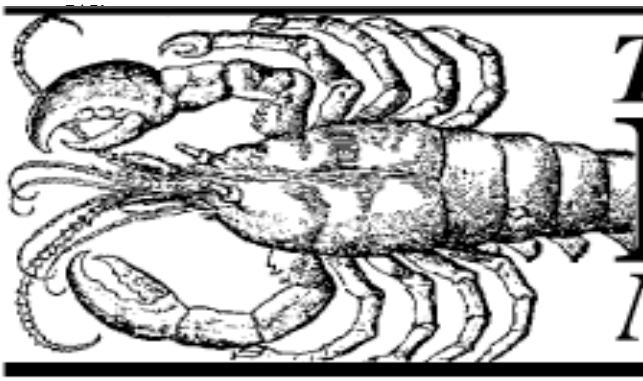
VOLUME TWENTY FIVE APRIL 2012 NUMBER ONE



The Lobster NEWSLETTER

ANNOUNCEMENTS

PREPARE YOUR ABSTRACTS!

November 27-30, 2012, Portland, Maine, USA
Holiday Inn by the Bay

A unique opportunity to share your research on:

- Foodweb Dynamics
- Anthropogenic & Environmental Stressors
- Metapopulation Dynamics & Connectivity
- Coupled Human-Natural Systems & Ecosystem-Based Management

Online abstract submissic May 1 – July 2, 2012

Proceedings of peer-reviewed papers published in *Canadian Journal of Fisheries & Aquatic Sciences*

Symposium Convener:
University of Maine Sea Grant Program
www.seagrant.umaine.edu/lobster-symposium

Coordinators:
Rick Wahle, University of Maine
Andrea Battison, University of Prince Edward Island
Paul Anderson, Maine Sea Grant Program

Fundamental changes have occurred over the past few decades in the physical environment and food web interactions of the Northwest Atlantic. Such dramatic changes after decades of relative stability highlight the need for a greater understanding of the lobster in the context of its changing environment. The need is timely as fishery managers grapple with how to integrate traditional single-species management approaches with the mandate for ecosystem-based approaches. Major research initiatives are beginning to generate interesting results across the range of *Homarus americanus*. The symposium aims to promote the sharing of new findings, identify region-wide research gaps and priorities, and catalyze and enhance research collaborations and networks.

Check the website for updates, including draft agendas, call for abstracts, and registration information.

http://www.seagrant.umaine.edu/lobster-symposium

Trans Tasman Rock Lobster Executive Forum

As an agreed output of the 7th Rock Lobster Congress convened in Blenheim New Zealand during 2011 the NZ Rock Lobster Industry Council (NZ RLIC), with assistance from the Australian Fisheries Research and Development Corporation (FRDC) has confirmed a Trans-Tasman forum for executive members and support staff of Australian and New Zealand rock lobster industry organisations.

The forum ran over a day and half in Melbourne commencing Thursday May 3rd 2012 and industry representatives were quick to register. "Sharing the Knowledge" has been a theme of various workshops involving Australian and New Zealand lobster industry participants over a number of years and the forum continued to build on effective cooperation and collaboration.

The draft agenda included: ·

- Alignment of rock lobster stock monitoring and stock assessment standards
- Electronic data collection – storage and reporting standards and protocols;
- Evaluation of compliance and enforcement regimes and strategies for improved compliance and more efficient and effective enforcement;
- Marine mammal interactions – rock lobster industry responses;
- Marine Parks and no-take marine reserves – is there an opportunity to retain access for lobster fishermen;
- Export standards – grading; packaging; market access; etc. An initial comparison of operational policies and practices.

The Forum will also firm up arrangements for the 8th Rock Lobster Congress scheduled to be hosted by the NSW Rock Lobster Industry in September 2012.

PRE-ANNOUNCEMENT

10th International Conference and Workshop on Lobster Biology and Management
Cancún, México

Tentative date: April/May 2014

Host and organizer: Universidad Nacional Autónoma de México, Instituto de Ciencias del Mar y Limnología, Unidad Académica de Sistemas Arrecifales.

The International Conference and Workshop on Lobster Biology and Management is the largest international event for all disciplines of lobster research and management. The past ICWLs were held in Perth, Australia (1977), St. Andrews, Canada (July 1985), La Habana, Cuba (June 1990), Sanriku, Japan (July 1993), Queenstown, New Zealand (February 1997), Key West, USA (September 2000), Hobart, Australia (February 2004), Charlottetown, Canada (September 2007), and Bergen, Norway (June 2011). It is now our privilege to host and organize the 10th ICWL in Cancún, México, in 2014 (tentative dates: around late April or May).

Cancún is a modern city/tourist resort located on the Caribbean coast of México. The tourist area ("hotel zone") occupies a 23 km-long narrow island between the turquoise-blue Caribbean waters to the east and the shallow Nichupté lagoonal system to the west, whereas the city occupies a more inland location. The hotel zone features a vast array of world-class oceanfront hotels with white sand beaches, restaurants, golf courses, night clubs/discotheques, and shopping malls. Thirty km south of Cancún lies the smaller and more bohemian town of Puerto Morelos, which is also the gateway to the Riviera Maya, a 120 km-long strip of coast that constitutes the most important tourist corridor in Mexico. This corridor includes long stretches of white beaches, tropical coral reefs, coastal mangroves, vast expanses of tropical jungle featuring crystal clear-water *cenotes* (sinkholes) and underground caves, the Mayan archaeological sites of Tulúm, Xel-ha, and Cobá, several ecological parks, the beautiful islands of Cozumel, Mujeres, and Contoy, and the hospitality of the local people. So, in addition to providing a spectacular place to host the conference, Cancún/Riviera Maya provide endless opportunities for great recreational and cultural activities!

We are in the process of exploring potential venues and sponsors, and expect to launch the first official announcement and the conference web page by the end of this year.

See you in Cancún in 2014!

Patricia Briones-Fourzán & Enrique Lozano-Álvarez
Unidad Académica de Sistemas Arrecifales (Puerto Morelos)
Instituto de Ciencias del Mar y Limnología
Universidad Nacional Autónoma de México
Convenors, 10th ICWL.

