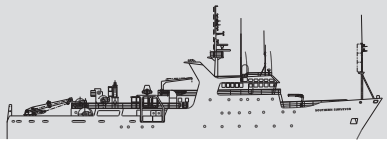

MARINE
NATIONAL FACILITY

2012 program

RV Southern Surveyor

voyageplan
ss2012_v07

Tasmantid Seamounts: volcanic, tectonic, and carbonate record

Itinerary

Mobilise Brisbane 0800 hrs, Friday 23 November, 2012
Depart Brisbane 1600 hrs, Friday 23 November, 2012

Arrive Brisbane 0800 hrs, Wednesday 19 December, 2012 and demobilise

Principal Investigators

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CSIRO

Scientific Objectives

The Tasmantid seamounts are a chain of underwater hotspot-derived intraplate volcanoes situated 150 to 600 km east of the Australian mainland (Figure 1). Because of the long record of hotspot-derived volcanic activity - spanning more than 2000 km and >40 million years - the seamounts provide an exceptional and largely untapped record of Australian plate velocity. Deciphering this record by obtaining volcanic samples suitable for high-resolution 40Ar/39Ar geochronology is a major objective of this expedition (Cohen, Vasconcelos, Knesel). Such volcanic samples will also record the chemical evolution of a long-lived mantle plume, and chemical analyses will reveal information on mantle reservoirs, melting, magma diversification, and the contrasting contamination effects of thinned continental lithosphere in the north versus oceanic lithosphere in the south (Knesel, Arculus). Geophysical data will also be collected over the seamounts and oceanic crust of the Tasman Sea to help study the tectonic history and lithospheric structure of the region. The larger seamounts are variably capped by fossil and modern coral reefs and/or other carbonate sediments (Webb). Although not targeted specifically, where carbonate materials are recovered with the volcanic rocks this material will provide a key biologic and climatic record of the seas east of Australia. Morphologic analysis of the seamounts will allow identification of volcanic and coral-growth geomorphology, as well as any mass wasting deposits (Cohen, Webb).

Voyage Objectives

1. 30 kHz swath surveying of the Tasmantid seamounts (Figure 1) Priority: High. This will allow mapping of volcanic features, subsequent erosion history and carbonate reef growth, and evidence of mass-wasting. Mapping is also crucial to target dredge sites. The region of highest priority includes the large seamounts near the bend in the chain (Queensland, Britannia) and extending north towards the Louisaide Plateau.

2. Dredging volcanic rocks from the seamount flanks. Priority: High. Samples will be analysed post-cruise by geochemistry and 40Ar/39Ar geochronology.

3. Geophysical data. Priority: Medium. Combined swath and gravity data will be used to study the strength and structure of the lithosphere along the chain, with particular emphasis on how the lithosphere has responded to seamount loading, and the difference in response between continental and oceanic crust. Magnetic data will also be used to help constrain seafloor-spreading rates.

4. Sample carbonate material and deep-water organisms as ‘by-catch’. Priority: Medium-low. Samples collected on an opportunistic basis (e.g., where organisms are attached to volcanic samples) will be identified and preserved as dictated by the material. Knowledge of the deep-water organisms of the Coral Sea is very scarce. Hence, any marine biota collected along with the volcanic samples will enhance our knowledge of life in these remote and inaccessible habitats, and provide a climatic and biologic record in the Tasman Sea, potentially extending well into the mid-Cenozoic. Voucher samples of any modern species will be provided to the Queensland Museum for additional expert study.

5. Water sampling. Priority: Low. On an opportunistic basis obtain surface water samples for post-voyage geochemical analysis. Very few surface ocean trace element geochemistry analyses exist for shallow water in the Coral Sea. Collection of samples will be done when and where an opportunity exists.

Time Estimates

Based on a steaming speed of 10 knots:

Transit port of Brisbane to -Stradbroke Guyot: 250 nm (25 hours).

Transit Frederick Reef to port of Brisbane: 410 nm (41 hours).

3800 nm swath mapping on seamounts & transits between seamounts (380 hours).

30 dredges @ 4 hours each (120 hours).

2 days for contingencies (weather, equipment).

