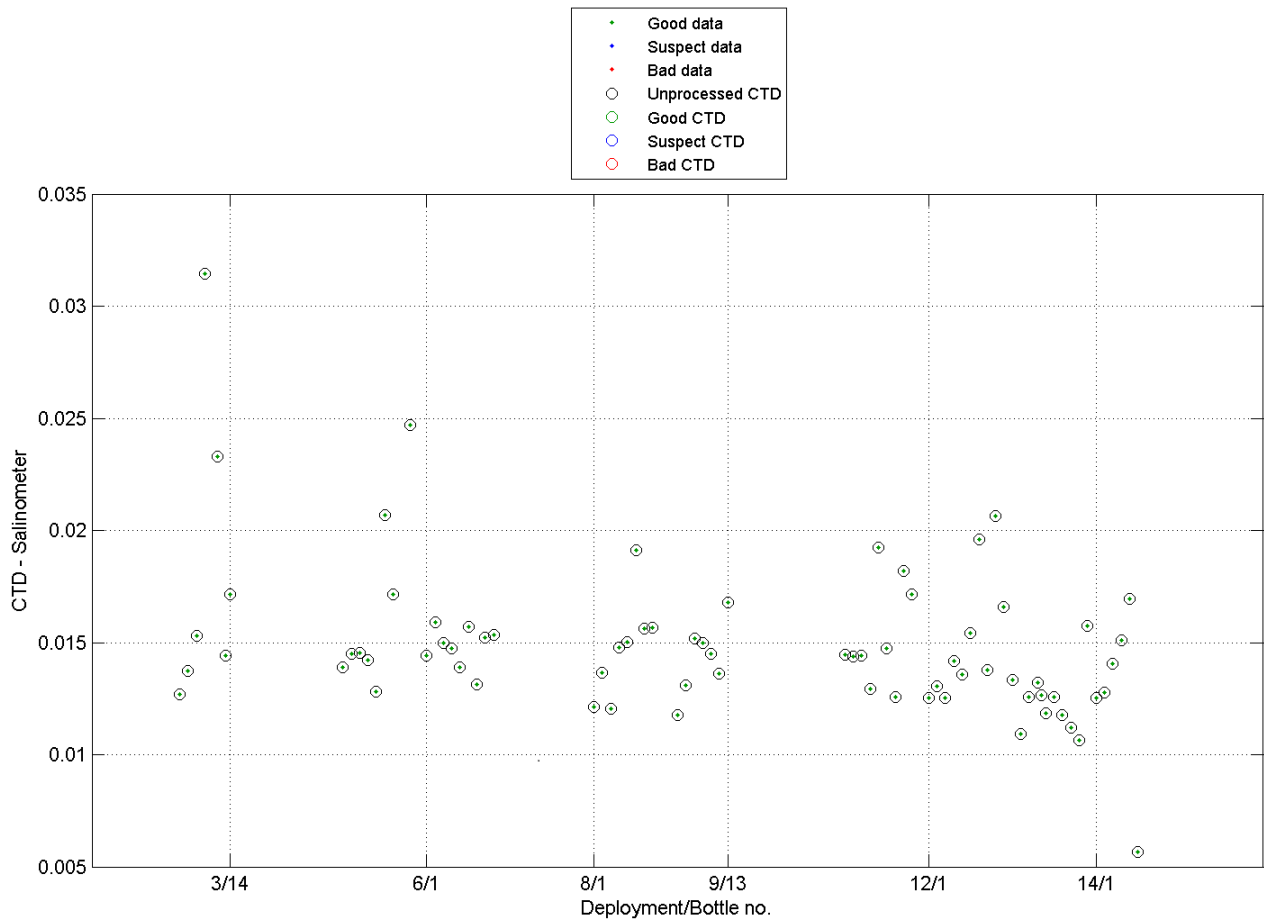
3.6 Dissolved oxygen

Details	
HyPro Version	4.4
Instrument	Automated Photometric Oxygen system
Software	SCRIPPS
Methods	SCRIPPS
Accuracy	0.01 ml/L + 0.5%
Analyst(s)	Peter Hughes
Lab Temperature (±1°C)	Variable 19 - 21°C
Sample Container type	Pre-numbered iodine flask, glass 140 mL glass vial w/stopper
Sample Storage	Samples analysed within ~48 hrs
Comments	No issues with analysis.

