

The Lobster

NEWSLETTER

RESEARCH NEWS

Lobster Research in New Caledonia

From: Emmanuel Coutures

I am doing a Ph.D. on the population dynamics of palinurid and scyllarid species in the New Caledonia lagoon so that we can better develop and manage these fisheries. My study is in the South Province of New Caledonia and is under the direction of Professor C. Chauvet, Laboratoire d'Etude des Ressources Vivantes et de l'Environnement Marin, French University of the Pacific.

We have five common species of *Panulirus*: *P. longipes femoristriga* (long-legged spiny lobster), and *P. penicillatus* (pronghorn spiny lobster) live on the outer reefs and are fished commercially; *P. versicolor* (painted spiny lobster), and *P. ornatus* (ornate spiny lobster) live in more protected areas such as inside reefs and in lagoons, and are fished mainly by recreational fishers. *P. homarus* (scalloped rock lobster) is found in only one small bay (just 200 m long), the only bay where waves act on rock with no coral cover. As well, there are also two other common species of scyllarid: *Parribacus caledonicus* (butterfly lobster) and *Scyllarides squammosus* (slipper lobster).

All these palinurids and scyllarids are caught by hand, usually at night.

My study focuses on the ecology of the early life-history stages in the plankton in bays near Noumea, by sampling at night with a 100 cm x 70 cm mouth net (250 µm mesh). In 60, 15 minute night hauls at two depths (surface and 5 m), 55 phyllosomas were captured, most of them scyllarid.

Several pueruli collectors (Witham, Booth crevice, Serfling and Ford, and others of my own design) have been placed around islets and along bays in the lagoon - but no pueruli were caught. We also found juvenile spiny lobsters in the same general area as the adults. The exception was *P. longipes femoristriga*

which was found only in bays or in the harbour (on a ship's hull). We are working with fishers to obtain estimates of CPUE, distribution of species, and lobster activity patterns. Recently purchased tracking equipment will be used to study feeding behaviour and diurnal rhythms of *P. longipes femoristriga*, *P. penicillatus* and *S. squammosus*.

Emmanuel Coutures
LERVEM

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RECENT EVENTS

Oil Spill In Rhode Island

FROM: Stan Cobb and Michael Clancy

It was a Dark and Stormy Night when, on January 19, fire broke out in the engine room of a tugboat towing a barge carrying 3.9 million gallons of No. 2 fuel oil. The seas were estimated at 5-7 meters, whipped up by gale force winds of up to 50 knots when the barge went adrift and came ashore on a beach fronting a wildlife sanctuary in Rhode Island, USA. Over the next 24 hours or so approximately 825,000 gallons of fuel oil leaked from the damaged barge and into the surrounding waters. The Department of Environmental Management (DEM) immediately closed the area nearby the barge to commercial fishing. Of particular concern to the DEM was the impact on the lobster fishery, in part because of the large number of dead lobsters that had washed up on the beach. Preliminary estimates suggest that perhaps a million lobsters were stranded. For several months after the spill a large area remained closed to lobster fishing because smell and taste tests showed some of the lobsters to be tainted with oil.

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RESEARCH NEWS

Lobster Phylogeny Project Update - Spring 1996

From: Michael J. Childress, William F. Herrnkind, and Ray W. George

The Lobster Phylogeny Project (LPP) was created to provide a better understanding of: (1) the phylogenetic relationships of lobsters, (2) the origins of population variation and speciation, and (3) the patterns of variation in life history traits and behaviours. It facilitates these goals by maintaining a lobster DNA library from samples collected around the world, which can be made available to anyone interested in lobster systematics or population genetics. In addition, the LPP will occasionally arrange workshops on these research topics.

In September 1995, a LPP workshop was held at the Keys Marine Laboratory in Long Key, Florida, USA. Participants included Ray George and John Lowe from the Western Australian Museum, Shane Sarver from the University of South Carolina, and William Herrnkind, Margaret Ptacek and Michael Childress from Florida State University. Participants reviewed their current research and discussed topics of common interest.

Over the past three years LPP has requested and received a number of lobster tissue samples from around the world, for which we are grateful. However, there are many populations of lobsters we have yet to add to the LPP DNA collection. We thus ask participants in the upcoming Fifth International Conference on Lobster Biology and Management to bring lobster tissue samples from their geographic region to the meeting in New Zealand. These samples will be added to the LPP lobster DNA collection.