Total is 614 hours (operations and transits) = 25.6 days

Voyage Track

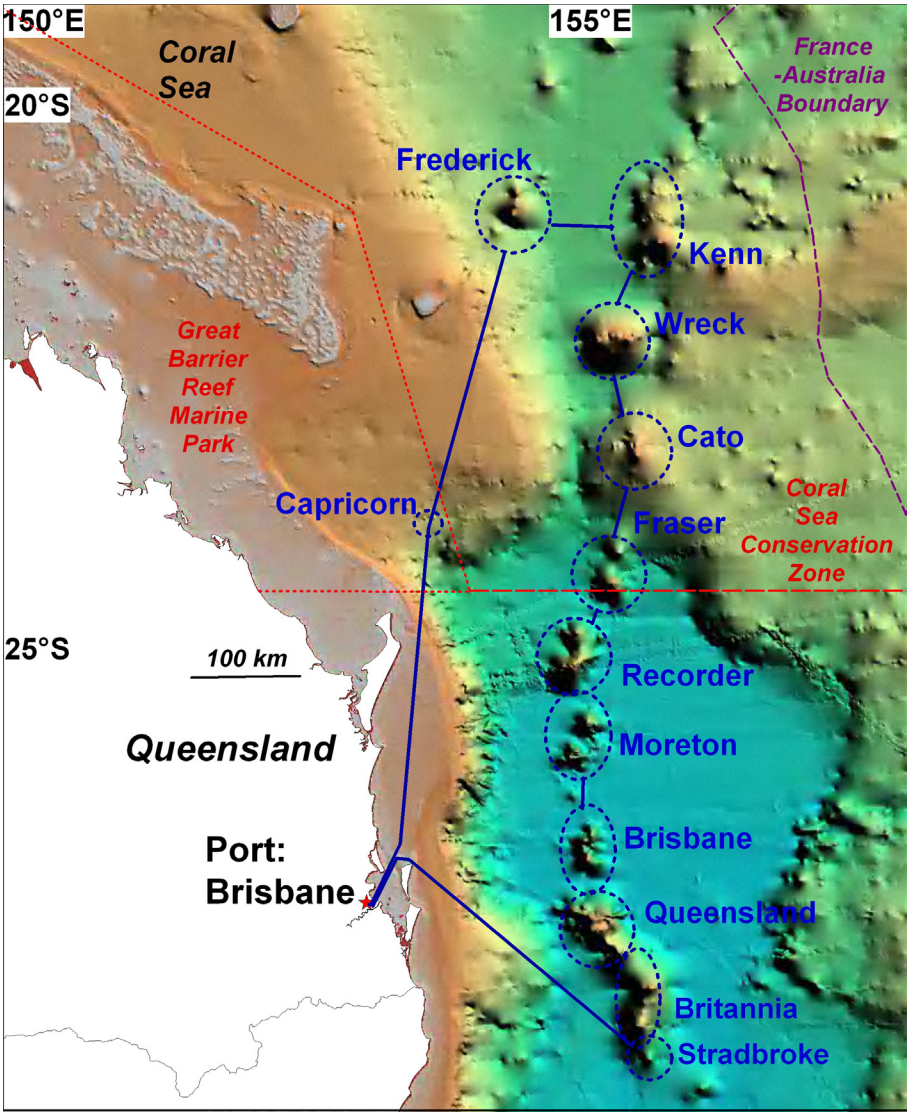

Figure 1: Tasmantid Seamounts with the planned ship track

Seamount	Quadrant	Latitude (decimal degrees)	Longitude (decimal degrees)	Latitude (degrees)	Latitude (minutes)	Latitude (decimal seconds)	Longitude (degrees)	Latitude (minutes)	Latitude (decimal seconds)	Comments
Stradbroke	SW	-29.21782	155.61660	-29	13	4.148	155	36	59.756	Portions of the eastern flank mapped by Marion Dufrense 153.
	SE	-29.21791	156.05972	-29	13	4.458	156	3	34.974	
	NE	-28.96175	156.09379	-28	57	42.293	156	5	37.633	
	NW	-28.97905	155.62844	-28	58	44.569	155	37	42.388	
Britannia	SW	-28.68604	155.36567	-28	41	9.744	155	21	56.398	Portions of the summit has high-resolution swath, and eastern flank mapped by Marion Dufrense 153.
	SE	-28.78157	155.66630	-28	46	53.666	155	39	58.673	
	NE	-27.94933	155.77040	-27	56	57.599	155	46	13.444	
	NW	-28.04521	155.54572	-28	2	42.770	155	32	44.581	
Queensland	SW	-28.04521	155.54572	-28	2	42.770	155	32	44.581	No pre-existing swath data.
	SE	-27.94933	155.77040	-27	56	57.599	155	46	13.444	
	NE	-27.26343	155.13904	-27	15	48.348	155	8	20.530	
	NW	-27.43083	154.90824	-27	25	50.977	154	54	29.664	
Brisbane	SW	-27.02416	154.99218	-27	1	26.969	154	59	31.834	No pre-existing swath data.
	SE	-27.03403	155.15721	-27	2	2.519	155	9	25.956	
	NE	-26.68105	155.16385	-26	40	51.766	155	9	49.860	
	NW	-26.66012	154.97861	-26	39	36.432	154	58	42.978	
Unnamed	SE	-26.38137	154.96957	-26	22	52.918	154	58	10.438	No pre-existing swath data.
	NW	-26.30079	154.85014	-26	18	2.851	154	51	0.511	
Moreton (S)	SW	-26.06609	154.94793	-26	3	57.910	154	56	52.537	Portions of the southern and eastern flanks have been swath mapped.
	SE	-26.01496	155.04865	-26	0	53.845	155	2	55.129	
	NE	-25.90824	154.97776	-25	54	29.653	154	58	39.925	
	NW	-25.94358	154.85747	-25	56	36.888	154	51	26.903	
Moreton (N)	SW	-25.79535	155.03598	-25	47	43.249	155	2	9.510	No pre-existing swath data.
	SE	-25.72397	155.19771	-25	43	26.306	155	11	51.767	
	NE	-25.61281	155.10942	-25	36	46.109	155	6	33.908	
	NW	-25.66442	154.97835	-25	39	51.923	154	58	42.049	
Recorder (S)	SW	-25.15439	154.77059	-25	9	15.786	154	46	14.117	Portions of the western flank and centre have swath data.