4 Plots – Quality Control

All plots can be viewed at \\strait-hba\mnf\processedVoyageData\RVinvestigator\in2015_c01\hyd

4.1 CTD vs Hydro Salinities Error Plot



4.2 CTD vs Hydro DO Error Plot

No error plot issued. The RINKO DO instrument used for the CTD deployments requires post-voyage processing to convert its signal output to umoles/litre so that it can be compared with the bottle DO results. This conversion has not been finalised at the time of hydrochemistry processing.

4.3 Assayed RMNS vs Deployment

KANSO reference seawater for nutrients (RMNS) Lot CA was included with every analysis run. A new RMNS bottle was opened and assayed each analysis run. The RMNS results as a function of the CTD deployments assayed for nutrients is tabulated below.

The RMNS lot CA certificate is appended in section 5.2 of this report.

Table: Assayed RMNS lot CA results versus CTD Deployment. Units, $\mu\text{mole/L}$

KANSO reference seawater lot. CA	Nitrate + Nitrite		Nitrite		Phosphate		Silicate	
Certified Value	20.20		0.065		1.441		37.46	
Expanded uncertainty	0.16		0.010		0.014		0.23	
CTD Deployment	Mean	SD	Mean	SD	Mean	SD	Mean	SD
3	20.24	0.05	0.067	0.001	1.454	0.002	38.28	0.38
5	20.13	0.03	0.065	0.004	1.447	0.003	37.63	0.06
6	20.09	0.01	0.066	0.002	1.435	0.004	37.16	0.08
8	20.00	0.02	0.067	0.002	1.436	0.003	37.36	0.04
9	19.92	0.02	0.068	0.003	1.433	0.004	37.27	0.07
11	19.92	0.05	0.066	0.003	1.423	0.003	37.25	0.04
12	19.99	0.01	0.069	0.001	1.444	0.007	37.59	0.03
13	19.90	0.02	0.067	0.001	1.433	0.009	37.55	0.05
14	19.85	0.05	0.065	0.001	1.440	0.004	37.82	0.06

4.4 Flagged and Missing Data.

Deployment	RP	Analysis	Flag	Reason for Flag or Action
3	3	oxygen	No result	Sample assayed, titration endpoint not well defined. Cause unknown.
6	3, 11, 13	oxygen	No result	Sample assayed, titration endpoint not well defined. Cause unknown.
8	3	oxygen	No result	Sample assayed, titration endpoint not well defined. Cause unknown.
13	11	nutrients	suspect	Waterfall plot shape and nutrient values indicates sample is possibly from RP13.
14	9	oxygen	No result	Sample assayed, titration aborted, forgot to add acid reagent required for titration.
14	11	oxygen	No result	Sample not collected. 5L bacteria sample collected from Niskin bottle before it could be sampled for oxygen.

5 Appendix

5.1 Salinity Reference Material

Osil IAPSO Standard Seawater	
Batch	P157
Use by date	15/04/17
K ₁₅	0.99985

5.2 RMNS Lot CA

Appended next page.

Lot.CA

Issue no.:Sample
Issue date:20**y**m**d



The General Environmental Technos Co., Ltd.

Certificate of Analysis
Certified Reference Material
KANSO CRM Lot.CA



Reference Material for Nutrients in Seawater (RMNS)

This certified reference material (CRM) was produced using treated natural seawater on the basis of quality control system under JIS Q 0034 (ISO GUIDE 34), for use in managing analysis precision or verifying performance of analytical methods or instruments for analysis of nutrients in seawater or matrices similar to seawater.

1. Name and Location of the Manufacturer/Analysis Facility

The General Environmental Technos Co., Ltd.
Laboratory for Instrumentation and Analysis
3-1-1, Higashikuraji, Katano, Osaka, 576-0061, Japan

2. Name of Reference Material and Sample Form

Name: Reference Material for Nutrients in Seawater (RMNS)
Sample: About 90 mL of this CRM solution in a 100 mL polypropylene bottle (vacuum-sealed in aluminum-film bag).

3. Certified Values

The certified values of 4 types of nutrients are shown in the table below. The expanded uncertainty in the table represents combined standard uncertainty calculated using a coverage factor of 2 which gives approximately 95 % level of confidence. The standard deviation (SD) of between-bottle is calculated based on the results of 180 bottles measured in duplicates, following JIS Q 0035 guideline.