New Reviews of Lobsters in the *Treatise on Zoology*

Brill has taken over the production of the ***Treatise on Zoology: Crustacea***, the English version of the old ***Traité de Zoologie.*** Two of these volumes are of interest to readers of *The Lobster Newsletter*. The first book covering the decapods,

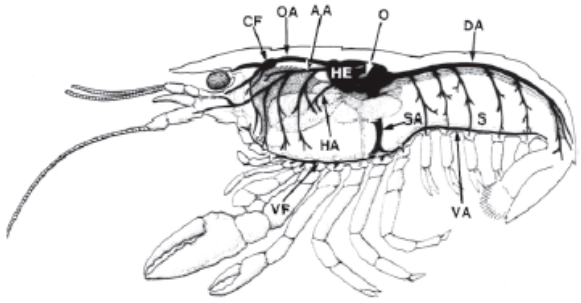
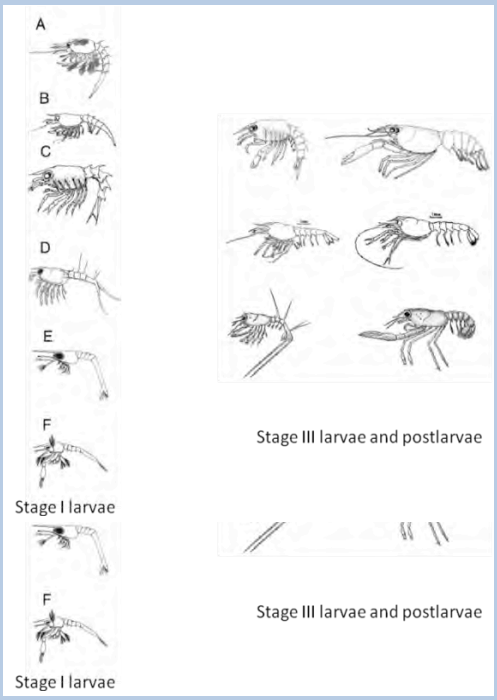


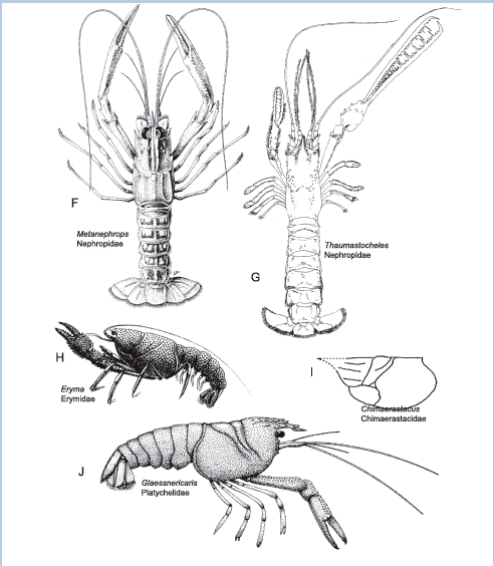
Fig. 66.14. Schematic drawing of the circulatory system of *Homarus americanus*. AA, Antennal artery; CF, cor frontale; DA, dorsal abdominal artery (superior pleonal artery); HA, hepatic artery; HE, heart; O, ostium; OA, ophthalmic artery; S, segmental artery; SA, sternal artery; VA, ventral abdominal artery (inferior pleonal artery); VF, ventral thoracic artery (inferior thoracic artery). [From Martin & Hose, 1995, fig. 1; redrawn after McLaughlin, 1980, fig. 47A.]

Fig. 66.14. Schematic drawing of the circulatory system of *Homarus americanus*. AA, Antennal artery; CF, cor frontale; DA, dorsal abdominal artery (superior pleonal artery); HA, hepatic artery; HE, heart; O, ostium; OA, ophthalmic artery; S, segmental artery; SA, sternal artery; VA, ventral abdominal artery (inferior pleonal artery); VF, ventral thoracic artery (inferior thoracic artery). [From Martin & Hose, 1995, fig. 1; redrawn after McLaughlin, 1980, fig. 47A.]



Volume 9A, was published in December 2010 and contains a chapter, ***"Infraorder Palinura,"*** by Kari Lavalli and Ehud Spanier.

As of January 2012, Volume 9B has a new chapter on ***"Infraorder Astacidea: the Marine Clawed Lobsters"*** by Richard Wahle, Dale Tshudy, J. Stanley Cobb, Jan Factor, and Mahima Jaini.



These chapters present comprehensive reviews of external and internal morphology, embryonic and larval development, ecology and behavior, economic issues, phylogeny and biogeography, and family level systematics.

Orders can be placed with Brill at http://www.brill.nl/.

Submitted by
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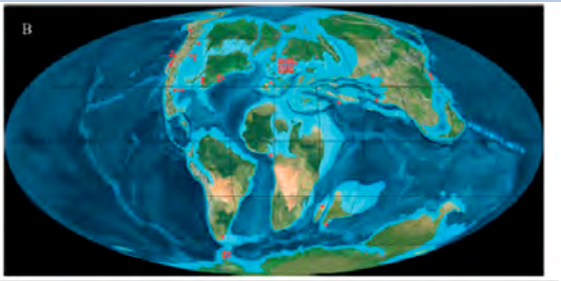
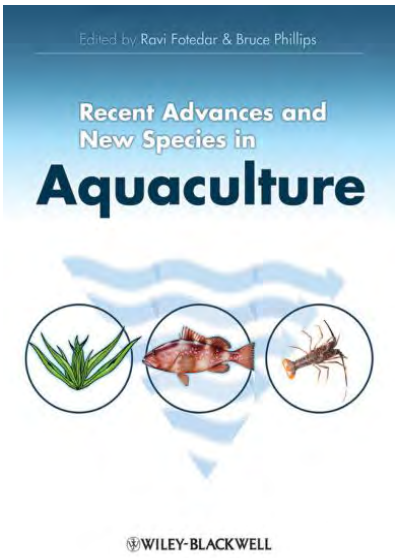


Fig. 66.33. Occurrences of fossil lobsters of Nephropidae plotted on Late Cretaceous (Turonian, 90 mya) paleogeographic reconstructions (Blakey 2006).

