



voyageplan **SS03-2008**

2008 RV *Southern Surveyor* program

Estimating the effectiveness of spatial closures for
deepwater gulper sharks and associated fishery species

Itinerary

Depart Adelaide 0800 hrs, Thursday 28th February 2008

Arrive Hobart 1500 hrs, Monday 17th March 2008

Principal Investigator

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Scientific Objectives

Areas of seabed in Commonwealth waters off temperate Australia are being closed to fishing as marine reserves are developed by the DEHA, and as spatial closures are increasingly used by AFMA to manage fishery stocks. One current focus for both conservation and fishery closures is the protection of gulper sharks which are under consideration for endangered species listing. Other species and habitats assessed as being at high risk from fishing impacts co-occur with gulper sharks on the continental slope, as do important commercial species including the pink ling, blue eye trevalla and ribaldo. Large gaps in the ecological knowledge of these species will limit the effective design of area closures (e.g. optimising sizes and numbers) and assessment of their performance. Knowledge gaps include species movements, the key ecosystem properties of natural refuges, and the benefits of natural and closed area refuges for species harvested by multiple fishing gear types.

As part of a larger project, our aim during this survey is to fill some of these gaps by characterising the habitats and ecosystem processes in 200-700 m depths that sustain key species, and commencing a process to determine the relevant aspects of species ecology. Primarily this will be (1) to measure the movement of fish within and to/ from a large closed area in the GAB with a tagging program, and (2) estimate the abundance of selected species in relation to habitat features (substructure within submarine canyons, escarpments and rocky banks, and adjacent water column features) with two independent, non-extractive photographic methods. Data will be gathered using a combination of proven sampling tools and techniques (multibeam acoustics, towed camera system, baited underwater video) and new technology and applications (surveillance cages, deep deployment of an acoustic tracking system).

SS03/2008 Voyage Objectives

1. Map and characterize the benthic ecosystem of the “60-mile closure” in the GAB using the EM300 multibeam and quantitative towed camera surveys
2. Quantify the abundance of gulper sharks and associated species, inside and outside the closure by non-extractive quantitative towed camera surveys.
3. Estimate species relative abundances inside and outside the “60-mile closure” using non-extractive underwater baited video cameras (BRUVs).
4. Assess the survivorship by gulper sharks and other species following tagging. This will use a specially designed trap with (1) a surveillance camera to monitor behaviour during descent, on the bottom, and during ascent, and (2) an acoustic receiver to track fish movements away from the trap after release.
5. Evaluate movement in and out of the “60-mile closure” using two curtains of acoustic VR2 listening stations to detect fish tagged with acoustic V16 tags.
6. Acquire additional deepwater camera calibration data with scalebar and rotating 16-laser array.

These will contribute to the project's overarching science objectives that aim to:

1. Identify, classify and quantify habitats at the multiple spatial scales relevant to the ecology of the study species.
2. Collect the data necessary to test hypotheses on the ecological roles of upper slope habitats, especially the links between biodiversity and target fishery species.
3. Estimate species' abundances with photographic techniques, and validate these by cross-comparison and modelling.
4. Implement an acoustic tag and release program to determine the movement of species between habitats and closed areas.
5. Evaluate the potential of gulper sharks to provide an indicator of ecosystem health.

Southern Surveyor's operations will commence with multibeam mapping of the central section of the "60-mile closure" to determine locations for the acoustic receiver arrays and the sites for camera and sled sampling. Mapping will also determine the locations for the fishing and tagging program to be undertaken by a companion vessel. Camera transects may be used to fine-tune the positions of the mooring sites, after which the receiver arrays will be deployed. The program of BRUVs and additional camera transects inside and outside the closed area will follow, and determine the daily sampling schedule for the remainder of the time at the "60-mile closure" site. Physical sampling with the sediment grab and sled, and current measurement drops with the LADCP, will be conducted opportunistically. Some of the acoustic receivers may be recovered and redeployed if the tagging program is successful, and if time and weather permit.