The LPP lobster DNA library includes all types of lobsters including homarids, palinurids, scyllarids, and synaxids. When preparing the tissue samples please follow these very simple directions:

1. Collect live individuals from each species and/or sub-species of lobster in your area (frozen individuals can be used as long as they were frozen fresh, but **formaldehyde preserved individuals will NOT work**);
2. Remove two walking legs (preferably legs 2, 3, or 4 since walking legs 1 and 5 are sometimes valuable taxonomic characters. If the legs are too big for a 50 ml container send only a segment or two.);
3. Place each pair of legs in a plastic container with a secure leak-proof top;
4. Label the sample carefully (using only pencil on a small slip of paper), species, subspecies (if applicable), sex, carapace length, date and location of collection (be specific, the more information the better);
5. Fill the container with absolute (95-100%) ethanol (use 70% ethanol if absolute is not available and note concentration on container. Please note, the greater the ratio of ethanol to tissue, the easier the DNA extraction; 50 ml per pair of legs is sufficient; and
6. Take a close-up color photograph of the specimen from both a dorsal and lateral perspective (this provides future researchers with a record of morphological characters to compare) after the two legs have been removed.

Interested researchers will be able to learn more about the LPP and the samples available in the lobster DNA library at the phylogeny workshop at the Fifth International Lobster Conference. For additional information about the LPP or requests for sample containers and

ethanol, please contact Dr. Michael Childress at the address below.

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RECENT EVENTS

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Clearly there was a loss to the lobster population. The question was, and is, how large a loss? The DEM, and we at the University of Rhode Island, are working on complementary projects to assess the effect of the spill on the population. DEM researchers are assessing the mortality and size structure evident from lobsters recovered from the beach and projecting long-term consequences. We are attempting to determine the geographical extent, numerical losses, and rate of recovery by sampling the underwater area of the spill.

Two issues are important. First, the amount of mortality caused by the oil, and second, the possible lowered reproductive potential of the population. Fishermen, of course, will feel the impacts of both, but on different scales of time. Most of the closed fishing areas were opened by the end of April, and all were opened by the end of May. The impacted fishermen have filed claims and/or have been compensated for their losses. However, lobsters of all sizes were killed, and it takes an American lobster 5 to 7 years to grow from an egg to minimum legal size in this area. Most of the lobsters washed up on the beach were in the smaller size classes. What will that mean to the abundance of larger lobsters over the next few years?

Since the spill we have been collecting the data needed to answer these questions. We have tended traps with Bob Smith, a fisherman who

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fishes the affected area during the spring, summer, and fall. With other fishermen, we examined the catch of traps in areas where the oil did not reach. While counting the trap catch we also sampled some berried female lobsters and counted their eggs, to make a comparison of clutch size in the impacted area and in control areas. Teams of divers performed censuses, using visual and airlift sampling, to determine the density of lobsters on the bottom near the spill site at control sites away from the spill. This sampling has been done twice, once in March/April, again in July, and will be repeated once more in September to see if we can determine how fast the population recovers. We will use the population density estimates, along with detailed side scan sonar maps of bottom topography to estimate both how many lobsters are present in the area and how many we would expect if the natural lobster density were similar to the density in the control areas.

Lobsters will repopulate the area in two ways — through larval settlement and in-migration of juveniles and adults. We monitored the larval supply in the overlying waters during the summer, and will perform airlift sampling of the bottom to determine settlement strength. We have tagged over 1,500 lobsters, and are beginning to get returns that will help us evaluate movements into and out of the spill area.

We have not collected all the data nor have we analyzed it in any detail. Even so, it is clear that there was a significant effect by the spill on the lobster population in the immediate area of impact. An assessment of the longer term effects will be carried out by Saul Salla, whose expertise in lobster population dynamics is well known. He will integrate the results of the DEM beach survey and our underwater surveys and try to project the long-term losses

to the population. The complementary efforts of a number of people working on this problem will, we hope, lead to a fair and accurate assessment of the damages, and provide the basis for a just restitution of the economic losses.

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Lobster Meeting in Norway

From: Gro van der Meer and John Booth

A meeting aimed to bring together information to better manage the wild fishery and to optimize conditions for wild seeding of laboratory-reared juveniles, was held on the island of Kvitsoy off Stavanger in late May 1995. It provided an opportunity for a large proportion of European workers, studying *H. gammarus*, to meet and discuss lobster fisheries, culture, and seeding. The Norwegian Institute of Marine Research and the Norwegian Research Council were hosts; Norwegian lobster fisheries the focus. Scientists working on clawed lobsters in North America, and on spiny lobsters in other parts of the world, broadened discussions.

Sessions covered reproduction, larval and juvenile ecology, habitat, migration, age and growth, stocks and population dynamics, and culture. As studies of *Homarus* in Norway are not as well advanced as those in North America or the United Kingdom, each session began with a review of the topic, followed by shorter presentations on Norwegian work and general discussion of the topic with respect to Norway. The review papers, along with abstracts of the subsequent presentations, will be published in the Institute of Marine Research report series, *Fisken og Havet*.