	Certified Value ($\mu\text{mol/kg}$)	Expanded Uncertainty ($\mu\text{mol/kg}$)	Between-Bottle SD ($\mu\text{mol/kg}$)	Analysis Method
Nitrate	19.66	0.15	0.012	Colorimetric method in Japan Meteorological Agency's Manual on Oceanographic Observation (1999); Cu-Cd reduction Naphthylethylenediamine photometric method
Nitrite	0.063	0.010	0.0021	Colorimetric method in Japan Meteorological Agency's Manual on Oceanographic Observation (1999); Naphthylethylenediamine photometric method
Silicate	36.58	0.22	0.024	Colorimetric method in Japan Meteorological Agency's Manual on Oceanographic Observation (1999); Molybdenum blue method
Phosphate	1.407	0.014	0.0040	Colorimetric method in Japan Meteorological Agency's Manual on Oceanographic Observation (1999); Molybdenum blue method

4. Value Determination

The certified values were arithmetic means of the results of 30 bottles each (measured in duplicates) analyzed by the General Environmental Technos Co., Ltd. and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) with colorimetric method (continuous flow mode).

5. Traceability

Each certified value of nitrate, nitrite, and phosphate was determined by one of Japan Calibration Service System (JCSS) standard solutions for each nitrate ions, nitrite ions, and phosphate ions. Silicate value was determined by one of Merck KGaA silicon standard solution 1000 mg/L Si traceable to National Institute of Standards and Technology (NIST) silicon standard reference material (SRM) 3150. The salinity of calibration solutions used in continuous flow analysis (CFA) method were adjusted to the salinity of this CRM ± 0.5 psu. National Metrology Institute of Japan (NMIJ) CRMs were analyzed with this CRM and the results were confirmed within uncertainty.

6 . Raw Material and Processing Method

Collected location: (1) Suruga Bay, Japan; 270 meters depth.

(2) Pacific Ocean (19 °N, 130 °E); surface seawater.

Raw seawater was filtered (0.45 µm membrane filter), 93.7 % of seawater (1) and 6.3 % of seawater (2) were mixed by weight ratio, autoclave treatments (2 sets of 120 °C for 2 h) conducted, and about 90 mL aliquots of treated seawater were transferred into 100 mL polypropylene bottles in a Class 10000 clean room. (No additives)

7 . Intended Use

Seawater nutrient reference material solution for nutrients analysis. (Do not use for other purposes)

8 . Storage and Usage Specifications

Do not freeze (the composition of the product may change).

Store at room temperature below 40 °C.

Because of no additives or preservatives, the quality is not ensured for reuse after opening the outer seal.

Do not dilute or concentrate the product.

Shake well and open the seal right before use.

When sampling the product, do not insert objects to prevent contamination.

9 . Certified Date

2015/6/18

1 0 . Production Date

2013/2/22

1 1 . Expiration and Guarantee Date

Under unopened and stored condition described in section 8, this CRM's expiration and guarantee date is 2020/2/21

1 2 . Homogeneity

Out of 2500 bottles produced, 6 sets, each set consisting of randomly selected 30 bottles were analyzed (total of 180 bottles analyzed). The level of homogeneity was assessed from the results and confirmed acceptable homogeneity. Uncertainty associated with sample homogeneity is reflected in the uncertainties of the certified values. The standard deviations of between-bottle for 180 bottles analyzed are given in the table in section 3.

1 3. Additional Information

(1) Salinity **34.376 psu** (standard deviation 0.0005 psu; n = 10)

An electrical conductivity measurement method in Japan Meteorological Agency's Manual on Oceanographic Observation (1999) was used to measure salinity.

1 4. Health and Safety

Do not eat or drink the product.

Because the product is seawater, generally, it can be disposed by diluting; however, follow local jurisdictions when carrying out the disposal procedure.

1 5. Limitations of Copied Certificate

When copying this certificate, make clear indication as such in the copied certificate.

1 6. Technical Information

The buyer of this CRM shall be notified when changes in property values and/or any important changes are made in relation to this product. For more technical information, contact us at the address or webpage below.

1 7. Name and Signature of Party Responsible for Production and Certification

The General Environmental Technos Co., Ltd.

Laboratory for Instrumentation and Analysis

Director: Masanobu KATAGIRI

For any inquiry, please contact us



The General Environmental Technos Co., Ltd.

Laboratory for Instrumentation and Analysis

3-1-1, Higashikuraji, Katano, Osaka, 576-0061, Japan

TEL : +81-72-810-6551 FAX : +81-72-810-6552

E-mail: RMinfo@kanso.co.jp

Webpage : <http://www.kanso.co.jp/eng/production/index.html>