Recent Advances and New Species in Aquaculture

Ravi Fotedar, Bruce Phillips



This comprehensive, up-to-date text delivers the latest must-have information on species new to aquaculture and documents the most important technological innovations of the past decade.

Every aspect of the growing field has been addressed with coverage spanning recent technological development, new species, recent changes and global trends. More specifically, you will find information on the culture of species such as barramundi, cobia, dolphin fish, spiny lobsters, slipper lobsters, mud crabs, penaeid prawns, Nile tilapia, yellow king fish, abalone, sea cucumber and sea urchin, seaweed, ornamentals and Indian major carps, fugu, mud skippers, cephalopods and blue fin tuna.

The technological innovations and introduction of new species into aquaculture are critical to the evolution of the global aquaculture industry; an industry which is rapidly becoming one of the fastest growing in the world, having experienced huge advances across its many and diverse facets. *Recent Advances and New Species in Aquaculture* focuses explicitly on the ever-changing face of aquaculture, providing core scientific and commercially useful information on the remarkable growth in aquaculture production and in the advancement of new technological tools.

Written by many well respected international figures and drawn together and edited by Ravi Fotedar & Bruce Phillips, this exciting book is an essential purchase for anyone involved in or about to enter into the aquaculture industry.

Libraries in all universities and research establishments where aquaculture, fish biology, aquatic and environmental sciences and fisheries are studied and taught will find this an important addition to their shelves.

Recent Advances and New Species in Aquaculture is sure to become a key companion for all those studying aquaculture and a valuable source of reference for all personnel involved in the industry.

ISBN: 978-1-4051-7664-4
Hardcover | 416 pages |
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September 2011

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RESEARCH NEWS

Slipper lobster fishery in Sri Lanka

From: D.S Jayakody

There exists a small scale slipper lobster fishery in Sri Lankan coastal waters extending up to a depth of 30 meters. *Thenus orientalis* dominates the catch and its contribution to the total slipper lobster production is around 90%. With the declining trend and increased prices paid for spiny lobsters, this subsistence fishery is now emerging. Major fishing areas are the north and eastern coasts. Some catches are coming from Negombo, Chilaw and Kalpitiya areas of the west and north - western coasts. Annual production is around 50 to 75 metric tons, which is used for export and for the use of local tourist hotels. Slipper lobsters are caught as a by-catch of other demersal fisheries. They are caught by trawl nets targeted for shrimp or by bottom set gill nets set for shrimp and other demersal fishes. Due to the increased demand for slipper lobsters, fishing effort shows an increasing trend especially in north and eastern coasts. Lobstermen sell the lobsters to buy their other daily household needs. The only regulation applicable to the slipper lobsters is the ban on harvesting berried females. Although it is an export-oriented fishery, stock sizes are not known and fishers continue to harvest the resource from the wild. The slipper lobster resource was not previously harvested heavily from the north and east coasts due to the unrest that prevailed there for the last twenty-five years. With the settled situation prevailing for the last two years, fishers are harvesting this resource along with the other coastal resources without considering the sustainability.

Under the funding of the IDRC, a project was initiated to collect information on the fishery, biology and socioeconomics of fishers who are engaged in lobster fishing (spiny and slipper). Researchers realized the need for monitoring the resource-harvesting pattern to ensure sustainability. Accordingly the researchers plan to advise the decision makers on a minimum legal size which is lacking at the moment for the slipper lobster fishery. The author wishes to thank the International Development Research Centre, Canada for providing funds for the above study under the project "Promoting Rural Income from Sustainable Aquaculture through Social Learning in Sri Lanka".

Prof. D.S. Jayakody
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Makandura, Gonawila (NWP), Sri Lanka.

Genetic codes revealed

From: Daryl Sykes

The New Zealand rock lobster (*Jasus edwardsii*) is a culturally, economically and ecologically important species that represents New Zealand's most valuable marine species export. The rock lobster fishery is managed within the Quota Management System (QMS), with the Total Allowable Catch (TAC) being approximately 3395 tonnes per year across the North, South and Chatham Islands. The export market for this species is worth over NZ$224 million a year.

A collaboration between the NZ Rock Lobster Industry Council (NZ RLIC) and the Victoria University of Wellington (VUW) has developed a panel of microsatellites markers for rock lobster, and characterized the genetic structure of four populations. These markers have now been tested and were developed with the aim of examining source-sink dynamics and identifying patterns of genetic connectivity between populations.

VUW and the NZ RLIC have now compiled a second and more ambitious project proposal to expand on initial results and to characterize the genetic structure of rock lobster populations in each of the nine management areas.

The proposed new work will include:

1) DNA extraction of rock lobster samples from multiple sample sites within each management area
2) Amplification of the ten microsatellite markers with polymerase chain reaction
3) Genotyping of all 10 loci for the individuals sampled
4) A combined analysis of this new data with the existing data that have been previously collected

The primary aim of this project is to develop a series of molecular markers for southern rock lobsters, and use these markers to characterise the genetic structure of multiple populations. By measuring connectivity or linkages between populations information will be used address the issues and needs identified by the industry.

These issues include but are not limited to the consideration of differential minimum legal capture sizes; redefining existing management area boundaries – with both sub-division and amalgamation being possible options; establishing appellations of rock lobster products; and incorporating DNA technologies to traceability protocols if the need arises to implement those to satisfy export market requirements.

Dr James Bell at VUW will be the project leader. He will contribute expertise in marine ecology and population genetics gained from 13 years experience in these fields. He has published over 100 papers, scientific reports, and technical papers since 2000. He is currently co-Principle Investigator in a relevant large Ministry of Fisheries population genetics project and leads a group of 15 postgraduate research students. Dr Bell had his research achievements recognised in 2010 with a VUW Research Award.

The project will be directed by a small steering committee comprising Dr Bell, NZ RLIC Executive Officer, Daryl Sykes, and two of the NZRLIC Board members.

