FRANKLIN

National Facility
Oceanographic Research Vessel

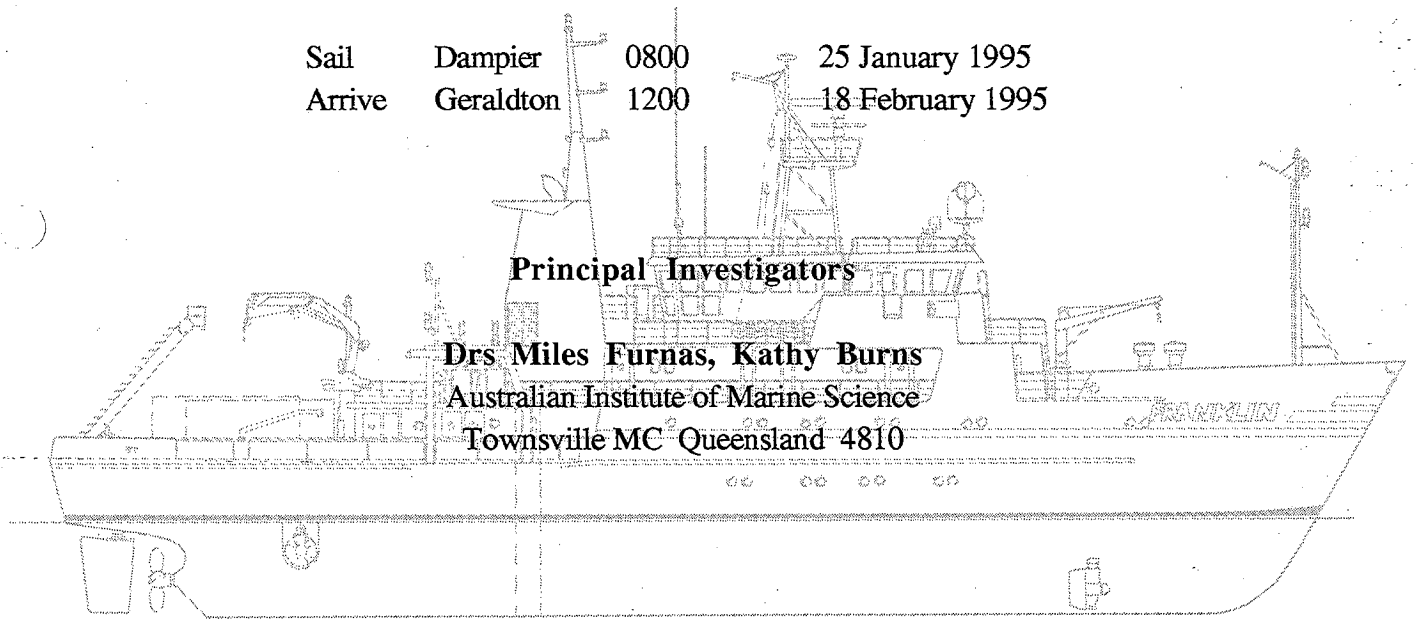
RESEARCH PLAN

Cruise FR 2/95

WESTERN GASPS

(Greater Australasian Shelf Productivity Study)

Sail	Dampier	0800	25 January 1995
Arrive	Geraldton	1200	18 February 1995



Principal Investigators

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AUSTRALIA

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Research Plan
Cruise FR 2/95

WESTERN GASPS
(Greater Australasian Shelf Productivity Study)

Itinerary

Sail	Dampier	0800	25 January 1995
Arrive	Geraldton	1200	18 February 1995

Principal Investigators

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Cruise Objectives

1 Measure water column primary production, nitrogen demand (NO_3, NH_4) and sedimentation of organic carbon (POC), inorganic carbon (PIC) and particulate nutrients (PN, PP) in and from the water column on the Australian NW shelf and western Timor Sea under summer conditions when internal wave activity is most developed.

2 Measure dissolved and particle-associated concentrations of hydrocarbons, and sedimenting fluxes of hydrocarbon materials in outer shelf waters of the Australian NW shelf and western Timor Sea under summer conditions.

3 Recover and re-deploy TDR moorings and tide gauges at or near Rowley Shoals and Scott Reef.

4 Measure physiological and ecological properties or processes (primary production, N-fixation, N-utilization) associated with the pelagic cyanobacterium, *Trichodesmium*, in NW Australian waters.

