2011 program

RV *Southern Surveyor*

MARINE NATIONAL FACILITY

voyageplan
ss2011_v04

Biological Oceanography of Western Rock Lobster Larvae – Part 2

Itinerary

Mobilise Fremantle 24 August 2011
Depart Fremantle 25 August 2011, 1000 hrs

10 September – Launch workboat to transfer Scientist to Abrohlos islands (weather dependent)

Arrive Geraldton Tuesday 13 September 2011, 1600 hrs

Demobilise Geraldton Wednesday 14 September 2011

Principal Investigators

Professor Anya M. Waite (Chief Scientist) – The UWA Oceans Institute, School of Environmental Systems Engineering

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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.

Late stage phyllosoma (VII – IX) should be available during the August/September period. These will be the focus of our study assessing health of late stage phyllosoma and their ability to metamorphose to puerulus.

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 1/6 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 experimental tanks (x 10) installed in the fish lab 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. (6 Days)

3) Transects (Leg 2/5 Days): Survey of phyllosoma abundance across the 29 and 30 degree transects out to 112ºE. We will used the CTD at each station for nutrient uptake (3 hr per station) and sample with Surface ("Neuston") net each night from 10 pm to 2 am. Stations will be 30' longitude apart. 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 Nacelle and the underway fluorescence to identify/confirm the presence of chlorophyll a patches as identified from satellite images.

4) Targeted Patch/Front Sampling (Leg 3/10 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. Areas will be indentified as enriched as chlorophyll a ("patches") and also sample areas deplete in chlorophyll a as controls. We will also specifically target the Abrolhos Front, if present, Sampling with CTD, bongo and neuston nets will be undertaken to provide experimental material. We will use the Nacelle and the underway fluorescence to identify/confirm the presence of chlorophyll a patches as identified from satellite images. During this stage of the voyage we will use the EZ net as necessary to resolve significant vertical gradients in plankton abundance.

Transit – 1 day

Contingency – 2 days

Voyage Track

(See Figs. 1 & 2)

Time Estimates

Leg 1:
Phyllosoma netting and experimental setup – 6 days (Fig. 1)

Leg 2:
Regional Survey – 4 days (Fig. 1)

Leg 3:
Patches and Fronts: 10- days (Fig. 2)

~ 45 CTD Stations

Piggy-back Projects

None.

Southern Surveyor Equipment

-80 Freezer

Rosette + CTD

Other Rosette-mounted instruments: oxygen sensor, turbidity, fluorescence

Milli-Q water

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 (X 10) – to be installed in Fish lab.

Bongo Nets (CSIRO CMAR Floreat)

Nitrate Analyzer mounted on Rosette (borrowed from CSIRO)

Liquid Nitrogen Dewars (3-4 maximum)

Special Requests

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

Use of workboat to transfer scientist to Abrolhos Island, 10 Sep. Time to be confirmed.

Personnel List

Anya Waite	UWA	Chief Scientist
Lynnath Beckley	Murdoch University	Deputy Chief Scientist
Peter A. Thompson	CMAR	Senior Scientist
Alicia Sutton	Murdoch University	Research Assistant
Eric Raes	UWA	Research Officer
Christin Sawstrom	UWA	Scientist
Josh Dornan	Fisheries, WA	Senior Technical Officer
Jonathon Saville	Volunteer	Student
Andrew Jeffs	Univ of Auckland	Scientist
Richard O'Rourke	Univ of Auckland	PhD Student
Lisa Woodward	CMAR	MNF Voyage Manager
Rod Palmer	CMAR	MNF Electronics Support/ Deputy Voyage Manager
Hiski Kippo	CMAR	MNF Computing Support
Mark Rayner	CMAR	MNF Hydrochemistry support
Sue Reynolds	CMAR	MNF Hydrochemistry 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
Rod Palmer	BB05328
Hiski Kippo	AS02377
Mark Rayner	AS02432
Sue Reynolds	BB03210