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Marine Stewardship Council certification of the western rock lobster fishery of Western Australia

From Rhys Brown

The Western Rock Lobster Fishery (WRLF) has completed its third five-year recertification in March 2012. The recertification process was conducted by Scientific Certification Systems and the final report has been put on the MSC's website. The fishery was the first fishery certified by the MSC and it takes the MSC's certification to March 2017.

Three conditions have been set for the fishery's continued certification:

1. That well-defined and effective harvest control rules are put in place. As a first step to meet this condition, a Harvest Strategy and Decision Rules Discussion Paper has been released for public comment.
2. That relevant data is collected to support the harvest strategy and it is clearly shown how it will be used to inform/assess the harvest strategy. This has been done in the latest WRLF Stock Assessment Report:

http://www.fish.wa.gov.au/docs/frr/frr217/frr217.pdf

3. That sufficient reliable information on the spatial extent of the fishery has been collected to identify the nature of the impacts of the fishery on different habitat types. Information on the spatial extent of both the key habitats and the associated fishing effort will have to be provided. A new project involving large-scale habitat mapping and computer enhancement is being undertaken by Department of Fisheries and two Universities to address this condition.

The above conditions must be completed by the time of the fishery's second annual audit in December 2013.

The WRLF's MSC recertification report can be found at: http://www.msc.org/track-a-fishery/certified/south-atlantic-indian-ocean/western-australia-rock-lobster/2nd-reassessment-downloads

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Red and green spiny lobster populations in Brazil: a sampling program.

From: Raúl Cruz

Spiny red lobster (*Panulirus argus*) and green lobster (*Panulirus laevicauda*) support a large commercial fishery in Brazil. Currently the artisanal fishermen have used different legal models of baited rectangular traps called manzuá or covo (one side entrance) and cangalha (two or three side entrances), all woods coated with wire or nylon mesh. Many illegal models of gill net (called caçoeiras) are still used to catch lobster (Moura, 1963). Since 2000, different designs of artificial shelters called "marambaias" (constructed with materials of opportunity) which are illegal, were introduced in the Northeast lobster fishery grounds.

Figure 1 Artificial shelter called marambaias in a lobster fishing ground in Brazil. The drawing is a free composition by the author to illustrate a shelter drum grouped in layers that will be colonized by lobsters.

In lobster traps, associated fauna is diverse and consists mainly of fish, mollusks and invertebrates (Ivo et al., 1996), constituted mainly by several species of slipper lobster (*Scyllarides brasiliensis*, *Scyllarides delfosi* and *Parribacus antarcticus* (called sapatas lobster) that are caught incidentally in low abundance.

The lobster distribution on the continental shelf of Brazil is located in south western Atlantic between Amapá (04° 26' N 51° 32' W) and Espírito Santo (21° 17' S 40° 56' W) state (Fig. 2). The fishery grounds occur in northern (Amapá and Pará state), northeast (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia state)

and southeast (Espírito Santo state). The northern region of Rio de Janeiro (20 ° 17 'S and 40 ° 14'W) ends the spatial distribution of spiny lobsters.

Figure 2 Map of Brazil showing the distribution of coastal states that fishing lobster: Amapá (AP), Pará (PA), Maranhão (MA), Piauí (PI), Ceará (CE), Rio Grande do Norte (RN), Paraíba (PB), Pernambuco (PE), Alagoas (AL), Sergipe (SE), Bahia (BA) and Espírito Santo (ES). The broken line shows the principal area that fisherman using artificial shelters called "marambaias".

Lobster habitat is widespread with a substrate of reef formations and calcareous algae (Countinho and Morais, 1970) at depths from 1 to 50 m. However in the north region Silva et al. (2003) report a developing lobster fishery in a deep area between 50 to 100 m, and this stock is composed of large-sized lobster (Silva et al., 2008) up to 175 mm (CL). Cruz and Bertelsen (2009) reported that larger females brood more eggs than smaller females, and female lobsters larger than 120 mm (CL) produce >1 million eggs. Fishing larger lobster in deep water reduces the most reproductively important individuals, depresses the population and the reproductive potential of species.

In shallow waters, more than 50% of the lobsters (red and green) that are captured in traps and gill nets are sublegal, and egg-bearing females are sold on the black market (Cruz et al., 2011). This practice is causing a high level of growth overfishing, which occurs when lobsters are harvested before they can reach a reasonable size.

A decrease in the number of sublegal lobsters (<5%) caught by fishermen, could increase the length at first capture, the yield per recruit and catches, as demonstrated in the Cuban lobster fishery by Cruz et al. (1991). This fishing scenario is probably one of the determining factors in the change and the decline in landings of lobster species in Brazil.

The Brazil fishery has been regulated for more than a half century, but control measures are inconsistent in the fishery and law enforcement is often ineffective. From 1965 to 1993, the number of gear by type and years was compiled for region and state. The recorded operation by boat and months was divided into catch (kg) and number of gear checked (unit of effort) by the fishers. In the same period biological sampling data (lobster length composition) was undertaken in coastal landed and fishing industry enterprises. Unfortunately, since 1993 this important biological data was not collected.

Recent genetic evidence suggests that the population of *Panulirus argus* in the Caribbean Sea and the continental shelf of Brazil are genetically and ecologically different (Diniz et al., 2005). The sea coast of Brazil has several lobster populations, commercial (*P. argus, P. laevicauda*) and noncommercial (*Panulirus echinatus*, and some species of *Scyllaridae*), that do not depend on foreign transmigration of larvae, have a closed geographic access and do not have country neighbors that fish lobster in its continental shelf.

A sampling methodology and a reliable database of the fishery has been proposed in new book. This methodology takes into account that lobster recruitment (pueruli) is caused by a single source (Cruz et al., 2011), the wide distribution of lobsters covering an area of 356 610 km² to isobaths of 100 m (Cruz et al., 2011), and the absence of a sampling system in the sea to collect information of the life cycle of lobsters and fishery parameters.

The book on the proposed methodology was published in Portuguese and Spanish.

