FRANKLIN

National Facility
Oceanographic Research Vessel

AIMS Exmouth Hydrocarbon Transect

RV FRANKLIN
CRUISE FR 09/96

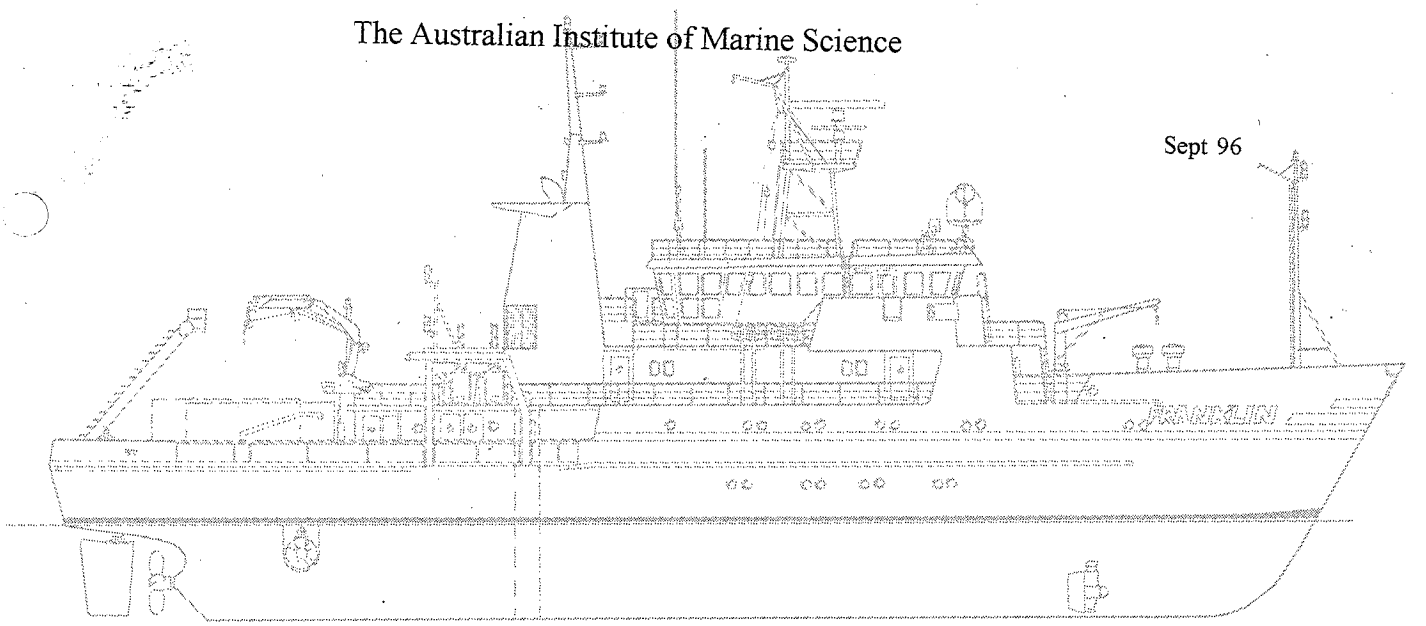
Depart Fremantle	1000 hours	Wednesday 30 October 1996
Return Darwin	1000 hours	Friday 22 November 1996

CHIEF INVESTIGATORS

Dr Gregg Brunskill
Dr Kathy Burns
Dr Tenshi Aynkai

The Australian Institute of Marine Science

Sept 96



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AUSTRALIA

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RV FRANKLIN FR9/96

NATIONAL FACILITY STEERING COMMITTEE

Inventory:

Depart Fremantle	1000 hours	Wednesday 30 October 1996
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Project Title: AIMS Exmouth Hydrocarbon Transect

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Summary of Logistic Requirements for this Proposal:

Area of Operations: 21^{o} 37' to 19^{o} 26' S.
114^{o} to 115^{o} 10' W.

Exmouth shelf and plateau, but also now including Mermaid Reef (Rowley Shoals) and Scott Reef en route to Darwin.