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

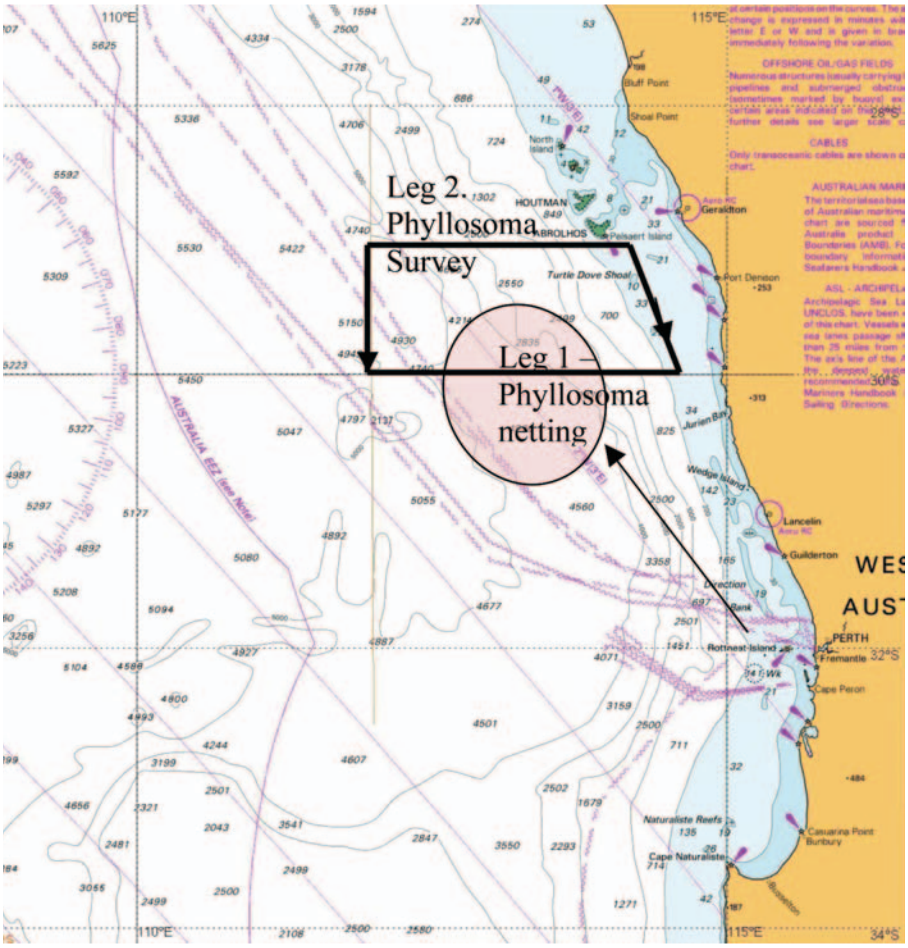

Figure 1: study area for leg 1 and voyage track for leg 2.

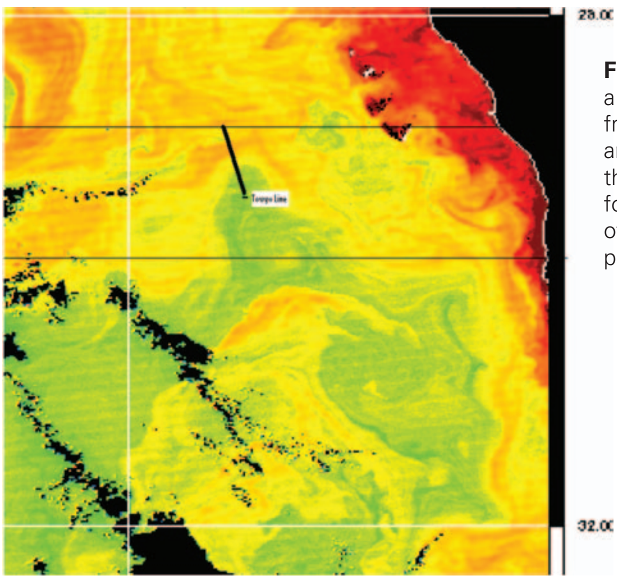

Figure 2: The line indicates a transect across long-lived front (steep gradient in SST and chlorophyll a) typical of that we will target in Leg 3 for cross-front comparisons of food web structure and phyllosoma nutrition.