We opened the book with a presentation of the Banco do Nordeste do Brasil S.A., who was the sponsor of the book, the Preface and a brief Introduction. Then, a bibliographic review of 50 years of research on the lobster population which began with the founding of the Institute of Marine Sciences (Labomar) in Fortaleza city, State of Ceará. Its founder was Professor Dr Melquíades Pinto Paiva and current director Professor Dr. Luis Parente Maia.

We examine the following aspects: The database used, an analysis of the landing (municipalities and state), seasonality of the catch of lobster (red, green and Scyllaridaes), methodology for sampling: adults, pre-recruits, juveniles and puerulus; in these chapters we discuss and propose a stratified random sampling, the sample size and fishery indices. Good information is given of the lobster industry and how it will be used in population dynamics. In particular, it gives exploratory information about the oceanic process and the recruitment variability.

Furthermore, considering that this book is aimed at different sectors of society, it includes various aspects of external and internal anatomy of lobsters, great photos of the species caught, the techniques used to measure the lobsters and how they should organize the catch and effort statistics.

The book ends with a discussion and consideration of the aspects reviewed. The book is bilingual, allowing a wide dissemination of its results in the two main lobster fishing regions most economically important, Western Atlantic and Brazil, consisting mainly of speakers of the language regions bordering between Spanish and Portuguese.

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Are rock lobster larvae gourmets or gluttons?
Neither! New research suggests that larvae live in a nutritional poorhouse

From: Anya M. Waite

At the start of our study on western rock lobster (*Panulirus cygnus*) larval nutrition in the eastern Indian Ocean, we originally posed the question "Are rock lobster larvae gourmets or gluttons?", but initial results suggest that except for when rock lobster larvae find tidbits of their favourite food, they are in fact living on the nutritional equivalent of gruel in the poorhouse. The FRDC-funded project "*Biological Oceanography of Western Rock Lobster Larvae*" (2010-2013) has yielded some key new insights into how the larvae, the *phyllosoma*, feed in the wild.

Our first published journal paper, just accepted in the international journal *PLoS One* (Saunders et al., 2012), indicated that late stage phyllosoma have a marked preference for arrow worms, or chaetognaths (Fig. 1), above other prey such as krill and salps. However the prey field suggests that they may contact chaetognaths only rarely (Säwström et al., in preparation). Further, genetic analyses indicate that many phyllosoma are in fact starving, such that prey densities may be critical determinants of phyllosoma health (O'Rorke, submitted). Between high-quality prey encounters, surprisingly, phyllosoma have been seen to consume jellies that may not have great nutritional value, the colonial radiolarians. This is the first time these organisms have been detected as phyllosoma prey.

Cruises in July 2010 and August/September 2011 targeted waters from 111° E to 115° E and from 28° to 33° S. We found phyllosoma at the surface (primarily at night) in almost all waters west of the core flow of the Leeuwin Current

(which moves along continental shelf break). We have noticed that Leeuwin Current waters form thin warm layers on the ocean surface, sometimes reaching far offshore. Beneath this warm layer is salty warm water from the central Indian Ocean, only slightly cooler than the Leeuwin Current itself. Surges and instabilities in the Leeuwin Current moving against the rotation of the earth set water in wide circular motion forming rotating water masses known as eddies which can be up to 200 km in diameter and last for up to a year as they move slowly west across the Southern Indian Ocean. The eddies can impact concentration of prey for phyllosoma.

It is into this complex ocean system that the phyllosoma are released, and here they must make a living. Our work has illuminated that phyllosoma of the Western Rock Lobster are likely to be strongly food limited, and that fluctuations in the ambient prey field will have a major impact on their nutritional state as they move shoreward to settle as puerulus on Western Australian coastal reefs.

Collaborators:
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Peter A. Thompson and Ming Feng – CSIRO Wealth from Oceans Flagship
Andrew G. Jeffs and Richard O'Rorke – University of Auckland

Figure 1. ***Top:*** Freshly caught phyllosoma ingesting their favourite food, an arrow worm, or *chaetognath*, at sea July 2010. ***Bottom***: newly hatched puerulus emerged from stage IX phyllosoma in ship-board tank, July 2010 Field of view is approximately 6 cm in width. Photos: Megan Saunders.

Nikolas Sachlikidis – Department of Primary Industries, Queensland
Christin Säwström[1], Megan I. Saunders[2], Anya M. Waite and Eric Raes – University of Western Australia
Nick Caputi and Simon de Lestang – Department of Fisheries, Western Australia
Roger Barnard – Lobster Harvest, Fremantle Western Australia
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Robot Army: A cost-effective approach to mapping lobster habitats?

From: Matt Pember, Simon de Lestang, and Dirk Slawinski

A thorough appreciation of the nature and extent of the habitats a fishery operates across, and possibly impacts upon, is fundamental to the effective implementation of ecosystem-based fisheries management. Understanding the relationships between benthic habitats and the species they support not only allows managers to control against any potentially undesirable impacts on habitats, but permits management to be more adaptive and spatially explicit. The significance of reliable habitat information to sustainable management is highlighted by the fact that such knowledge can be considered a prerequisite for fisheries seeking to obtain, or retain, third party certification. In the case of the western rock lobster, *Panulirus cygnus*, current and recently completed projects have made considerable contributions toward understanding the relationships between the exploited species and the habitats that support it. For example, Bellchambers et al. (2010) illustrated the importance of kelp and sessile invertebrates in structuring lobster demographics. More recently Hovey et al. (2012) refined models and were able to predict lobster occurrence based on fine-scale geophysical and geomorphic variables. Those studies, both in deep water, were based on fine-scale knowledge of habitats derived from hydro-acoustic and video surveys. The drawback of such studies is that they are very expensive and time consuming, which causes these studies to be both spatially and temporally discrete. Currently, areas mapped at high resolution represent <1% of the western rock lobster fishery and is the result of three large scale expensive studies. The adoption of a more broad-scale approach to mapping the distribution of habitats in the fishery was needed.