Preferred dates: 30 Oct to 22 Nov 96

Number of Scientific berths required: 3 Scientists

Number of support staff: 6 technical officers (above)

Source of funds: AIMS funding

Project Description

Objectives

A. To compare the rates of production and decomposition of organic matter on the NW Australian Shelf, Slope, and Exmouth Plateau, & our earlier measurement of these processes in nearshore mangroves & shallow water Exmouth Gulf, the Gulf of Papua, and the North Queensland coastal shelf.

B. To determine the water column concentrations & fluxes, & sedimentary fluxes of persistent hydrocarbons of natural and petroleum industry origin on the shelf, slope and plateau north of Exmouth Gulf.

C. To find locations of sediment accumulation along this coast (current knowledge indicates that the shelf is being eroded), and to obtain cores at sediment accumulation sites to determine the recent history of hydrocarbon, bulk organic matter, and carbonate fluxes to sediments & associated degradation processes.

D. To sample surface sediments in a grid pattern in the area of interest to map the distribution of carbonate, organic carbon, & hydrocarbon tracers, nutrients, trace elements, and Montebello Island nuclear bomb isotopes.

Research Plan

Our goal is to determine estimates of synthesis and degradation rates of various classes of hydrocarbons in the water column and surfical sediments, and to determine recent history of diagenesis of these hydrocarbon compounds in sediment cores, from 8 stations on the shelf, slope, and adjacent plateau off the coast from Exmouth Gulf & Montebello Island regions.

At work stations on the shelf (Stations 1,2,3), slope (Stations 4, 5, 8, 9), and plateau (Stations 6 & 7), we will organise our work into a) clean water work (primary production & respiration, SeaStar in situ large volume filtration, and sediment trap deployment & recovery, b) muddy work (sediment Kasten coring, sediment grab sampling, and c) night time grab sampling.

During clean work, the aft deck sampling will be kept very clear of mud, oils, greases, and rust. Water column primary production, bacterial production, & respiration will be done. Primary production estimates will be done from a separate fluorescence probe & datalogger, and has to be done between 0900 and 1600 hours. Some of this CTD/fluorescence profiling (about 70 profiles) will be done on a grid pattern related to the main stations listed. Water column samples (<300) will be taken from the hydrocast rosette bottles for estimation of suspended sediment concentration and chemistry, and for filtered water samples for analyses on the ship and at AIMS. SeaStar in situ filtration & column extraction of hydrocarbons will be done on position for 30 hours, probably attached to the mooring surface float for the sediment traps. Large volume samples for radionuclides in seawater will also be done by pumping several cubic meters of water through large cartridge filters. During this time the previous day's Kasten cores will be processed and packaged under super clean conditions on

the aft deck. Sediment traps will be deployed for 6-10 days, and recovered as cleanly as possible.

During mud work, the aft deck will be used for deployment of Smith-MacIntyre Grab (about 150) and the Kasten corer (about 12). Kasten cores from each site will be used for estimation of 100 year histories of hydrocarbon diagenesis & deposition rates. Grab samples of surface sediments will be done in transit between stations and on grid transects, using a Smith-MacIntyre grab.

During the night, the ship will be put on a grid transect in the vicinity of the sampling stations, to map the distribution of surfical sediment type (Smith-MacIntyre Grab). This information will guide us in selection of station locations for future cruises concerning with sedimentation, and it will allow extrapolation of the data gained at the present stations to a larger portion of the region.

After the work on Exmouth Plateau Carbon Budget is completed, we will steam to Dampier (or Broome) to allow Dr. Ayukai to get off and catch a plane back to Townsville for her urgent duties. Dr. Russell Hill of AIMS will board the Franklin at this time. He will sample Smith-MacIntyre Grab sediment for bacterial culture plating and growth experiments on board from 16-20 November. En route to Darwin, we will stop at Mermaid Reef (Rowley Shoals) to recover 1 moored current meter. We will then steam to Scott Reef to recover 1 moored current meter. We hope to take one or two Kasten cores in the vicinity of Scott Reef. Other moorings are to be recovered at the 200 meter depth contour, on a line between Scott Reef and Adele Island. This post-Broome work is for a different AIMS project (Burrage, Woodside).