	SE	-25.38278	154.83497	-25	22	57.990	154	50	5.896	
	NE	-25.11460	155.16683	-25	6	52.549	155	10	0.574	
	NW	-25.07108	154.93668	-25	4	15.881	154	56	12.052	
Recorder (N)	SW	-25.07108	154.93668	-25	4	15.881	154	56	12.052	Centre of guyot crossed by ss2012 _ t02.
	SE	-25.11460	155.16683	-25	6	52.549	155	10	0.574	
	NE	-24.81921	155.09297	-24	49	9.160	155	5	34.681	
	NW	-24.84925	154.86442	-24	50	57.289	154	51	51.916	
Fraser	SW	-24.51474	155.20037	-24	30	53.068	155	12	1.339	Crossed by several swath lines, including from SS5/2004 and SS02/2005.
	SE	-24.51551	155.40372	-24	30	55.822	155	24	13.396	
	NE	-24.37298	155.40983	-24	22	22.739	155	24	35.381	
	NW	-24.36003	155.21350	-24	21	36.101	155	12	48.600	
Unnamed	SW	-24.11573	155.29161	-24	6	56.642	155	17	29.807	Portions of western flank have swath data from SS5/2004.
	SE	-24.14226	155.39611	-24	8	32.140	155	23	45.992	
	NE	-24.06464	155.42913	-24	3	52.715	155	25	44.872	
	NW	-24.04411	155.32108	-24	2	38.800	155	19	15.881	
Cato	SW	-23.38592	155.49979	-23	23	9.312	155	29	59.244	Portions of W and S flanks have SS5/2004 swath. Avoid shallows around island. Area west of ~155.362 may also be of interest.
	W	-23.17556	155.41259	-23	10	32.009	155	24	45.335	
	N	-23.05368	155.51811	-23	3	13.259	155	31	5.207	
	SE	-23.32991	155.74757	-23	19	47.690	155	44	51.259	
Wreck	SW	-22.30138	155.16967	-22	18	4.982	155	10	10.819	Avoid shallow areas around islands.
	SE	-22.29024	155.61550	-22	17	24.878	155	36	55.786	
	NE	-22.06680	155.60353	-22	4	0.494	155	36	12.694	
	NW	-22.05610	155.03087	-22	3	21.946	155	1	51.128	
Kenn	SW	-21.50830	155.75299	-21	30	29.880	155	45	10.750	Avoid shallow areas around islands.
	SE	-21.23381	155.97841	-21	14	1.709	155	58	42.276	
	NE	-20.96550	155.79293	-20	57	55.811	155	47	34.562	
	NW	-21.13051	155.48037	-21	7	49.825	155	28	49.318	
Frederick	NE	-20.79915	154.46115	-20	47	56.929	154	27	40.147	No pre-existing swath data.
	SE	-21.06947	154.41905	-21	4	10.078	154	25	8.591	
Capricorn	eastern	-23.80953	153.64890	-23	48	34.300	153	38	56.050	No pre-existing swath data.
	western	-23.83390	153.58041	-23	50	2.040	153	34	49.480	
Gardner Bank	NW	-24.98333	153.51000	-24	59	0.000	153	30	36.000	Adding swath to east of region surveyed during ss2012 _ t02.
	SE	-25.13667	153.57333	-25	8	12.000	153	34	24.000	