A new project funded by the Australian Fisheries Research and Development Corporation (FRDC 2011/21) aims to accomplish this through the development and trial implementation of a cost-effective tool for the ongoing collection of geo-referenced environmental information by fishers. The concept arose from realisation that opportunities exist for greater industry involvement in collection of oceanographic and habitat data. Commercial rock lobster fishers are setting pots in benthic habitats on a daily basis and low-cost technologies are now available that have the potential to give them the ability to collect geo-referenced, high resolution habitat data. Information could be collected across a broad spatial scale, i.e. across the extent of the fishery, with no added cost or interruption to their fishing operation. The cost effectiveness of this system is the product of an innovative use of relatively inexpensive

technology and the direct involvement of stakeholders in data collection.

The project centres on the development and implementation of small, fully-programmable waterproof units (called POTBots) which can be mounted inside a lobster pot. POTBots are programmed to record video of benthic habitats each time the lobster pot is deployed and log temperature data when the pot is on the bottom and positional information when on the surface. POTBots records video during a pot's descent which provides both a wide view (~20-100 m^2) of the habitat when the pot is still in the water column and then a closer up view of the surrounding few meters when the port has settled on the bottom. A working prototype has now been developed and ten units deployed with participating fishers are already beginning to provide information on the composition and spatial distribution of benthic habitats targeted by the fishers across different parts of the fishery and fishing season (Fig. 1). Wide and continuous deployment of systems throughout the fishery will allow researchers to quantify how such relationships change with latitude and depth and vary temporally. The aim for the current fishing season is to build-up 50 units with 40 being deployed at any one time.

In addition to mapping habitat, POTBots are capable of collecting a range of other important data including spatial information on salinity, water temperature, depth and the relative abundance / species composition of finfish. For example, many commercial and recreationally important fish species are attracted to lobster pots and preliminary trials suggest estimates of relative abundance could be generated through analysis of longer or additional videos captured during each pot deployment (Fig. 2).

Ultimately, increased understanding of the way habitats influence the demographics of exploited species and the development of a continuous system of monitoring habitat changes will enhance the capacity of fisheries management to adapt to issues such as climate change. While the project concentrates on the fishery for the western rock lobster in a proof of concept study, the technologies have far wider applications, particularly for small or data poor fisheries.

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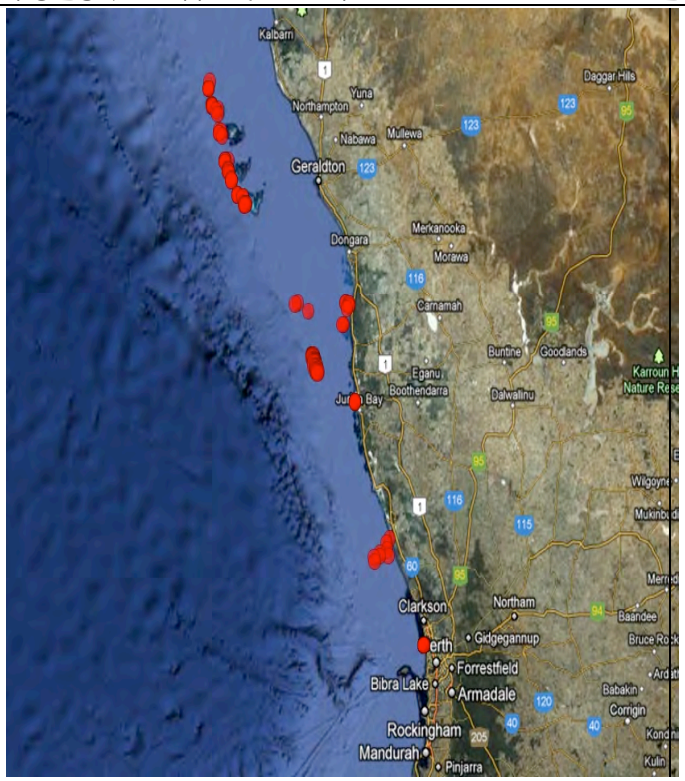


Figure 1. Spatial distribution along the west coast of approximately 150 successful POTBot deployments made during field trials onboard commercial and research boats. For each deployment, information on benthic habitats has been collected and positions are based of GPS information recorded by the prototype units.