Cruise Track, Time Estimates, Justification.

We will board the Franklin in Fremantle on 29 October. Depending upon the success or failure of our shipping arrangements, we may need to use 30 October to load some of our equipment. Our stop in Exmouth Gulf near Learmouth is to pick up Dr. Bradley Opdyke, who is flying in from Viet Nam. For the Exmouth Plateau work, I am using Chart AUS 328.

29 October, Arrive Fremantle, locate & move container to wharf.

30 October, Complete transfer of gear to Franklin
1500? Depart Fremantle, Steam to Exmouth Gulf

2 November, 1800, arrive off Learmouth, small boat pickup for Opdyke
2000, Station 1, CTD and 4 water samples (Ayukai)
2100, Station 1, Kasten coring, 14 m, near 22deg 7 min S., (Brunskill)
114deg 9 min E.
Large volume radiochemistry sample at 5 m (Pfitzner).

2200, 15 hrs steaming to Station 7, 19deg 27 min S
114deg 35 min E.
CTD (0-300 m) at 8 equidistant locations between Sta.1 and 7

3 November, Station 7, 1200, CTD, Primary Production, 12 water samples
1300, Grab & Kasten Core, 1500 meters (Brunskill)
1500, Deploy sediment traps (300 & 1400 meters) (Soles).
1700, Deploy SeaStars (4) on floating buoy (Codi, Soles).
1800, Follow SeaStar buoy all night & next day.

4 November, Follow SeaStar buoy all day
0900, Large volume radiochemistry samples, pump from 5 and 100 m (Pfitzner)
Kasten cores being processed all day (Zagorskis)
1000-1600, CTD, Production, water samples (24) (Ayukai)
2400, Recover SeaStars after 30 hours pumping time (Soles, Codi).

5 November, 0100, Steam to Station 5 at 20deg 59 min S., 114deg 12 min E.
0900, Deploy sediment traps (300 & 600 meters, 700 m depth) (Soles)
1000, Deploy SeaStars (4) on sediment trap surface buoy (Codi, Soles)
1100, Steam to Station 4 at 21deg 1 min S., 114deg 20 min E., 400 m depth
1200, Station 4, CTD, Production, water samples (12) (Ayukai)
1400, Grab, Kasten core (Brunskill)
1600, Steam to Station 3 at 21deg 7.5 min S., 114deg 25 min E., 300 m depth
1700, Deploy sediment trap (200 m) (Soles)
1900, Sediment grab samples on 1 hr grid pattern along slope & shelf up to Muiron Islands, all night. (Opdyke), ending up at Station 4.

6 November, 0800, Station 4 (400 m), Deploy sediment traps (1) at 300 m (Soles)
1000, Sta. 4, CTD, Production, Water samples (12) (Ayukai)
1100, Steam to Station 2 (100 m) at 21deg 35 min S., 114deg 13 min E.
1400, Sta. 2, CTD, Production, Water samples (12) (Ayukai)
1500, Large volume radiochemistry sample at 5 and 100 meters (Pfitzner)
1600, Grab, Kasten Core (Brunskill)
1700, Steam to Station 5, 3.5 hrs
2100, Recover SeaStars after 30 hrs pumping (Codi, Soles).
2200, Grid sediment grab sampling all night (Opdyke), ending up at Station 4.

7 November, 0800, Sta. 4, Deploy SeaStars on sediment trap surface buoy (Codi, Soles)
1000, Large volume radiochemistry samples at 5 and 100 m (Pfitzner)
1100, CTD, Production, Water samples (12) (Ayukai)
1200, Steam south to 300 m depth
1400, Sediment grab sample, Kasten Core (~ Sta. 3) (Brunskill)
1500, CTD, Production, Water samples (12) (Ayukai)
1800, Sediment Grab on 1 hr grid all night (Opdyke)