5 Investigate physiochemical processes affecting the concentration and speciation of iron in northern Australian waters and its potential contribution to regional biological productivity.

6 Recover and re-deploy two current meter moorings on the NW shelf off Broome (for D. Burrage, AIMS). Carry out time series and cross-shelf CTD sampling investigate internal wave dynamics on the northern NW shelf.

7 Carry out trial sampling for pelagic larval and juvenile stages of reef fish along the shelfbreak of the Australian NW shelf.

This cruise will constitute a portion of the Australian contribution to the international Global Ocean Flux Study (OzGOFS), specifically to address questions regarding primary production and biogeochemical cycling along ocean margins. In particular, the northern and northwestern Australian shelves may be viewed as useful models for tidally driven and non-upwelling shelf systems in the tropics.

The primary production and sedimentation measurements will geographically complement measurements made on earlier *Franklin* (FR03/92) and *Lady Basten* (1993) cruises in northern Australian waters. Measurements during this cruise will establish primary productivity and nitrogen utilization dynamics on the outer NW shelf during summer periods when internal wave activity is most likely to transport nutrient materials into the euphotic zone. Concurrent experimental studies on *Trichodesmium* will be carried out in parallel with water column productivity studies in the vicinity of the drifting sediment traps set out to collect material sedimenting from the euphotic zone.

Observational and experimental studies of the distribution and fate of natural and human-introduced hydrocarbon materials in the NW shelf region require observations of background hydrocarbon concentrations and speciation in marine waters, sediments and biological materials. Chemical oceanographic sampling during this cruise will focus upon quantifying concentrations and speciation of dissolved, particle-associated and sedimenting hydrocarbon materials in outer shelf waters of the NW shelf and western Timor Sea.

It is now recognized that iron (Fe) availability may be an important factor affecting pelagic biological productivity in a number of oceanic regions. The biological availability of iron is determined by its regional delivery rate from riverine and atmospheric sources and physio-chemical processes which make the iron available for biological uptake. Experimental studies during the cruise will focus upon the photochemical behaviour of iron under high irradiance conditions in tropical surface waters, iron speciation and biological responses to changes in iron availability.

Internal waves are presumed to be one of the major physical processes affecting the oceanography of the NW shelf. Mooring servicing and associated hydrographic sampling will be undertaken as part of long-term studies at AIMS of internal wave dynamics and residual flows along the northern section of the NW shelf.

Ashmore Reef, the Scott Reef complex and the Rowley Shoals are presumed to be stepping stones for the southward dispersal of larval reef fish from Indonesian reef systems to coastal and nearshore reefs off Western Australia. The trial light trapping will provide a first look at abundances of pelagic larval and juvenile reef fish likely to be found in offshore NW Australian waters during the summer.

The servicing of moorings and tide gauges at Scott Reef and Rowley Shoals will support AIMS long-term monitoring of the structure and variability reef communities on offshore reef systems in NW Australia.

Cruise Track and Time Budget

The cruise track will be based around three (3) sequential 24-hour deployments of a lagrangian sediment trap array and in-situ hydrocarbon extraction pump samplers at four (4) sites along the shelfbreak between the Monte Bello Islands and Ashmore Reef (Figure 1). A number of deployments of lagrangian fish larvae light traps will also be carried during the night during the period while following the sediment traps. Only minimal hydrographic sampling will be undertaken on the transit legs between experimental sites. The focus will be upon water column sampling and experimental studies in discrete water masses tagged by the drifting sediment trap. While in the vicinity of Rowley Shoals and Scott Reef, AIMS mooring strings will be recovered and re-deployed and tide gauges on the reefs will be replaced by divers. Two mid-shelf current meter mooring will be serviced while working northward and a number of hydrographic stations near the mooring site and on a cross-shelf line going by the mooring will be sampled on the southward leg while returning to Geraldton.