It was noted that the decline in Norway's commercial landings, from more than 500 t early this

century to just 30 t, concerns managers; the cause may be recruitment overfishing. Remedial measures have included an increase in minimum legal size, which may have brought about an increase in mean lobster size. The technique of cuticle implantation and the measurement of accumulated fluorescent brain pigments were seen as having great potential for learning more about age and growth for stock assessment.

Mass rearing of lobster to any size is now possible in Norway where more is known of lobsters in culture than in nature. But techniques need to be improved to decrease rearing costs and to allow economic enhancement of wild stocks; larval mortalities in the tanks used in Norway for large scale production are too high.

It is still unknown where and when most settlement of larvae in nature takes place. Fitness of laboratory-reared juveniles for life in the wild is a major issue for enhancement. Use of special (shell sand, oyster spat) substrates in the rearing boxes has led to lobsters developing crusher claws. Acclimation before release, to the conditions which will be experienced in the wild, and maintaining low stress levels, help in the successful transition of the juveniles to life at sea, but further study is required. The best size at which to release lobsters is still unknown as are the best habitat and stocking densities. There is need to discern and then unravel "bottlenecks" to survival of the various life stages. Discussion focused on the cost-effectiveness of direct field observation compared with field manipulation experiments when determining juvenile processes; there is probably need for both. Densities of newly settled lobsters in the wild vary geographically; in New England (USA), they may be as high as 5 m⁻², but estimates for Europe appear to be much lower. In Norway, lobsters have been released at 1 per metre of shoreline.

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The meeting provided useful advice on directions and priorities for lobster research in Norway. We all - Norwegian and foreign - benefited from the exchange of ideas and information.

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FISHERIES AND AQUACULTURE UPDATE

Some Observation on Spiny Lobsters

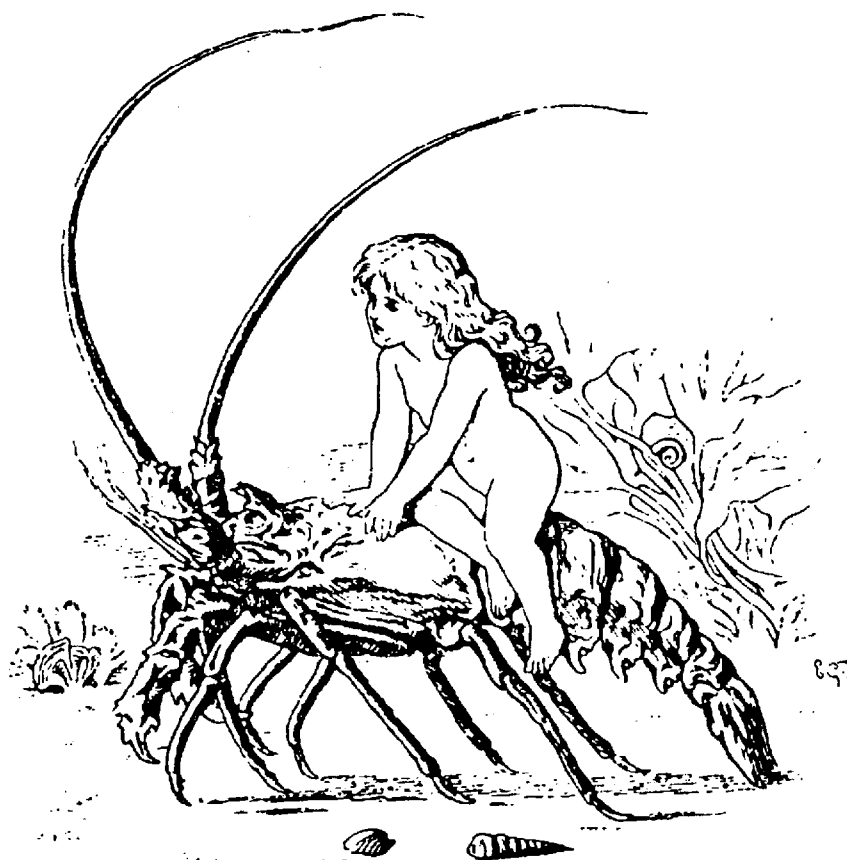
From: Dr. B. Srikrishnadhas and Dr.
Md. Kaleemur Rahman

Personnel of the Fisheries College and Research Institute, Tuticorin, India, have been rearing lobsters for the past eight years. One result has been the development of a commercially viable method of growing spiny lobsters. One batch of lobsters has been maintained for over three years, indicating that spiny lobsters can be maintained in captivity for at least this period of time. Growth, however, was slower after year one. *Panulirus homarus* has

been spawned in controlled conditions. A couple of local companies have taken up the spiny lobster culture, based on the rearing techniques developed in this Institute.

Another interesting observation was the molting of a berried lobster (*P. homarus*). The eggs attached to the molted exoskeleton were examined and found dead. Normally, berried crustaceans do not molt until the eggs hatch, though during unfavourable conditions eggs can be shed without hatching. The reason for this rare phenomenon observed here with this lobster is not fully understood.