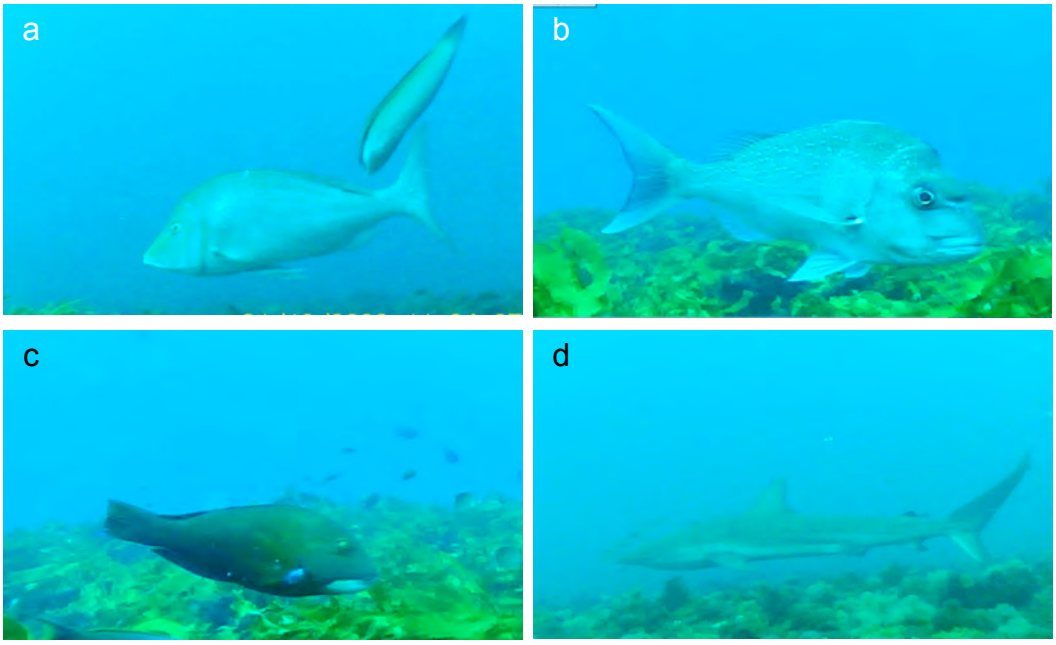


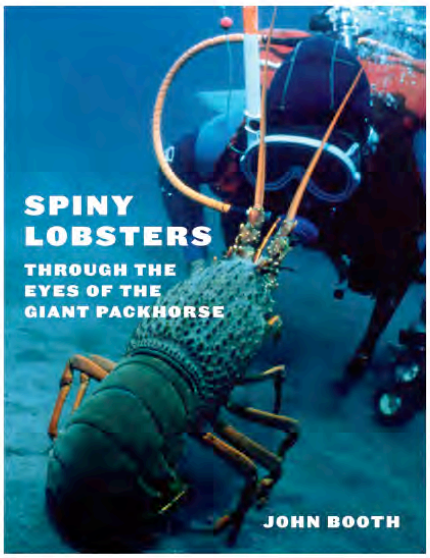
Figure 2. Screen shots from videos captured by POTBot cameras deployed at the Houtman Abrolhos Islands illustrating commercially and recreationally important finfish species and associated habitats; a) Spangled Emperor, *Lethrinus nebulosus*, b) Pink Snapper, *Pagrus auratus*, c) Baldchin groper,*Choerodon rubescens*, d) Dusky whaler, *Carcharhinus obscurus*.

BOOK REVIEWS

"SPINY LOBSTERS – Through the eyes of the giant packhorse."

By John Booth
Victoria University Press 2011

From Jim Penn



As one of the world scientific authorities on lobsters, Dr John Booth was in a unique position to create this very informative account of the life history and fisheries for the giant packhorse lobster and related spiny lobster species. Having been the leading lobster scientist in New Zealand since the early 1970s and recently retired, he has now used his freed up time to combine an extensive scientific knowledge on spiny lobsters with a wealth of useful anecdotal information from fishermen friends and research colleagues to create this very useful and easily read volume. Throughout the book, the focus is mostly on the giant packhorse lobster, which is the largest spiny lobster known, but usefully deviates into the lives of other spiny lobsters to make the content applicable to all readers generally interested in spiny lobsters and their fisheries. By taking this approach John has been able to effectively condensed the large array of scientific literature on spiny lobsters into a manageable sized single volume, which provides the reader with an easily understood overview of the complex biology and fisheries for these internationally important marine species.

Chapter 1—Wide wanderings: explains the highly developed migration behaviour of the packhorse and related species, which can result in movements covering hundreds of kilometers and immediately captures the imagination to provide an intriguing start to the lobster story. The significant movements of the giant packhorse and other spiny lobsters, through to the "unusual" movements resulting in spectacular mass stranding of *Jasus lalandii* in South Africa are described and explained. This provides the reader with an understanding of the highly developed behaviour of these apparently sedentary species, which is essential to the understanding of the fisheries for these species and particularly critical for scientists undertaking stock sampling and the analysis of lobster fishery data.

Chapter 2—So just what are packhorse? provides an intriguing insight into the historical taxonomy of the giant packhorse back to the 1800's, before expanding to cover the taxonomic relationships between all of the spiny lobster species found throughout the worlds oceans. The evolutionary development of spiny lobsters and the relationships between all of the generic groups found around the world is also discussed.

Chapter 3—Presence and Absence: covers the distribution and habitats of the packhorse lobster in New Zealand and eastern Australia then expands to chart the distribution of all of the world's spiny lobsters and some related species. This chapter also includes information on the stocks and fisheries for some spiny lobsters which are only found on isolated

seamounts through the southern oceans. This chapter records the spectacular initial catches obtained from these stocks, which resulted in international conflicts. Personal accounts from some of the fishermen involved in these lobster "wars" adds useful context to this "exciting" phase of spiny lobster fisheries development.

Chapter 4—Bizarre beginnings: brings to life the unusual planktonic early life history stages of lobsters through to the unique puerulus non-feeding stage which settles back onto the coastal habitats occupied by the juveniles and adults. Numerous photographs and diagrams are provided to illustrate these stages of the life history and include practical guide to identify the larvae of different lobster genera. A key to distinguish spiny lobster puerulus from similar looking marine species provides a useful guide for scientists new to the field. This chapter also provides an expert overview of the oceanographic processes affecting larval migrations and the critical factors influencing the behaviour and settlement of the packhorse and other species pueruli in coastal habitats.

Chapter 5—A closer look at packhorse: provides a detailed description of the largest spiny lobster including some humorous anecdotes on the perils of researching this giant lobster species. The chapter includes a detailed description of the packhorse anatomy which readers will also find is generally applicable to other spiny lobster species.

Chapter 6—Daily routines: deals with the general biology, behaviour and ecology of packhorse lobsters from the juvenile stages through to the adults with their extensive migratory behaviour. This behaviour and its relationship to predation, feeding (including cannibalism) and natural mortality are outlined in useful detail, including the significant impacts that these lobsters can have on their habitat. This explanation of the keystone predator role of packhorse lobsters, although probably not applicable to spiny lobsters generally, provides a useful insight into the ecological impact of these remarkable species in the cold-water habitats that they occupy.

Chapter 7—The pageant of fishing: describes the fishing for packhorse and includes anecdotes from the fishermen who have specialised in catching this unique species over the history of the fishery. Also covered is the traditional fishing by the Maori and the fishing methods and gears used, by the recreational and commercial fisheries. The chapter also provides a short but detailed history of the packhorse fishery and a brief overview of fisheries and methods for capture of spiny lobster generally.

Chapter 8—Managing the fortunes of fisheries: summarises the performance of management of some *Jasus* lobster fisheries and highlights the pitfalls of assuming that stock levels can be maintained by good management alone. A useful overview of the impact of large-scale oceanographic processes on spiny lobster recruitment generally is also provided. The chapter also contains a concise summary of the management systems used for spiny lobster fisheries and the stock assessment data and methods used to support management. The overview of the puerulus based catch forecasting systems available for a number of spiny lobster fisheries provides a particularly useful introduction to this aspect of fisheries science, which has become a key component to sustaining many spiny lobster stocks.