Time Budget

Steaming (2080 mi @ 11.5 kts = 181 hrs)	7.5
Sediment traps (72 hrs @ each of 4 sites = 288 hrs)	12.0
Moorings (Scott Rf & Rowley Shoals: 2 days @ each of 2 sites)	4.0
Mooring (mid-shelf) and associated hydrographic sampling	1.0
Contingency Steaming	0.5
Total	**25 days**

ORV Equipment Required

Deck Machinery

Laboratory Van
Trawl winch
Hydro winch and CTD winch
Running water on after deck for incubators and washdowns of gear
Zodiac for diving operations at Rowley Shoals and Scott Reef and iron sampling
Compressor for filling SCUBA tanks

Scientific Instrumentation

CTD and rosette sampler
In-situ fluorometer
U/W light sensor
Normal navigational and meteorological logging (incl. surface light)
ADCP
XBT's and launcher
Scintillation counter
Thermosalinograph
Access to clear-air cabinet in GP Lab
Clean air cabinet

Computing

ORV Mac's, IBM compatibles, Networked Sun's

User supplied equipment

Deck Equipment

Deck incubators for production experiments (copious flowing seawater needed)

Scientific Equipment

2-channel autoanalyzer
U/W light meter
Light sensor and logger
GC for N-fixation experiments (H_2, compressed air, N required)
zooplankton nets
respirometers
filtration equipment
small radio transmitters for homing on drifting traps
Replacement tide gauges and current meter/thermistor arrays for moorings includes 8 railway wheels for weights (2 per mooring, 4 moorings)
Acoustic release transponder for Benthos releases
Dive gear
SCUBA tanks (8)
Lagrangian sediment trap array (2) + ropes, floats and dan-buoys (2 sets)
Lagrangian light traps (4) + ropes, floats and dan-buoys (2 sets)
Infiltrix in-situ sampling pumps

NB.1. We intend to use radioisotopes (^{14}C, ^{3}H). All radioisotope work will be carried out in a purpose-built workstation to go in the deck van as previous Franklin cruises. Wastes to be stored and disposed of ashore. An AIMS autoanalyzer systems using phenol will be set up in the other end of the deck van.

NB 2. Compressed gases (H_2, compressed air, N_2) will be needed to run a small CG in the chemistry laboratory fume cupboard for *Trichodesmium* experiments. Compressed N_2 will be required in the GP lab to pressure filter particulates for iron measurements in the clean cabinet. Organic extractions with small volumes of hexane to be made in fume cupboard in GP lab.

NB 3. We intend to bring small volumes (several winchesters) of formalin for the preservation of zooplankton and fish larvae samples. The formalin and preserved samples will be stowed on the exterior of the vessel.

Scientific Party

Dr. M.J. Furnas	Australian Institute of Marine Science	Chief Scientist
Dr. K. Burns	"	
Mr. N. Crosbie	"	
Mr. N. Johnston	"	
Mr. R. MacAllister	"	
Ms. S. Codi	"	
Dr. D. Capone	Chesepeake Biological Laboratory, Univ. of Maryland	
Dr. E. Carpenter	State Univ. of New York, Stony Brook	
Mr. R. Szymczak	ANSTO	
Bob Beattie	CSIRO ORV	Cruise Manager
Phil Adams	"	
Mark Rayner	"	

