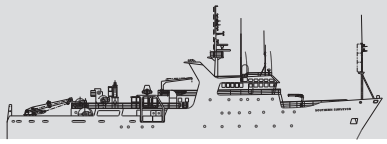

MARINE
NATIONAL FACILITY

2010 program

RV *Southern Surveyor*

voyageplan
SS05-2010

Biological Oceanography of Western Rock Lobster Larvae

Itinerary

Mobilise Fremantle 05 July 2010
Depart Fremantle 06 July 2010 at 1000 hrs
Arrive Fremantle 27 July 2010 at 0800 hrs and demobilise

Principal Investigator(s)

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CSIRO

Scientific Objectives

Lack of knowledge of Western Australia's fisheries oceanography fundamentally limits understanding of the recruitment of Western Rock Lobster, Panulirus cygnus, in a fishery worth $200-300 million/year to Australia. The life cycle of P. cygnus includes a planktonic "phyllosoma" larval stage that is transported up to 1500 km offshore via ocean currents. Development continues for approximately 9 – 11 months at sea, before juveniles ("puerulus") return over the shelf to recruit to coastal reef areas. Critical to improving the management of this fishery, which is under intensive review, is appropriate process information about the oceanographic mechanisms driving coastal recruitment. The last three years of puerulus settlement have been low, with the latest (2008/09) settlement the lowest in 40 years of monitoring and not explained by the environmental factors previously identified as affecting settlement. The cause of the low settlement represents a key unknown for managers assessing the sustainability of WA's coastal fisheries, and is likely to be driven by variation in food availability during the open-ocean stage of the phyllosoma larvae. Our study will test the hypothesis that the ocean productivity, particularly the nitrate-driven classic food chain supporting diatoms, copepods and other zooplankton, limits phyllosoma growth rate and survival in their oceanic phase. We will execute this study at, or after the peak, of the autumn/winter plankton bloom in the Leeuwin Current, with the aim of quantifying oceanographic parameters crucial to modelling rock lobster larval dynamics.

Hypotheses:

1. Productivity of the offshore planktonic ecosystem drives phyllosoma nutrition and health, and is thus a critical variable driving recruitment success for the species. Specifically:

   a. The classic food web (nitrate→ diatoms→ copepods) is the primary source of food for rock lobster phyllosoma.

   b. Phyllosoma will be healthier (e.g., more lipid-rich) in denser patches of chlorophyll a, especially if the patches are long-lived (> 1 month) and contain developed zooplankton populations.

2. The autumn bloom in the Leeuwin Current is an important source of productivity for rock lobster larvae, especially for mid-stage phyllosoma. This is one critical mechanistic element underlying the possible linkage between Leeuwin Current strength and puerulus settlement. (Focus of July voyage)

Voyage Objectives

1) Remote Sensing: Prior to, and during, the voyage, the chlorophyll field in the study region will be examined, to identify the presence of oceanic chlorophyll a patches, as well as assessing the bloom status of the Leeuwin Current itself.

2) Collection of phyllosoma for ship-board feeding experiments (Leg 1 / 5 days): We will target areas indicated by fisheries experts as collection areas for phyllosoma and use Neuston and Bongo nets to catch phyllosoma and their food. These experiments will be executed in 5 L and 20 L tanks installed on the back deck of the SS throughout the voyage. We will use Tow-yo transects as needed and the underway fluorescence to identify / confirm the presence of chlorophyll a patches as identified from satellite images. (5 Days)

3) Transects (Leg 2 / 8 Days): Survey of phyllosoma abundance (horizontal and vertical) in a half degree spatial grid. The grid will extend from 28oS - 34oS and out to 112oE (i.e. North of Abrolhos to latitude of Fremantle). This grid will comprise 5 station lines with 5-8 stations on each and we will used the CTD and EZ net at each station (3 hr per station). Stations will be 30' longitude apart so about 950 nm with 33 stations (= 8 Days). In this phase we will make a preliminary assessment of the patchiness of both chlorophyll a and phyllosoma, as well as collecting detailed samples for biochemical analyses. We may use the Tow-yo and the underway fluorescence to identify / confirm the presence of chlorophyll a patches as identified from satellite images.

4) Targeted Patch Sampling (Leg 3 / 6 Days): Patches identified as significant enough to provide enhanced food resources will be sampled in more detail to collect phyllosoma, both for more detailed biochemical analyses, and for experimental work. We will specifically target areas indentified as enriched as chlorophyll a (" patches") and also sample areas deplete in chlorophyll a as controls, Sampling with CTD, bongo and neuston nets will be undertaken to provide experimental material. We will use the Tow-yo and the underway fluorescence to identify / confirm the presence of chlorophyll a patches as identified from satellite images.