8 November, 0900, CTD, production, water samples (24) on 1 hr grid (Ayukai) ending at Station 4...
1400, Recover SeaStars at Station 4 (Codi, Soles).
1500, Steam to Station 3 (1 hr)
1600, Deploy SeaStars (4) on sediment trap surface buoy at Station 3
1700, Large volume radiochemistry samples from 5 and 100 m (Pfitzner)
1800, Sediment Grabs on 1 hr grid all night, base of slope (Opdyke)

9 November, 0800, Sediment grab and Kasten core, 2 miles E. of Station 5 (Brunskill)
0900-1500, CTD, production, water samples (24), 5 stations, seaward of Sta. 5
1600, Sediment grab samples on 1 hr grid all night (Opdyke), to Sta. 3 at
2200, Recover SeaStars at Station 3 (Codi, Soles)
2400, Sediment grab samples on 1 hr grid all night, ending at Sta. 5 (Opdyke)

10 November, 0800, Large volume radiochemistry samples at Sta. 5 (Pfitzner)
0900, Grab and Kasten Core 2 miles N. of Sta. 5 at 700 m depth (Brunskill)
1000-1500, Production, CTD, Water samples (30) 5 stations (Ayukai)
1600, Sediment grab samples on 1 hr grid seaward of Sta. 5 (Opdyke)

11 November, 0800, Grab and Kasten Core 35 miles N. of Sta. 5 at 1000 m depth
0900-1500, Production, CTD, Water samples (30) on 1 hr grid, N. of Sta. 5
1600, Sediment grab samples on 1 hr grid, N. of Sta. 5 all night (Opdyke)

12 November, 0900, CTD, production, water samples (30) on 1 hr grid (Ayukai)
starting at Station 5
1800, Sediment grab samples on 1 hr grid, seaward to Sta. 7, ending up back
at Station 3 (Opdyke).

13 November, 0800, Recover sediment traps at Stations 3, 4, and 5 (Soles).

1800, Sediment grab samples on 1 hr grid, seaward to Station 7 (Opdyke)

14 November, 0800, Recover sediment traps at Station 7.
1000-1500, CTD & production, water samples (32) starting at Sta. 7 (Ayukai)
1600, Sediment grab samples on 1 hr grid toward Station 8 at 19deg 56 min S.,
115deg 2 min E. (Opdyke)

15 November, 0800, Sediment grab & Kasten core at Sta. 8, 1000 m (Brunskill)
0900, CTD & production profile, water samples (4) at Station 8 (Ayukai)
1000, Steam to Station 9 at 19deg 56 min S., 115deg 9 min E.
1100, Sediment grab and Kasten Core at Sta. 9, 250 m (Brunskill)
1200, CTD & production profile, water samples (4) at Station 9 (Ayukai)
1300, Steam to Dampier, 10 hrs
2300, Arrive Dampier, small boat to deliver Ayukai to Wharf, and return
with Dr. R. Hill (AIMS). Water taxi from Dampier Port Authority?

16 November, 0100, Steam for Mermaid Reef (27 hrs)

17 November, 0300, Arrive Mermaid Reef
0800, Recover 300 meter mooring (Soles) at
17deg 2.12 min S., 119deg 38.78 min E.
1500, Grab samples
1600, Steam to Scott Reef (20 hrs)

18 November, 1200, Arrive Scott Reef
1230, Recover mooring at 260-320 meters depth at

14deg 5.34 min S., 121deg 43.1 min E.
Sediment grab and Kasten Core if work allows

19 November, 0800, Recover moorings landward of Scott Reef at
14deg 39.05 min S., 122deg 02.09 min E. at 200 m contour
Grab samples, Kasten Core if time permits
1800, steam for Darwin

20 November, Steaming

21 November, Steaming

22 November, Arrive Darwin early morning
Unload gear, transfer to shipping container
Pack perishable (frozen) samples for air transport