Dr. B. Srikrishnadhas and
Dr. Md. Kaleemur Rahman
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INDIA



Patricisa Briones and Enrique Lozano sent the above illustration of their daughter. Actually, Patricia says, it came from Confluencia, but we agree that it probably originally came from Water Babies.

RECENT EVENTS

Lobster Kill in Eastern Canada

From: Les Burrridge

On July 10, 1996 over 80,000 pounds of lobster died at a commercial lobster pound at Back Bay, New Brunswick, Canada. Within two hours of the pound owner noting the first signs of distress, nearly all of the 120,000 pounds of lobsters were either dead or showing signs of stress. All animals were on their backs and those still alive were moribund, except for erratic movements of both claws and legs, suggesting exposure to a toxic substance. The live lobsters

were removed, processed, and, where there were no detectable levels of contaminants, released for sale. One affected lobster was moved to a local laboratory, where it has not yet fully recovered.

Samples of lobster and water were collected within hours of the first deaths being noted. Various labs throughout Atlantic Canada have been involved in testing. Disease and phycotoxins have been ruled out as cause of death, and no chemicals of a suspicious nature were found in tissue samples. Attention has focused on water samples. There was a large amount of macro-algae (*Ulva lactuca*) present under the pound and abnormally high dissolved oxygen

levels were reported, leading to speculation that supersaturation may have played a role in the deaths. Another suggestion is that chemicals used to treat crustacean parasites of salmon ("sea lice") may be responsible. The pound is in close proximity to several salmon aquaculture sites. The case is being followed by enforcement officials in the event legal proceedings are initiated.

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ANNOUNCEMENTS

Lobster Institute Web Site

The Lobster Institute at the University of Maine has developed a Home Page on the World Wide Web, and it is well worth a visit. The emphasis (as you might expect, given its location) is on *Homarus americanus*, but we are sure all sorts of lobster types will be welcome.

Slipper Lobster Book Proposed

Ehud Spanier and Kari Lavalli are interested in producing a book, *The Biology and Fisheries of Slipper Lobsters*. Those who wish to contribute articles (in English) should contact Ehud with tentative titles for chapters.

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Fourth International Crustacean Congress

Fred Schram is organizing the next International Crustacean Congress, to be held in Amsterdam, July 20-24, 1998. The theme of the congress will be "Crustacea in the Biodiversity Crisis". Papers on all aspects of all crustaceans may be submitted. Papers will be organized according to the following subthemes:

Systematics, Evolution, Phylogeny and Paleontology;

Development, Larval Biology, and Life Histories

Ecology and Behavior

Physiology and Biochemistry;

Genetics and Molecular Biology;

Fisheries, Aquaculture, Pollution and Toxicology

For further information, contact:
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An Apology

We inadvertently left out the figure accompanying the article by Pitcher et al., Distribution of Lobster Larvae in the NW Coral Sea, in the last issue of The Lobster Newsletter. The figure is inserted on page 11 in this issue. Our apologies to the authors and to the readers.

New Zealand 1997 Lobster Meeting

Arrangements are proceeding well for the *Fifth International Conference and Workshop on Lobster Biology and Management* to be held in Queenstown, New Zealand during 9-14 February 1997. The Meeting brings together lobster researchers, managers, and industry people from around the world. There will be contributions on all lobsters - clawed, spiny, slipper, and scampi.

A change to timing is that the date for final receipt of Abstracts, the Registration and Accommodation Form, and registration payment has been put back one month, to 31 October, 1996. If you have not received the Registration and Accommodation Form and the Second Circular by now, please contact the Organizing Committee (address below).

The Meeting is limited to 150 full registrants and we already have more than this number of pre-registrations; regretfully, probably not all wanting to will be able to attend. Please get your Registration and Accommodation Forms to us promptly.

The Registration and Accommodation Form asks you to indicate the Workshop Panels you would like to be on. Panelists, and those presenting papers or posters, will have priority in registration.

The venue for the subsequent international lobster meeting will be decided at Queenstown. Tradition has it that the current host country nominates the next. Whether this is the way that the next venue is chosen remains to be seen, but in the meantime, the Organizing Committee would like to hear from any country interested in hosting the next meeting around the year 2000.

The Organizing Committee

*Fifth International Conference on
Lobster Biology and Management*

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REVIEWS

Biology Of The American Lobster, *Homarus Americanus*

Edited by Jan Robert Factor. 1995. Numerous line drawings, half tones and photographs. Academic Press, 6277 Sea Harbor Dr., Orlando FL 32821 p. ISBN 0-12-247570-4. US\$195.00

On the centennial of Francis Herrick's first monograph on *Homarus americanus* it is fitting that an in-depth update of the biology of the American lobster is published. Until now no single volume since Herrick's has provided so much detail on this species. One could argue that Cobb and Phillips' (1980) two volume *Biology and Management of Lobsters* came close, but that was a broader overview of all lobster taxa. In the fifteen years since, much new information has come to light. *Biology of the American Lobster*,

edited by Jan Factor, consists of 18 comprehensive chapters authored by 21 of the best scientists in the field.