Southern Surveyor Equipment

- Kongsberg EM300 swath mapper – swath bathymetry, swath seabed reflectance.
- TOPAS sub-bottom profiler.
- Simrad EK60 sounder for bottom detection and biological research (38 and 120 kHz).
- Rock dredge, safety links, and spares. Winch.
  Stern ramp cover to be in place for dredging operations.
- Smith-McIntyre grab.
- Rock saw.
- Laboratory space for sorting, cleaning, and storing rock samples.
- Laboratory freezer (for preservation of carbonates/biological samples).
- ADCP.
- XBT's.
- Underway data.
- Ship attitude - heave, pitch, roll, and heading.
- Data from winch sensors (tension, winch speed, and wire out).
- Bridge log.

User Equipment

- Towed SEASPY magnetometer, winch, and power source, on loan from GA. This equipment will already be in place from the previous voyage. Instrument to be run during swath surveying.
- Micro-g Lacoste Air-Sea II seagoing gravimeter, UPS, spares, and peripherals (including laptop computer), on loan from NOC, UK. This equipment will already be in place from the previous voyage. Instrument to be run continuously, weather permitting.
- LaCoste-Romberg Series G land gravimeter, on loan from NOC, UK, for land-ties at beginning and end of voyage.
- Rock sampling equipment (hammers, chisels), sample bags, plastic sample buckets.
- Chemicals to preserve organisms (nitric acid, ethanol, sodium hypochlorite).

Special Requests

Deck-space, tie down sockets, and hydraulic outlets for the SEASPY magnetometer winch. RS232 cable input to computer in Operations room. These items will already be installed and tested from the previous voyage.

Gravimeter (600 x 800 x 900 mm) installed on floor of photographic darkroom. RS232 cable input to computer in darkroom. These items will already be in place and tested from the previous voyage.

Personnel List

Participant	Affiliation	Position
Benjamin Cohen	University of Queensland	Chief Scientist
Gregory Webb	University of Queensland	Carbonates
James Sadler	University of Queensland	Carbonates
Lara Kalnins	University of Oxford	Geophysics
Tracey Crossingham	University of Queensland	Igneous Petrology
Beatriz Pruina	University of Queensland	Igneous Petrology
Ian Fortes	University of Queensland	Igneous Petrology
Toby Cunningham	University of Queensland	Igneous Petrology
Abbas Babaahmadi	University of Queensland	Petrology/Geophysics
Rebecca Norman	Australian National University	Petrology
TBD		
Lisa Woodward	CMAR	MNF Voyage manager
Tara Martin	CMAR	MNF Swath Mapping
Rod Palmer	CMAR	MNF Electronics Support
Anoosh Sarraf	CMAR	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.
Lisa Woodward	BB01145
Tara Martin	BB05761
Rod Palmer	BB05328
Anoosh Sarraf	BB02298

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

Benjamin Cohen
Chief Scientist