Voyage track

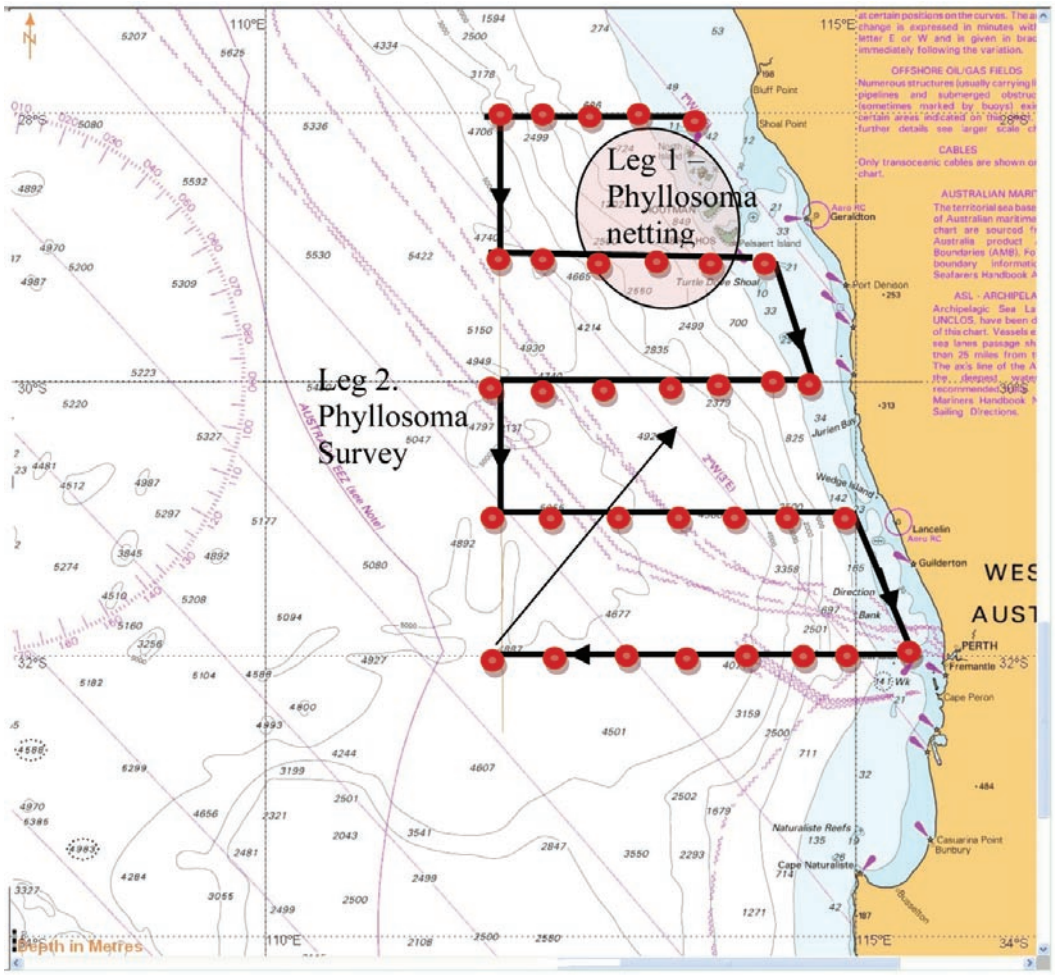

Figure 1: Study area for Leg 1 and voyage track for Leg 2.