The book's chapters might be grouped into four general categories: Chapters 1-4 address life history, ecology, taxonomy and evolution. Chapters 5-8 deal with fisheries management, population dynamics, and aquaculture; Chapters 9 and 10 with reproduction, development, and growth. The remaining chapters give detailed descriptions of the major organ systems, appendages and physiological processes.

Factor sets the stage in the introductory chapter with a basic description of the life history and adult anatomy; Williams then provides a thorough review of the taxonomic history of *Homarus* as well as a cladistic analysis found no where else of the placement of the genus among the nephropid lineages. In Chapter 3, Ennis provides a detailed account of larval and postlarval ecology that is thorough, but might have benefitted from more synthesis. In the fourth chapter, Lawton and Lavalli

provide the most extensive synthesis to date of the benthic ecology of *Homarus*; and in light of much new research on developmental shifts, they evaluate prior schemes of benthic life phases and offer up their own.

In Chapter 5, Miller compiles and explains a detailed timeline of the convoluted history of lobster fisheries management regulations in Maritime Canada and the northeast USA. Fogarty reviews lobster production models in Chapter 6, with tabulated estimates of demographic parameters and evaluates different stock assessment approaches. In the following chapter (7) Cobb points to the need for further behavioral and ecological research to ground-truth population dynamics models. Aiken and Waddy then describe the history of technical advances in lobster culture despite the still unrealized hopes of profitably farming lobsters to full size. On the subject of development, growth and reproduction, Talbot and Helluy describe in Chapter 9 developmental events before hatching and

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express the need to understand the endocrine control of the molt cycle during this period. Waddy, Aiken, and Kleijn detail in the next chapter the interplay of environmental and endocrine controls on growth and reproduction and point to the need to incorporate these complexities into yield per recruit models.

The remaining eight chapters illustrate the often central role *Homarus americanus* has played as a model organism in studies of crustacean functional morphology and physiology. This is especially true of neurophysiological studies: in Chapter 11 Beltz lists the advantages of the *Homarus* model, and describes recent findings in the neuroendocrine control of postural displays and their implications in social contexts. Govind summarizes in Chapter 12 work primarily from his own laboratory on developmental biology of muscles and their innervation, the differentiation of

fast and slow muscle fibers and developmental changes in the tail flip escape response. Atema and Voigt follow with a chapter describing the major sensory systems and particularly the role of chemosensory cues in foraging, shelter use, and social interactions. In Chapter 14 Lavalli and Factor systematically describe the form and function of feeding appendages of each developmental stage, a chapter richly supplied with line drawings and scanning electron micrographs. In the next chapter Factor continues with an equally descriptive section on the structure and development of the digestive system. In Chapter 16 Conklin brings together what is known about natural diets of lobsters and evaluates formulated feeds for use in culture. As indicated by Martin and Hose in the next chapter there has been surprisingly little work on the physiology of the open circulatory system of lobsters despite the experimental advantages of lobsters. In the final chapter McMahon discusses gas exchange and ion regulation. He too notes that *Homarus* has been underexploited as a model organism in respiratory physiology and emphasizes the importance of taking an integrated approach to the study of organ systems because they are often co-regulated.

The editor has done an excellent job of maintaining continuity in format and content. The book is a useful desk reference mainly because many chapters have tables and figures that encapsulate a synthesis of findings. All chapters close with a concise summary, and an extensive list of cited literature. Most have insightful recommendations for future work. There is some redundancy among some chapters, but perhaps that is not avoidable. In any case, there is useful cross-referencing to others chapters where appropriate. The index is detailed and a very useful reference. Black and white photographs are well produced. At \$195 the book may be a bit pricey for many individuals, all the more reason to recommend that your institutional library acquire it. This book is an essential resource for anyone working on lobsters and a useful reference for anyone in marine invertebrate biology. Professor Herrick would indeed be pleased.

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Note from the editors: Academic Press offered a 10% discount on Factor's book to readers of The Lobster Newsletter. Mention the Newsletter and Wanda Rigg's name when you place your order.

