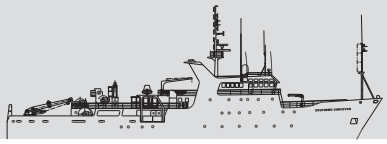

MARINE
NATIONAL FACILITY

2011 program

RV *Southern Surveyor*

voyageplan
ss2011_v05

The influence of natural hydrocarbon migration and seepage on the geological and biological systems of the offshore northern Perth Basin.

Itinerary

[LEG 1]
Mobilise Geraldton 0800hrs, Monday 19 September, 2011
Depart Geraldton 1800hrs, Monday 19 September, 2011
Arrive Geraldton 0800hrs, Monday 3 October, 2011 mobilise ROV and crew change

[LEG 2]
Depart Geraldton 1800hrs, Tuesday 4 October, 2011
Arrive Geraldton 0800hrs, Tuesday 18 October, 2011 and demobilise
Depart vessel 1800hrs, Tuesday 18 October, 2011

Principal Investigators

Dr Andrew T Jones (Chief Scientist) – Geoscience Australia
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Dr Andrew Heap – Geoscience Australia

Dr Andrew Ross – CSIRO Petroleum

Dr Jens Greinert – Royal Netherlands Institute for Sea Research

CSIRO

Scientific Objectives

1. Map sites of natural hydrocarbon seepage in the offshore northern Perth Basin (Jones, Kennard, Ross, Greinert)

On the basis of:

- acoustic signatures in the water column, shallow subsurface and on the seabed;
- geochemical signatures in rock and sediment samples and the water column, and;
- biological signatures on the seabed; document the spatial distribution of seepage sites and characterise the nature of the seepage at these sites (gas vs oil, macroseepage vs microseepage; palaeo vs modern day seepage).

2. Investigate generic structural controls on natural hydrocarbon seepage in the offshore northern Perth Basin, to determine the leaking versus sealing nature of individual faults within linked fault systems (Jones, Kennard)

Quantify seepage indicators over sealing structures through surveying the seabed over known oil and gas accumulations, then compare and contrast the results with indicators of seepage over structures with residual hydrocarbon columns that are known to have leaked or be leaking, then use these controls to assess the leaking or sealing nature of other structures in a variety of environments.

3. Assess the influence and potential future impact of natural hydrocarbon seepage on geological and biological systems and anthropogenic activities in Australia's southwest margin (Jones, Heap, Greinert)

Determine whether the level of natural hydrocarbon seepage within the offshore northern Perth Basin: a) is likely to impact climate change due to methane release in shallow water, b) is a control on benthic habitat distribution, c) presents a natural hazard such as for drilling or slope stability, or d) has the potential to change or influence petroleum prospectivity.

Voyage Objectives

The areas of potential natural hydrocarbon seepage to be surveyed include:

1. Proven (drilled) oil and gas accumulations and breached structures;
2. Hydrocarbon prospects identified by industry that have not been drilled (results will be calibrated against the drilled structures);
3. Areas with potential signatures of fluid seepage identified in seismic, satellite remote sensing and multibeam bathymetry data.