A D McEwan
CSIRO Division of Oceanography

G W Paltridge
National Facility Steering Committee

August 1994

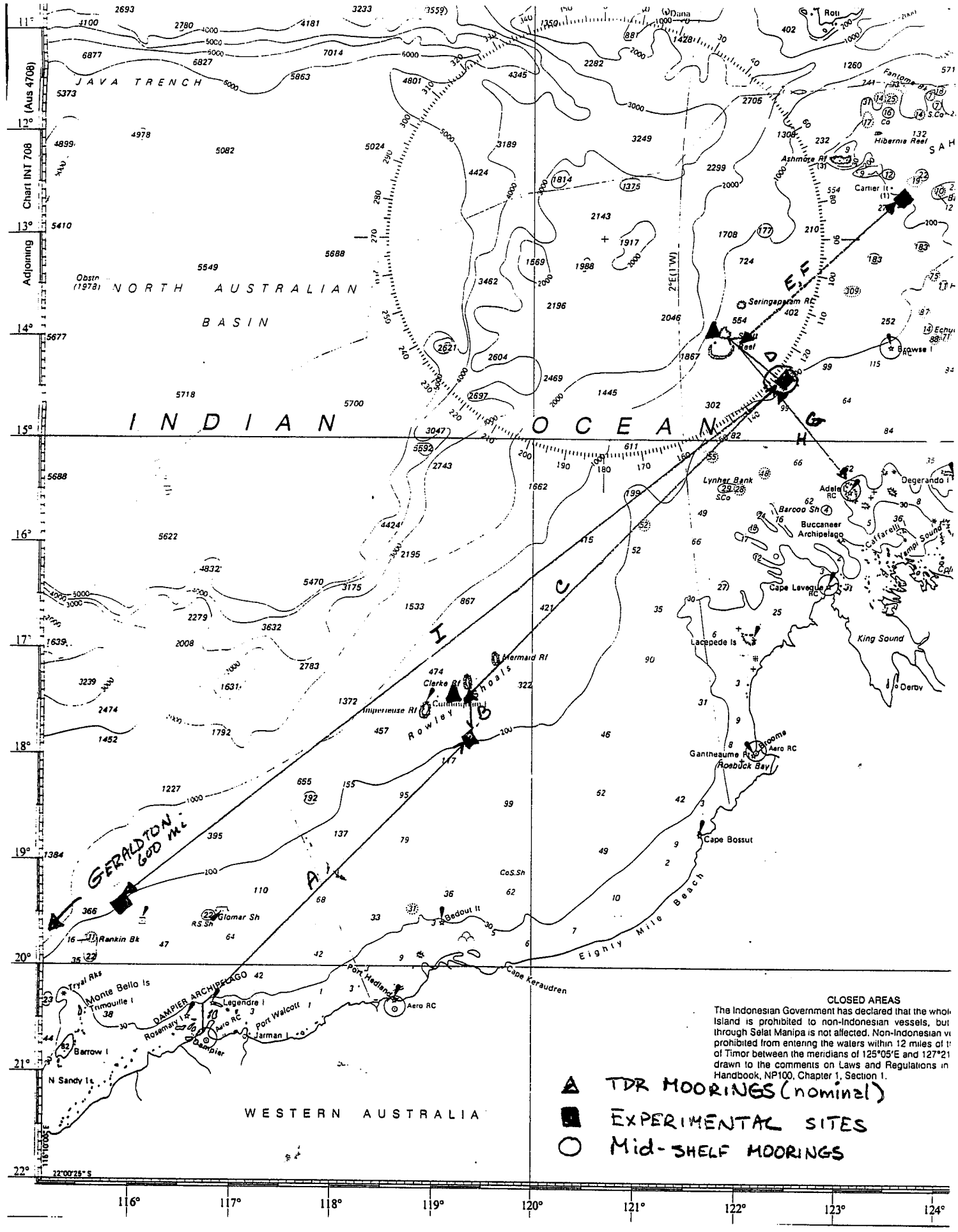
Chart INT 708 (Aus 4708)
Adjoining
JAVA TRENCH
NORTH AUSTRALIAN BASIN
INDIAN OCEAN
Obstn (1978)
Dana
Roti
Fantome
Hibernia Reef
Ashmore Rf
Cartier It
Seringapatam Rf
Scott Reef
Browse I
Lynher Bank
Adele I
Degerando I
Barcoo Sh
Buccaneer Archipelago
Caffarelli
Tenpi Sound
Cape Leveque
Lacepede Is
King Sound
Derby
Hermaid Rf
Clerke Rf
Imperieuse Rf
Rowley Shoals
Gantheaume Pt
Broome
Roebuck Bay
Cape Bossut
Eighty Mile Beach
GERALDTON 600 ML
Glomar Sh
Rankin Bk
Bedout I
Tryal Rks
Monte Bello Is
Trimouille I
DAMPIER ARCHIPELAGO
Rosemary I
Legendre I
Dampier
Port Walcott
Jarman I
Port Hedland
Cape Keraudren
Barrow I
N Sandy Is
WESTERN AUSTRALIA
CLOSED AREAS
The Indonesian Government has declared that the whol
Island is prohibited to non-Indonesian vessels, but
through Selat Manipa is not affected. Non-Indonesian v
prohibited from entering the waters within 12 miles of t
of Timor between the meridians of 125°05'E and 127°21
drawn to the comments on Laws and Regulations in
Handbook, NP100, Chapter 1, Section 1.
TDR MOORINGS (nominal)
EXPERIMENTAL SITES
Mid-SHELF MOORINGS
11°
12°
13°
14°
15°
16°
17°
18°
19°
20°
21°
22°
116°
117°
118°
119°
120°
121°
122°
123°
124°