CD-Rom Review

Marine Lobsters of the World by L.B. Holthuis. 1994. Updated CD-ROM of the FAO Species Catalog Vol. 13. Springer-Verlag, 175 Fifth Ave., New York City, NY 10010, USA. Macintosh: ISBN 3-540-14198-7; Windows: ISBN 3-540-14197-9. US\$79.00

The newest technology in publishing has been applied to lobster biology with the appearance of an updated and augmented version of L.B. Holthuis' FAO Species Catalog #13 Marine Lobsters of the World. My first reaction was lukewarm; I like the weight of a book in my hands, to turn the pages, stare intently at the drawings, and annotate the margins. But a CD-ROM is different, and the difference is great enough to make it not easily comparable to a paper text. I reviewed the Macintosh version, which requires a 68030 processor and system 7.0 or higher. A Windows version also is available and is essentially the same.

This CD is part of the World Biodiversity Database CD-ROM series set up by the Expert Center for Taxonomic Identification (ETI) at the University of Amsterdam and the Food and Agriculture Organization (FAO). The final product is a result of the efforts of many people at ETI: Dr. C. Fransen updated the descriptions of the taxa, Dr. H. Veldhuyzen made identification keys, G. Gijswijt did the technical editing and B. Peper computerized the data. Dr. Holthuis reviewed the

The **Lobster** NEWSLETTER

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Please send change of address to
John Pringle.

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CD-ROM before publication. The Lobster Newsletter reviewed Holthuis' book several years ago, and the praise at that time is echoed here. The book is excellent, and should be on all our bookshelves. In this review, I'll try to describe how the CD-ROM version works.

Easiest access to the volume is through the species list, which displays species names, common names, or higher taxa. There are 149 species listed, including several that were not in the original volume. A simple click with the mouse on any of these brings you to a "species card" which displays textual description and a line drawing of the species. While in the card, clicking on various symbols will send you to a page showing the taxonomy of the species, or synonyms and FAO names, or a list of the literature cited on the species. Clicking on the media clip symbol brings up a list of drawings, a distribution map, and color photographs. In the more common species, quite a number of images are available. To give one example, under *Homarus americanus*, there are four drawings, one map, and 12 photos. In all, there is a total of 820 drawings and photographs on the CD. The CD uses hypertext, which

allows useful links from text to other sections. For instance, a glossary has been added to the original text, and clicking on a word in a species description brings up its definition in the glossary. If you don't remember which segment of a pereopod the merus is, just click on the word and the glossary pops up with the definition "the middle segment of a pereopod, the fourth counted from either end." While in "merus" I clicked on "cheliped" to bring up a labeled line drawing of a cheliped from coxa to dactylus. Hyperlinks in the text allow you to move rapidly from one section to another without scrolling through the whole text. This is a very useful feature.

Just in case you think you are pretty good at identifying lobsters, the CD-ROM provides a quiz, which (depending on your choice) displays either a line drawing of a lobster species or a distribution map and then offers four choices. A "catcall" is given with each wrong answer; this self-proclaimed lobster buff is too embarrassed to report his score.

I liked the CD, and think it is useful. As with anything new, there are some aspects that are less than optimal. For example you cannot scroll through the reference section and it responds only to one click at

a time. A helpful keyword or two does pop up with each reference to orient the reader, but why are the keywords for the reference to Holthuis 1991 (Marine Lobsters of the World), "*Callinassa biffari*" and "Subgenus *Jasus* (*Sagmariasus*)"? Why not general lobster taxonomy? Any part of the text can be printed, so if you want a copy you don't have to find a photocopy machine. However, the print command only works on the visible part of the text, usually only a small part of the section you are reading. Also, the figure accompanying the text does not print using this command. And unlike a book, with a CD, you can't write on your computer at the same time as you read, unless you have a screen large enough to accommodate both the word processing image and the CD image at the same time.

These reservations aside, this new adaptation of a fine species catalog is both interesting and useful. I'm not sure I'm ready to replace my book with a CD yet, but I am pleased to have both.

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HALL OF FAME

Francis Hobart Herrick

FROM: Stan Cobb and Jennifer Voccola

The publication of the multi-authored "Biology of the American Lobster" in 1995 (see review in this issue) occurred on the 100th anniversary of the appearance of Francis Hobart Herrick's marvelous monograph "The American Lobster: A Study of its Habits and Development." Herrick's contri-

bution to lobster biology was great, not only through his monograph, but also through his many other publications. While working on lobsters, Herrick was professor of biology at Adelbert College of Western Reserve University in Cleveland, Ohio (USA) and spent several summers in Woods Hole, Massachusetts and Wickford, Rhode Island. However, as much as we lobster biologists might like to think that Herrick's life-long devotion was to lobsters, he actually was a biologist, teacher and administrator of wide abilities and interests.