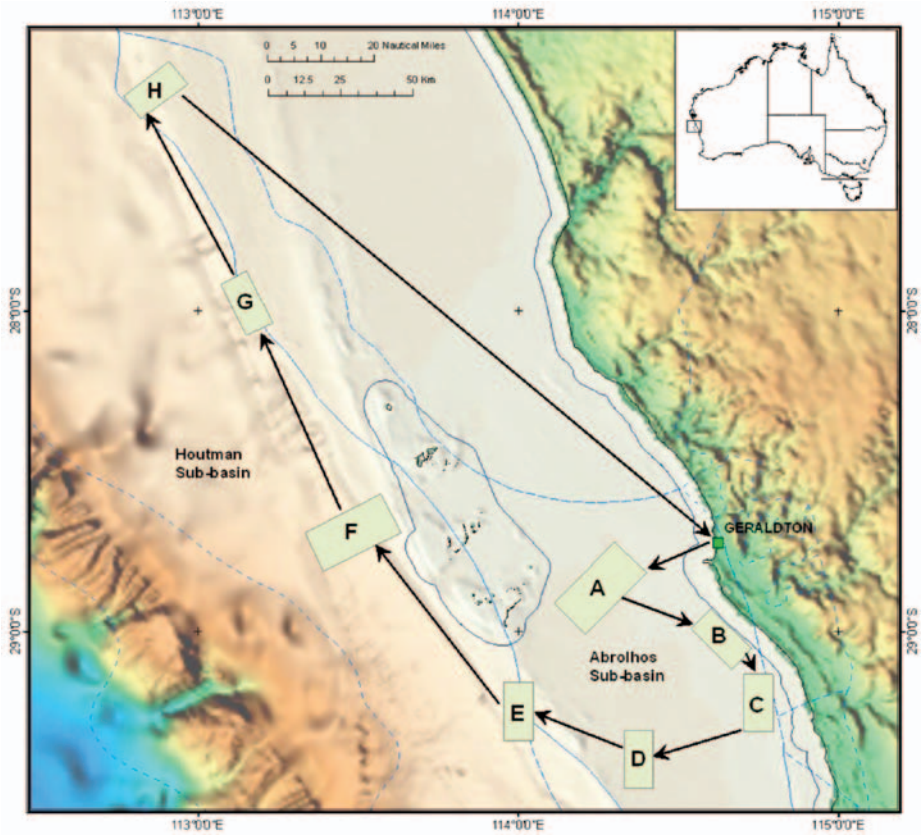

Figure 1: Map showing the bathymetry of the continental shelf and upper slope over the offshore northern Perth Basin, with the proposed study sites and general survey plan. Dashed lines mark the geological provinces within the basin, of which the Abrolhos and Houtman sub-basins are partially covered in the proposed survey.

Within each survey area:

[LEG 1]

1. Undertake water column measurements with the CTD. High priority.

2. Acoustic instruments (single- and multi-beam echosounders, sidescan sonar, sub-bottom profiler) will be used to map features associated with natural hydrocarbon seepage, including: bubble flares in the water column, seabed features (eg. pockmarks), and evidence of shallow gas (eg. gas chimneys). Very high priority.

3. The integrated hydrocarbon sensor array system will detect dissolved oil components in sea water, to discover any chemical anomalies in the water column that may be the result of natural seepage. Very high priority.

4. A CO2 sensor will detect any anomalous CO_2 plumes within the water column. High priority.

[LEG 2]

5. Undertake controlled observation and sampling of water, bubbles, biota, sediment and rocks from potential seepage sites with the ROV. Very high priority.

6. Sample surface and subsurface sediments from potential seepage sites using the surface grab and gravity corer, for analysis of head-space gas, infaunal content, and sediment texture and composition. High priority.

The general survey plan is as follows (Figure 1):

[LEG1]

Depart from Geraldton 1800hrs, Tuesday 20 September, 2011 and transit to Area A (2 hours to 2000 20/9).

Area A: Undrilled 'Zeewyck' and 'Updip Batavia' prospects

Bounding co-ordinates: -28°54.75', 114°6.75'; -29°0.5', 114°12.5'; -28°49', 114°24'; -28°43.25', 114°18'

Water depths: 40-55 m

Survey 150 km2 (50 hours to 2200 22/9)

Transit to Area B (2 hours to 0000 22/9)

Area B: Dunsborough oil accumulation

Bounding co-ordinates: -28°59.5', 114°32.25'; -29°7', 114°40'; -29°3.25', 114°43.75'; -28°55.75', 114°36'

Water depths: 20-45 m

Survey 80 km2 (24 hours to 0000 24/9)

Transit to Area C (1 hour to 0100 24/9)

Area C: Frankland gas accumulation

Bounding co-ordinates: -29°8', 114°42.25'; -29°18.75', 114°42.25'; -29°18.75', 114°47.75'; -29°8', 114°47.75'

Water depths: 20-45 m

Survey 80 km2 (24 hours to 0100 25/9)

Transit to Area D (2 hours to 0300 25/9)

Area D: Undrilled basin floor fan prospect

Bounding co-ordinates: -29°18.5', 114°19.75'; -29°29.25', 114°19.75'; -29°29.25', 114°25.25'; -29°18.5', 114°25.25'

Water depths: 55-65 m

Survey 150 km2 (48 hours to 0300 27/9)

Transit to Area E (2 hours to 0500 27/9)

Area E: Area of shallow faulting and seabed depressions on boundary of Houtman Sub-basin

Bounding co-ordinates: -29°9.5', 113°57.25'; -29°20.5', 113°57.25'; -29°20.5', 114°2.75'; -29°9.5', 114°2.75'

Water depths: 50-550 m

Survey 100 km2 (27 hours to 0800 28/9)

Transit to Area F (4 hours to 1200 28/9)

Area F: Houtman breached oil accumulation and undrilled 'Callisto' prospect

Bounding co-ordinates: -28°41.5', 113°20'; -28°48.75', 113°23.5'; -28°41.5', 113°38'; -28°34.25', 113°34.25

Water depths: 80-1100 m

Survey 150 km2 (36 hours to 0000 30/9)

Transit to Area G (4 hours to 0400 30/9)

Area G: Area of shallow faulting and seabed depressions on boundary of Houtman Sub-basin