23 November, Scientific crew air travel to Townsville

Scientific & Technical Participants

Dr. Gregg Brunskill,	Chief Scientist, AIMS Kasten coring, geochemistry
Dr. Tenshi Ayukai,	AIMS, Plankton & Bacterial production, Respiration, Plankton sampling, Sediment traps, nutrients.
Dr. Bradley Opdyke,	ANU Marine Geology, Carbonate chemistry, coring, grab sampling
Dr. Russell Hill,	AIMS Microbiology, Grab samples
Ms. Irena Zagorskis,	AIMS GTO, grab & core sediment processing
Ms. Sue Codi	AIMS Hydrocarbon chemistry, sediment traps, SeaStar in situ filtration
Mr. John Pfitzner,	AIMS radiochemistry, coring & grab samples
Ms. Jo-Anne Cavanagh,	AIMS, Hydrocarbon Chemistry sampling
Mr. John Soles,	AIMS mooring specialist, sediment traps, Mermaid & Scott Reef, Adele Island moorings.
Mr. Cary McLean,	AIMS mooring specialist, sediment traps.

National Facility Support Staff Requested

Mr David Vaudrey Cruise manager & computer systems operator: to operate and maintain shipboard computer facilities and dataloggers, acoustic doppler current profiler.

Mr Phil Adams Electronics technician: to maintain and repair shipboard computer facilities and dataloggers, and other electronic equipment.

Mr Ron Plaschke Rosette/CTD operator & chemist: To operate and maintain rosette & CTD system, sample, filter, and analyse water for selected parameters.

Equipment

Equipment required from National Facility:

Deck Machinery: Starboard A frame & oceanographic winches
Rosette deployment & recovery system
Stern A frame & winch
Stern capstan head for Kasten Corer
Aft deck crane
GPS Navigation, Bathymetric sounding

Scientific & Electronic Equipment:

Mainframe computer
Datalogging computers
CTD profiler, 12-10 L Niskin bottles, spares
Fluorometer
GPS
Sounder for mud mapping
CSIRO Chemistry Lab (salinometer, bench chemistry,
O2, silicate, nitrate, phosphate, alkalinity,
pH, distilled water, fume hoods)
Lower level lab, for organic chemical work,
involving organic solvents.
Refrigerators, freezers

Equipment to be supplied by applicant

4 SeaStar in situ filtration/extraction devices (Codi)
1 Kasten Corer, deck rails & caddy, slicing table (Brunskill)
6 Sets of sediment trap arrays, with current meters,
anchors, buoys, acoustic release, and wire. (Soles)
Primary production (fluorescence) profiling equipment (Ayukai)
Lab equipment for hydrocarbon chemistry (Codi)
Large volume radiochemistry sampling equipment (Pfitzner)
Smith-MacIntyre sediment grab sampler (Brunskill)

Pallets and shipping boxes for samples
Equipment for carbon dioxide titrations (Opdyke)
Microbiological lab equipment, microscope (Hill)

Special Requirements

Running Water: Copious quantities of running seawater will be required on deck for seawater cooled deck incubators, for sieving benthic samples, and for cleaning off corers and grab samplers.

Hydrocarbon contamination: Since we are trying to measure trace hydrocarbon compounds in seawater and mud, it will be necessary to minimise deck usage and leakage of oils, greases, exhaust fumes, hydraulic fluids, fuels, paints, and other petroleum-based materials.

Kasten Coring: From our experience on Franklin cruise 3/93, we need to have good communications between the winch operator, the A frame operator, and the aft deck coring chief. Headphone communications for these 3 persons would make the operation safer and more efficient.

Microbiology: Two meters of lab bench space, clean and out of traffic. Small amounts (200 ml) of formaldehyde will be used, and a bunsen burner will be needed to sterilise equipment.

We request the log of GPS positions for our sonar sounding line & work stations, copies &/or disks of the bathymetric and sediment penetration output with GPS information, CTD casts for temperature, salinity, depth, meteorological data (including diurnal irradiance), and chemical data reports for nutrient elements, salinity calibrations, and oxygen.

This cruise plan is in accordance with the directions of the National Facility Steering committee for the oceanographic research vessel *Franklin*.

C B Fandry
CSIRO Division of Oceanography

G W Paltridge
National Facility Steering Committee

Sept 1996