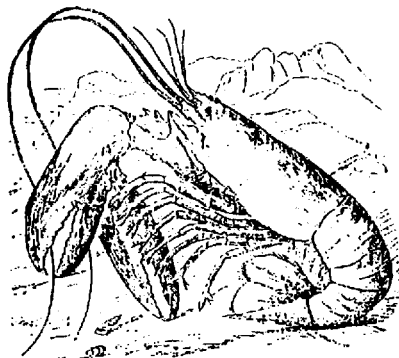
Herrick was born in 1858, in Woodstock, Vermont, to Reverend Marcus Aurelius and Hanna Andrews Herrick. Education in his family clearly was valued; he went to the elite boarding school, St. Paul's Academy, and then to Dartmouth College, where he graduated in 1881. For four years he taught high school biology, then went to Johns Hopkins University in Baltimore for further study. His dissertation research addressed the development of the snapping shrimp *Alpheus*, for which he was awarded the Ph.D. degree in 1888.

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AMUSEMENTS

Lobster Lore

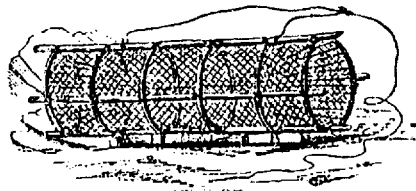
Ken Collins, Department of Oceanography, University of Southampton, is a particular favourite of the Newsletter's editors. He often provides us articles, but more than that, he frequently contributes "ancient cuts" that have adorned the pages of *The Lobster Newsletter*. Recently, while Ken was visiting the Aberdeen University Library, doing his "... usual search for items under lobster ..." he found W.B. Lord's (1867) book "... hidden away in their special collections." He sent us the portion on lobster from which we have cribbed the following article. We encourage all our readers to ferret out similar articles either from their local libraries or when they are traveling. John, Stan, and John.



On natural history and the fishery

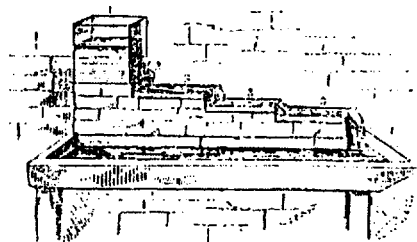
"Down among the deep channels, between the crags at the sea's bottom, alarms, except from the sea robbers themselves, are not to be dreaded. Here the lobsters are at home, and in such spots the wicker-trap...or the trunk-net, represented in the above cut, may be laid down for them...Lobsters are prolific creatures, and it is well that they are so, considering the enormous quantities consumed every day in England alone...The regular Lobster season may be said...to last from the month of March to August. About the middle or latter end of the last-mentioned month the shifting of

shells takes place, and the fish is unfit for human food; but,...The lost plumpness and condition soon return, and the winter season furnishes Lobsters equal in goodness and flavour to any caught "in high lobster time." It has been remarked by many experienced shell-fish dealers that the Lobster is exceedingly local in its habits, and there are some who profess to be able to recognize the natives of particular localities...Unlike some crustaceans who are coldly indifferent to the welfare of their offspring, the mamma Lobster keeps her brood about her until the youthful lobsterkins are big enough to start in life for themselves."

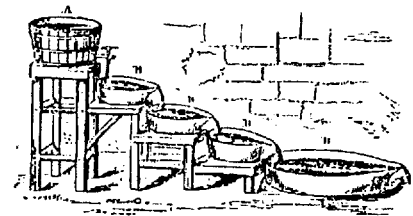


On culture

"It has been computed that each fully-matured female will produce from 18,000 to 20,000 eggs, and there is little doubt, but that with proper management and the expenditure of a very small capital, artificial fecundation of the ova...might be most successfully and profitably conducted in this country. Much attention has of late been paid to this subject in France...the annexed cut represents a set of chambers or troughs which were erected in the College of France...for the hatching of eggs..."



"This apparatus, although very neat and ornamental, is far more costly than there is any need for. Such a contrivance (see figure below)...can be readily put up for a few shillings, and will be found to answer ever practical requirement...very little ingenuity is needed to enable any cottager to hatch out his own young crustaceans from the egg...there appears no limit to the extent to which fish-hatching in all its branches may be carried by the industrious...Our space will not admit of our dealing at any length with this subject, and the few hints we have given are mainly intended to show that important results in this branch of national wealth may be arrived at by the use of very simple means and appliances."



On Markets

"The number of Lobsters brought every season to Billingsgate Market will serve to give some idea of the importance of Lobster-fishing, and the sums of money which must change hands in connection with it...that one day's supply for that great emporium of sea dainties reaches as high as 25,000; and here at early morning, long before mighty London is fairly up for the day, a scene of bustle and activity may be witnessed which well repays the early riser—

*'Double-double, toil and trouble,
Fire burn and cauldron bubble.'*

Steam in clouds floats above the vast loads of newly-boiled crustaceans and molluscs; carts of every size and pattern block the way...ice, in saw-dusty bales, is

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jostled against orange boxes; figs and codfish greet each other like old friends... "

In War

"The popularity of the Lobster extends far beyond the limits of our island, and he travels about to all parts of the known world, like an imprisoned spirit soldered up in an air-tight box. It has been said that during the Indian war a box of regimental stores belonging to our forces fell into the hands of the enemy, who thinking that a great capture of some kind of deadly and destructive ammunition had been made, rammed the painted tin cases, with goodly charges of powder behind them, into their immense guns, laid them steadily on the devoted British troops, and then with a flash and a thundering roar, preserved lobster, from Fortnum and Mason's was scattered far and wide over the battlefield."