Bounding co-ordinates: -27°55′, 113°4.25′; -28°4.5′, 113°9′; -28°2.25′, 113°14′; -27°52.5′, 113°9′

Water depths: 200-500 m

Survey 100 km2 (24 hours to 0400 1/10)

Transit to Area H (4 hours to 0800 1/10)

Area H: Livet breached oil accumulation and shallow faults with seabed expression

Bounding co-ordinates: -27°19.75′, 112°46′; -27°24′, 112°49.25′; -27°17.5′, 112°58′; -27°13.25′, 112°54.5′

Water depths: 180-550 m

Survey 150 km2 (36 hours to 2000 2/10)

Transit to Geraldton (12 hours to 0800hrs, Monday 3 October 2011)

Demobilise sidescan and mobilise ROV (10 hours to 1800hrs 3 Oct)

[LEG 2]

Depart Geraldton 1800hrs, Monday 3 October, 2011 and transit to Area A (2 hours to 2000 3/10).

Area A: Undrilled 'Zeewyck' and 'Updip Batavia' prospects

Bounding co-ordinates: -28°54.75′, 114°6.75′; -29°0.5′, 114°12.5′; -28°49′, 114°24′; -28°43.25′, 114°18′

Water depths: 40-55 m

Sample 12 stations (48 hours to 2000 5/10)

Transit to Area B (2 hours to 2200 5/10)

Area B: Dunsborough oil accumulation

Bounding co-ordinates: -28°59.5′, 114°32.25′; -29°7′, 114°40′; -29°3.25′, 114°43.75′; -28°55.75′, 114°36′

Water depths: 20-45 m

Sample 6 stations (24 hours to 2200 6/10)

Transit to Area C (1 hour to 2300 6/10)

Area C: Frankland gas accumulation

Bounding co-ordinates: -29°8′, 114°42.25′; -29°18.75′, 114°42.25′; -29°18.75′, 114°47.75′; -29°8′, 114°47.75′

Water depths: 20-45 m

Sample 6 stations (24 hours to 2300 7/10)

Transit to Area D (2 hours to 0100 8/10)

Area D: Undrilled basin floor fan prospect

Bounding co-ordinates: -29°18.5′, 114°19.75′; -29°29.25′, 114°19.75′; -29°29.25′, 114°25.25′; -29°18.5′, 114°25.25′

Water depths: 55-65 m

Sample 12 stations (48 hours to 0100 10/10)

Transit to Area E (2 hours to 0300 10/10)

Area E: Area of shallow faulting and seabed depressions on boundary of Houtman Sub-basin

Bounding co-ordinates: -29°9.5′, 113°57.25′; -29°20.5′, 113°57.25′; -29°20.5′, 114°2.75′; -29°9.5′, 114°2.75′

Water depths: 50-550 m

Sample 6 stations (36 hours to 1500 11/10)

Transit to Area F (4 hours to 1900 11/10)

Area F: Houtman breached oil accumulation and undrilled 'Callisto' prospect

Bounding co-ordinates: -28°41.5′, 113°20′; -28°48.75′, 113°23.5′; -28°41.5′, 113°38′; -28°34.25′, 113°34.25

Water depths: 80-1100 m

Sample 9 stations (48 hours to 1900 13/10)

Transit to Area G (4 hours to 2300 13/10)

Area G: Area of shallow faulting and seabed depressions on boundary of Houtman Sub-basin

Bounding co-ordinates: -27°55′, 113°4.25′; -28°4.5′, 113°9′; -28°2.25′, 113°14′; -27°52.5′, 113°9′

Water depths: 200-500 m

Sample 6 stations (36 hours to 1100 15/10)

Transit to Area H (4 hours to 1500 15/10)

Area H: Livet breached oil accumulation and shallow faults with seabed expression

Bounding co-ordinates: -27°19.75′, 112°46′; -27°24′, 112°49.25′; -27°17.5′, 112°58′; -27°13.25′, 112°54.5′

Water depths: 180-550 m

Sample 9 stations (53 hours to 2000 17/10)

Transit to Geraldton (12 hours to 0800hrs Monday 18 Oct, 2011)

Demobilise (10 hours to 1800hrs 18 Oct)