The survey will be undertaken with the assistance of a second chartered vessel (SARDI Aquatic Science's *Ngerin*) which will begin the one-week program of fishing, tagging and survivorship experiments as soon as it arrives at the site – probably five days after the *Southern Surveyor*. There will be the need to transfer scientific staff between the vessels at the start and end of the second vessel's sampling program.

Voyage Track

Sampling will be primarily within the “60-mile closure” in the eastern Great Australian Bight (~134°E), and at selected sites on the continental slope on the transit back to Hobart via the west coast of Tasmania (Figure 1). Sampling during the transit will be time and weather dependent.

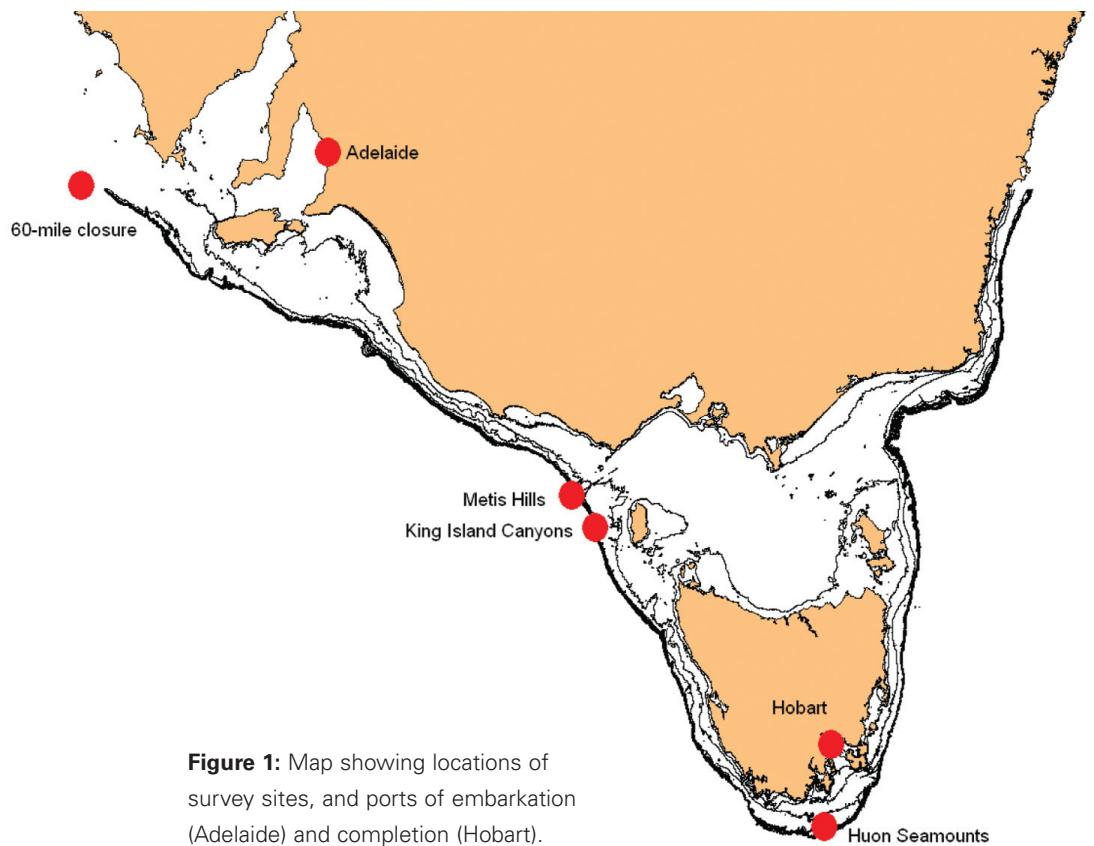


Figure 1: Map showing locations of survey sites, and ports of embarkation (Adelaide) and completion (Hobart).