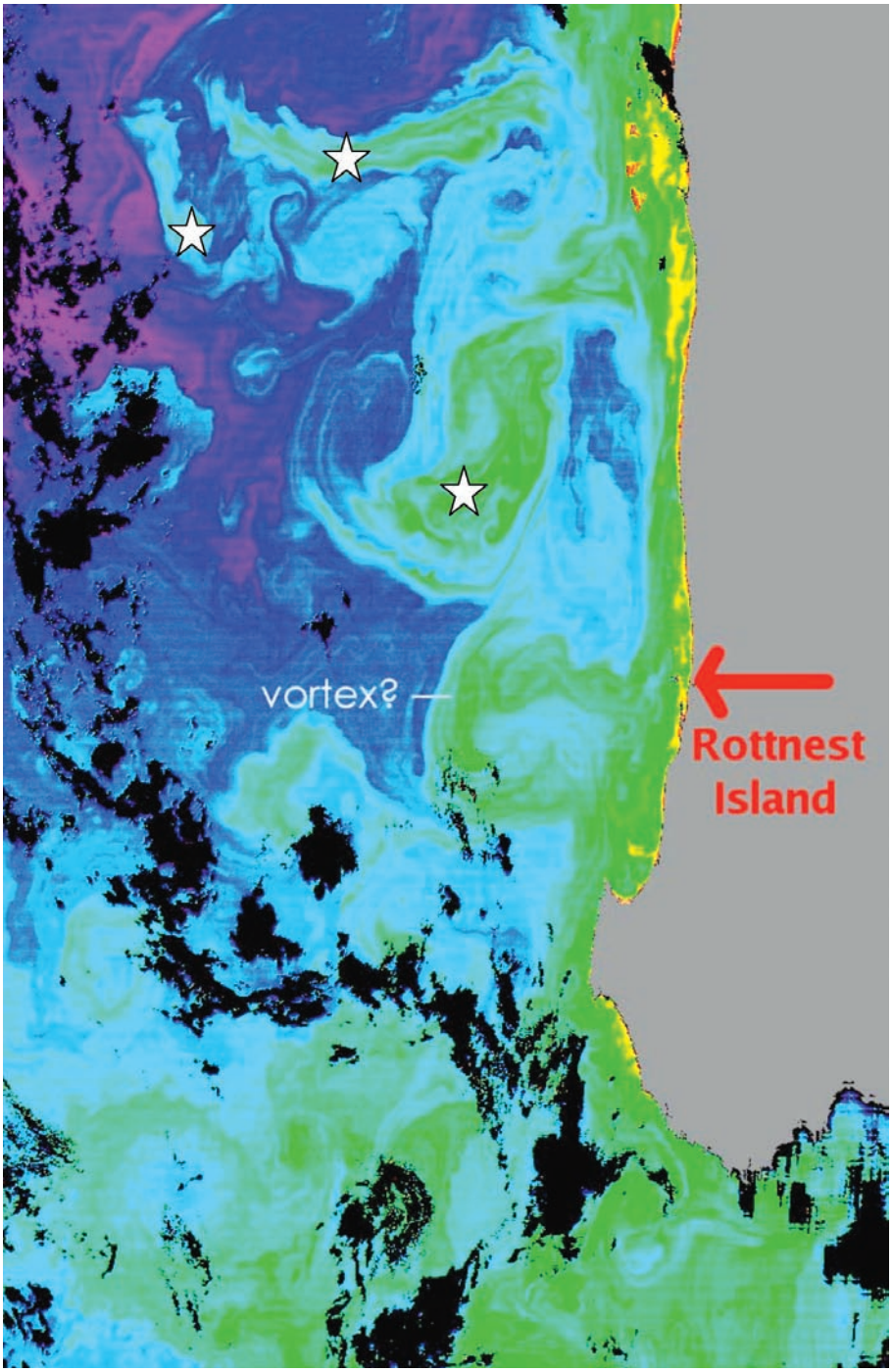

Figure 2: Starts indicate three long-lived chlorophyll a patches typical of those we will target in Leg 3 for in-patch vs outside-patch comparisons of food web structure and phyllosoma nutrition.

Time Estimates

Leg 1 : Phyllosoma netting and experimental setup – 5 days (Fig. 1)
Leg 2 : Regional Survey – 8 days (Fig. 1)
Leg 3 : Paired stations in patches: 6 days (Fig. 2)

~60 CTD Stations

Southern Surveyor Equipment

Rosette + CTD
Other Rosette-mounted instruments: oxygen sensor, turbidity, fluorescence
Milli-Q water
Scintillation Counter
Nacelle "Tow-yo" System developed by the MNF in lieu of SeaSoar
EZ Net

User Equipment

Manifolds, pumps, fluorometer and other sampling equipment:
these will be largely as for SSO4 (Ningaloo voyage)

Ship-board experimental tanks – a number of 20 L and 5 L tanks will be installed on the aft starboard deck covering an area of approximately 4 m2.

Bongo Nets (CSIRO CMAR Floreat)

Nitrate Analyzer mounted on Rosette (borrowed from CSIRO)

Special Requests

Use of Nacelle "Tow-yo" system repeatedly throughout the voyage.

Personnel List

Anya Waite	UWA	Chief Scientist
Lynnath Beckley	Murdoch University	Deputy Chief Scientist
Peter A. Thompson	CSIRO	Senior Scientist
Alicia Sutton	Murdoch University	Research Assistant
Melody Li	UWA	Research Officer
Nick Breheny	Murdoch University	Research Assistant
Judith Meyer	University of Kiel / UWA	Research Assistant
Nikolas Sachlikidis	Northern Fisheries Centre, Cairns	Senior Science Advisor
Simon Delestang	Dept. Of Fisheries WA	Senior Scientist
TBC	TBC	PhD student
TBC	TBC	PhD student
Don McKenzie	CSIRO MNF	MNF voyage Manager /Net Support
Lindsay Macdonald	CSIRO MNF	MNF Electronics Support
Bob Beattie	CSIRO MNF	MNF Computing Support
Alicia Navidad	CSIRO MNF	MNF Hydrochemistry support

UWA = University of Western Australia; UNSW = University of New South Wales

CSIRO = Commonwealth Scientific and Research Organisation; MNF = Marine National Facility

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.**
Don McKenzie	AS02764
Bob Beattie	AS02396
Lindsay MacDonald	AS04157
Alicia Navidad	AS04836

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

Anya M. Waite
Chief Scientist