Depart vessel 1800hrs, Monday 18 October, 2011

Southern Surveyor Equipment

- Load sensing and wire out sheave blocks required on the rear A-Frame centre lifting lug and Port lifting lug
- EM300 multibeam swath with sound velocity profiler
- Topas 3.5 kHz sub-bottom profiler
- 12 & 120 kHz echo-sounder of water column data to be recorded digitally
- CTD (including Transmissometer and 10 litre Niskin bottle sampling)
- Smith-Macintyre grab (2)
- Trawl winch for dredging
- Coring winch (for the gravity corer)
- - 80 degree freezer for quick freezing of samples and storage of frozen samples
- Walk in Freezer
- Fume cabinets in preservation lab and productivity lab
- Constant Temperature Lab (CTL) for core storage (cores and grabs) set at 4°C
- Camera station for video (operations room or if elsewhere with GPS feed)
- DP to be operational for ROV
- Navigation Trimble GPS Nav Trac XL.
- Aquarium Water system (Sea water)
- Rock Dredges
- Installation of 'dancing deck' over stern ramp for ROV & THOMAS core deployment system
- Ship's hydraulics for THOMAS core deployment system and Geoscience Australia winches
- Hydrographic A-Frame
- Stern A -Frame
- Moon pool trolley
- Container securing feet for 20 foot shipping container for Forecastle Deck
- 4 Twist locks for securing container to container feet
- Check container location deck threaded sockets
- Rock saw

User Equipment

- ROV with FWD looking B&W still & colour Video, rear looking Video, Altimeter and depth meter, Sonar system 325 or 675 kHz manipulator arm for sampling and measuring & Storage tray. Optional extra's THP thermistor, CTD Probe, Niskin bottles 5L.
- SideScan Sonar and Winch.
- GA surface slick sampling equipment (Fishing rods and Gore sorbents)
- Rock dredge spares.
- Free deployed Gravity Coring bomb.
- PH sensor and logger.
- DUC 11 Deep underwater Camera.
- Oktopus Box corer.
- Shipek Grab.
- Integrated Hydrocarbon Sensor array.
- Sukatron

Special Requests

- ROV GAPS USBL system to be fitted to moonpool trolley.
- 20 Foot ROV operations lab to be fitted to Forecastle deck on ship supplied container feet secured to the deck.
- ROV Winch to be fitted to Rear deck.
- Side Scan Winch to be fitted to rear deck.
- Space for Laptops used for sub-bottom profile data processing.
- Space for MBES processing laptops.
- Space in operations room for Side-scan Sonar PCs
- Space in wet laboratory for sedimentology (processing sediments)
- Room for sampling gear on deck (core barrels, liners, spare dredges)
- Room for small rock saw in wet laboratory

Personnel List

[LEG 1]

Andrew Jones	Geoscience Australia	Chief Scientist
John Kennard/ Cameron Mitchell	Geoscience Australia	Shift Leader
Lynda Radke	Geoscience Australia	Scientist
Chris Nicholson	Geoscience Australia	Scientist
Olivia Wilson	Geoscience Australia	Swath processor
Craig Wintle	Geoscience Australia	Mechanical tech
Stephen Hodgkin	Geoscience Australia	Electronics tech
Matthew Carey	Geoscience Australia	Science tech
Andrew Ross	CSIRO Petroleum	Scientist
Emma Crooke	CSIRO Petroleum	Scientist
Charlotte Stalvies	CSIRO Petroleum	Scientist
Stephen McCullum	CSIRO MNF	MNF Voyage Manager
Tara Martin	CSIRO MNF	MNF Swath Support
Peter Dunn	CSIRO MNF	MNF Electronics Support
Pamela Brodie	CSIRO MNF	MNF Computing Support

[LEG 2]

Andrew Jones	Geoscience Australia	Chief Scientist
John Kennard/ Cameron Mitchell	Geoscience Australia	Shift Leader
Lynda Radke	Geoscience Australia	Scientist
Chris Nicholson	Geoscience Australia	Scientist
Olivia Wilson	Geoscience Australia	Swath processor
Craig Wintle	Geoscience Australia	Mechanical tech
Mark Sharah	Geoscience Australia	Mechanical tech
Matthew Carey	Geoscience Australia	Science tech
Willem Versteeg	Ghent University	ROV tech
Bob Koster	NIOZ	ROV tech
Jeroen Vercruysse	NIOZ	ROV pilot
Dries Boone	NIOZ	ROV pilot
Stephen McCullum	CSIRO MNF	MNF Voyage Manager
Peter Dunn	CSIRO MNF	MNF Electronics Support
Pamela Brodie	CSIRO MNF	MNF Computing Support

As per AMSA requirements for additional berths on *Southern Surveyor,* the following personnel are designated as System Support Technicians and are required to carry their original AMSA medical and AMSA Certificate of Safety Training on the voyage:

Name	**AMSA Certificate of Safety Training No.**
Craig Wintle	AS02324
Matthew Carey	ASO4076
Stephen McCullum	BB03845
Peter Dunn	ASO3164
Pamela Brodie	ASO2447
Tara Martin	BB05761

This voyage plan is in accordance with the directions of the Marine National Facility Steering Committee for the Research Vessel *Southern Surveyor*.

Andrew Jones
Chief Scientist