Chapter 9–Impacts of fishing: provides observations on the impacts of fishing on the New Zealand lobster stocks and their environment and suggests marine protected areas be used as one of the tools to manage these impacts. The extrapolation from these specifically New Zealand situations to lobster fisheries elsewhere is more tenuous and the views expressed are more philosophical. These generalizations may be challenged by expert readers, however the chapter overall provides a useful checklist of the array of environmental issues facing lobster fisheries both in New Zealand and elsewhere.

Chapter 10—Green fingers: covers the development history of lobster aquaculture systems and the possibilities for enhancement of spiny lobster stocks. A very good synopsis of the current state of the "art" of lobster

aquaculture has been provided based on Johns close involvement with the pioneers in the field of spiny lobster aquaculture, particularly Jiro Kittaka and his aquaculture colleagues in NIWA. The commentary provided is particularly informative being from the perspective of someone with a comprehensive biological understanding of lobsters as well as a good grasp of aquaculture technology. The chapter also provides short overview of lobster enhancement including information on the developing grow out of wild caught tropical spiny lobsters in Vietnam.

Chapter 11—The final Chapter: relates to the markets for spiny lobsters and how they have developed over time. The overview of current markets and fundamentals of lobster handling should be required reading for all new lobster fishers who need to deal with live lobsters catching or transport and has been written in non technical terms suitable for this audience.

In summary, the book provides a valuable overview of spiny lobsters biology and fisheries, which has been made both interesting and entertaining to read, through its primary focus on the larger than life giant packhorse lobster. Numerous anecdotes about the fishermen and research characters involved with spiny lobsters add further interest throughout the volume. The book is well referenced for the dedicated scientific reader, but has also been written in an engaging non-technical style, with numerous illustrations to make the complexities of the lobster life history easier to comprehend for the wider audience for whom it is intended. That said, the book should be mandatory background reading for all new scientists entering the field of spiny lobster research and before they start delving into the large volume of detailed scientific literature on these valuable species.

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"Chemical Communication in Crustaceans"

By Thomas Breithaupt and Martin Thiel (eds.)
Springer-Verlag, 2011.

Lobsters depend on chemical information for many of their vital behavioral and ecological functions: from pelagic settlement to feeding and mating. The recent publication of "Chemical Communication in Crustaceans" provides a comprehensive summary of the advances in this field where lobsters have played an important role and continue to be model organisms. The main focus of this edited volume is on broad understanding of biological and physical principles that can lead to practical applications in management, aquaculture and chemistry.

While perfumes and flavor enhancers have been part of human culture for millennia, scientific research in Chemical Communication took off in all earnest with the identification in 1959 of the silkworm moth sex attractant "Bombykol", the first pheromone to be chemically and biologically identified. Research of Crustacean pheromones followed a decade later. To date, after half a century, hundreds of pheromones have been identified in insects but still very few in crustaceans. Yet a vast amount of information has accumulated about the existence and behavioral function of chemical signals in these primarily aquatic arthropods. This body of information has been assembled in 565 pages in the 2011 book "Chemical Communication in Crustaceans" by its editors Thomas Breithaupt and Martin Thiel, with illustrations by Jorge Andres Varela Ramos and published by Springer Verlag. The 27 chapters are organized into 5 parts; the first 2 chapters are an introduction by the editors and a discussion of pheromones and behavior; 6 chapters address signal and receptor properties; 10 chapters deal with behavioral functions in the best known model crustaceans; 6 chapters report on chemical identification; and the last 3 chapters consider applied

aspects, including aquaculture, pollution and lessons from insects. Each chapter ends with a list of pertinent references and the book concludes with an extensive and useful index.

Individual chapters typically focus on a model species and provide insight into the specific role of chemical signals in the life of the species with its phylogenetic and ecological constraints. For example, the chemical world of a copepod is pelagic, small-scaled, brief and specific; the world of a lobster is primarily benthic, large-scaled, long-lived and more complex; the chemical world of a robber crab provides an exceptional case by becoming terrestrial. Collectively, the various "stories", including the exceptions, provide a fascinating window into the underwater world of chemical communication. They bring to life the otherwise inaccessible complexity of odors dispersing under water in streams and ocean currents, in quiet muddy bottoms and wave-battered rocks. Together they paint a picture of flashes of chemical information that surround each individual and allow it to select the ones for which it has sensory filters while ignoring other signals that may play a role in the Umwelt of other species. Even in the more familiar aerial environment of humans the chaotic distribution of complex mixtures of odors is difficult to comprehend. The book therefore is a must-read for all interested in the inaccessible world of chemical signals and, specifically, the underwater world.

The chapters are lucidly written by the outstanding experts in the field. Their texts flow easily, avoid unnecessary jargon and supply useful and often beautiful illustrations. Unfortunately, many of the grey scale photographs are of very low resolution, e.g. histological sections, photomicrographs. The latter may be the weakest aspect of this otherwise excellent book. Interested readers will need to go to the original publications for visual details.

The most remarkable aspect of this edited volume is the integration of information with extensive cross-referencing between chapters. Each chapter not only presents the usual and required in-depth coverage of research focused on the authors' expertise, but also includes a brief introductory section showing a historic perspective of the authors' research interests. This welcome addition creates further linkage between chapters and gives the (correct) impression of a community of crustacean researchers who collectively have achieved the state of the art represented in this volume. Integration extends to the referencing of other related fields. As the editors point out in their introductory chapter, crustacean publications in this field tend to cite more fish (shared aquatic habitat) and insect (shared phylogeny) papers than the reverse. One might hope that this broad-minded tradition will continue and perhaps inspire broadening the perspective in other fields.

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Contact Nick Caputi (southern hemisphere) or Rick Wahle (northern hemisphere) about article submissions and inquiries or corrections to the Lobster Newsletter mailing list.