Time Estimates

Phase 1	Activity	Days
"60-mile closure"	Survey	10
	Steaming 200 nm	1
	Port / bad weather	1
Phase 2		
Transit to Hobart	Survey (time dependent)	2
	Steaming 900 nm	4
	Port / bad weather	1
Total		19

Planned numbers of sites and samples

Total sites

Top priority ("60-mile closure")
 2 acoustic receiver arrays
 5 cross-slope transects inside closure (all gears)
 5 cross-slope transects outside closure (all gears)

Second priority

Relocation of selected acoustic receivers
 Metis Hills
 King Island Canyons
 Huon Seamounts

Total samples (including second priority sites)

Mooring deployments = 24
 Camera transects: 10 transects + 2 each at transit sites = 16
 CTD/ LADCP = 10
 BRUVS = 10
 Sediment grab: 10 transects (duplicates) = 20
 Sherman sled: 10 transects = 10
 Mooring retrievals (optional) = few
 Mooring re-deployments (optional) = few

Southern Surveyor Equipment

- Inmarsat B & C, Minisat M, Optus Mobilesat, CDMA - Voice/Data/Fax
- Navigation - One minute archiving of the underway data including Time, GPS position and bottom depth (plus DGPS within Optus mobiles at footprint)
- 3DGPS (for accurate heading, pitch and roll)
- Meteorological Data (temp, humidity, wind speed & dir, barometric pressure)
- Endeavour Navigation package
- Simrad EK 500 sounder (12, 38 and 120KHz)
- Simrad EM300 multibeam swath mapper
- TOPAS sub-bottom profiler
- Sea Surface Temperature and Salinity
- Sea Surface Fluorescence
- ADCP
- Lowered ADCP
- Smith-McIntyre grabs (2)
- Rock dredges (2)
- Woods Hole sleds (2)
- CTD (Seabird SBE 911 plus)
- Wet and Dry Laboratory Spaces
- Photo/Preservation Lab
- Walk-in Freezer
- Laboratory Fridges and Freezer
- UNIX Computers, Personal Computers
- Trawl winches with 4,500m of 24mm wire
- CTD/Hydro winches each with 7,000m of 8mm single core conducting cable
- Hydrographic A-frame (stbd)
- Stern A-frame (SWL 15 tonnes)
- 7 tonne knuckleboom crane
- Gilson winches (15 tonne, 5 tonne)
- Tugger winch (5 tonne)
- Sonardyne tracking system
- Scanmar net monitoring system (for use with benthic sled)

User Equipment

- 24 VR2 reciever moorings (see Fig. 2)
- Towed camera system
- BRUVS units rigged for deep water deployment
- Sherman benthic sled
- Biological sample preservation chemicals (alcohol and formaldehyde)

(Companion charter vessel)

- Bottom longline fishing equipment
- Tagging equipment
- 3 smart traps
- Dewar with liquid nitrogen

Personnel List

Southern Surveyor

Alan Williams	CMAR	Chief Scientist
Bruce Barker	CMAR	Watch Leader/ Camera systems
Jeff Cordell	CMAR	Camera systems
Matt Sherlock*	CMAR	Camera electronics
Ross Daley**	CMAR	Shark biology & tagging
Mark Lewis	CMAR	Gear operations
Pamela Brodie	CMAR	NF Computing
Rick Smith	CMAR	NF Swath mapping
Karl Forcey	CMAR	NF electronics support
Karen Gowlett-Holmes	CMAR	Invertebrate biology
Tony Smith	CMAR	Data synthesis
TBA BRUVs technician	UWA	Underwater Baited Video

Ngerin (tentatively 7 days from March 2)

Mark Green	CMAR	Tagging & vessel coordination
Matt Sherlock*	CMAR	Camera systems
Ross Daley**	CMAR	Shark biology & tagging
TBA	UTAS	Shark survivorship
TBA	AMC	Fishing gears

* to join *Ngerin* at sea, then rejoin *Southern Surveyor* following tagging

** to join *Southern Surveyor* from *Ngerin* following tagging

Note: AFMA, Australian Fisheries Management Authority; AMC, Australian Maritime College; CMAR, CSIRO Marine and Atmospheric Research; DEHA, Department of the Environment, Heritage and the Arts; SARDI, South Australian Research and Development Institute; UTAS, University of Tasmania; UWA, University of Western Australia.

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

Alan Williams

Chief Scientist