In North America

"The coasts of British North America as well as many portions of the sea-board of the United States, abound in mail-clad inhabitants of many kinds. In some localities great amusement is at times afforded by their capture—a sort of *pic-nic* or *lobster frolic* being organized. A boat with plenty of eatables, drinkables, and a capacious cooking pot are provided, and long poles with their ends split are prepared...Some overhanging rock, or pleasant nook on the shore, is usually selected as a place in which to dine and cook the proceeds of the Lobster hunt. The driftwood and such dry sticks and shrubs as the neighbourhood will afford, are used a fuel to boil the pot, and the revels proceed right joyously. The bays, shallows, and mouths of rivers on the coast of Prince Edward's Island (Canada), abound in a species of seaweed, known amongst the inhabitants as '*eel grass*;' on this vast numbers of Lobsters feed as in

a rich sea garden. To these favoured hunting-grounds the Lobster-catchers betake themselves, and by wading little more than half-leg deep gather as many as they require. A bushel basket has been felled in this way in less than an hour."

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Lord, W.B. 1867. Crab, Shrimp and Lobster Lore, gathered amongst the rocks at the sea-shore, by the riverside and in the forest. George Routledge and Sons, London, U.K.

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At about the same time, the president of Western Reserve University in Cleveland decided to establish a department of biology and turned to W. K. Brooks, a distinguished native of Cleveland and head of the Biology Department at Johns Hopkins. Brooks recommended Herrick to President Hayden "as a man and a student and of considerable experience in undergraduate schools" (Waite 1929). At the age of 29, Herrick became the first instructor in biology at Western Reserve and began teaching General Biology to four students in September 1888.

As a teacher he faced many challenges, not the least of which was the lack of a room for laboratory instruction. A suitable location was found by the second semester, but the number of students studying biology grew rapidly. In 1891 Herrick was made Professor of Biology (and, effectively, head of department). He soon began

lobbying the university administration for a new biology building, which was finished 8 years later, in 1899. He was not idle in the interim.

In 1890, he started two major projects. First, the Honorable Marshall McDonald, U.S. Commissioner of Fisheries, asked him to complete a work on the habits and development or general biology of lobsters. Herrick collected his information from many points, including the lobster hatchery operated by the Commissioner of Inland Fisheries of Rhode Island, but his most systematic and prolonged observations were made at Woods Hole, in the Fisheries Laboratory, over a period of about 5 years.

The second project was in Cleveland, starting only two years after he arrived, where he may be better known for his advocacy for a museum of natural history at Western Reserve University. He apparently hoped the museum would be modeled after Harvard's Museum of

Comparative Zoology, but funds for a university museum were never found. Instead, the Cleveland Museum of Natural History was founded in 1920. Herrick was one of the original trustees and became a vice president in 1928.

All of this, teaching, research on lobsters, and building a department, must have taken considerable amount of time and energy. Herrick remained single until 1897, when he married Josephine Herkomer. They had two children, Agnes and Francis. In 1903, the family took a summer holiday in England where, for amusement perhaps, Herrick began to look for information about the famous ornithologist and painter, John James Audubon. His interest in birds and Audubon developed greatly over the next few years, leading to the publication of a two volume biography, "Audubon the Naturalist", in 1917. He also wrote two books on the American Eagle. His final book, "Wild Birds

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at Home," was published in 1935. Francis Hobart Herrick was accorded a number of honors in his lifetime. He was elected a fellow of the American Association for the Advancement of Science and of the American Ornithological Union. He received honorary degrees from the Western University of Pennsylvania (1897) and from Western Reserve University (1936). President Leutner's remarks at the awarding of the WRU degree read in part: "for your years of inspiring service as teacher to generations of students, for your courageous persistence in

the pursuit and helpful interpretation of the truths of nature, for the fine mellowness of your scholarship continuing past the usual period given by men to the service extracted by science from her devotees, teacher, scholar, biographer, stylist of note and charm, friend of many years ..." Herrick retired from active teaching in 1929, became professor emeritus and continued his writing about birds. He died in 1940, leaving a legacy that inspired students at Western Reserve, museum goers in Cleveland, ornithologists and Audubon admirers, as well as generations of lobster researchers.

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Erratum. Figure 1 to accompany Pitcher et al. 1995 in the Lobster Newsletter 8(2): 7-8.

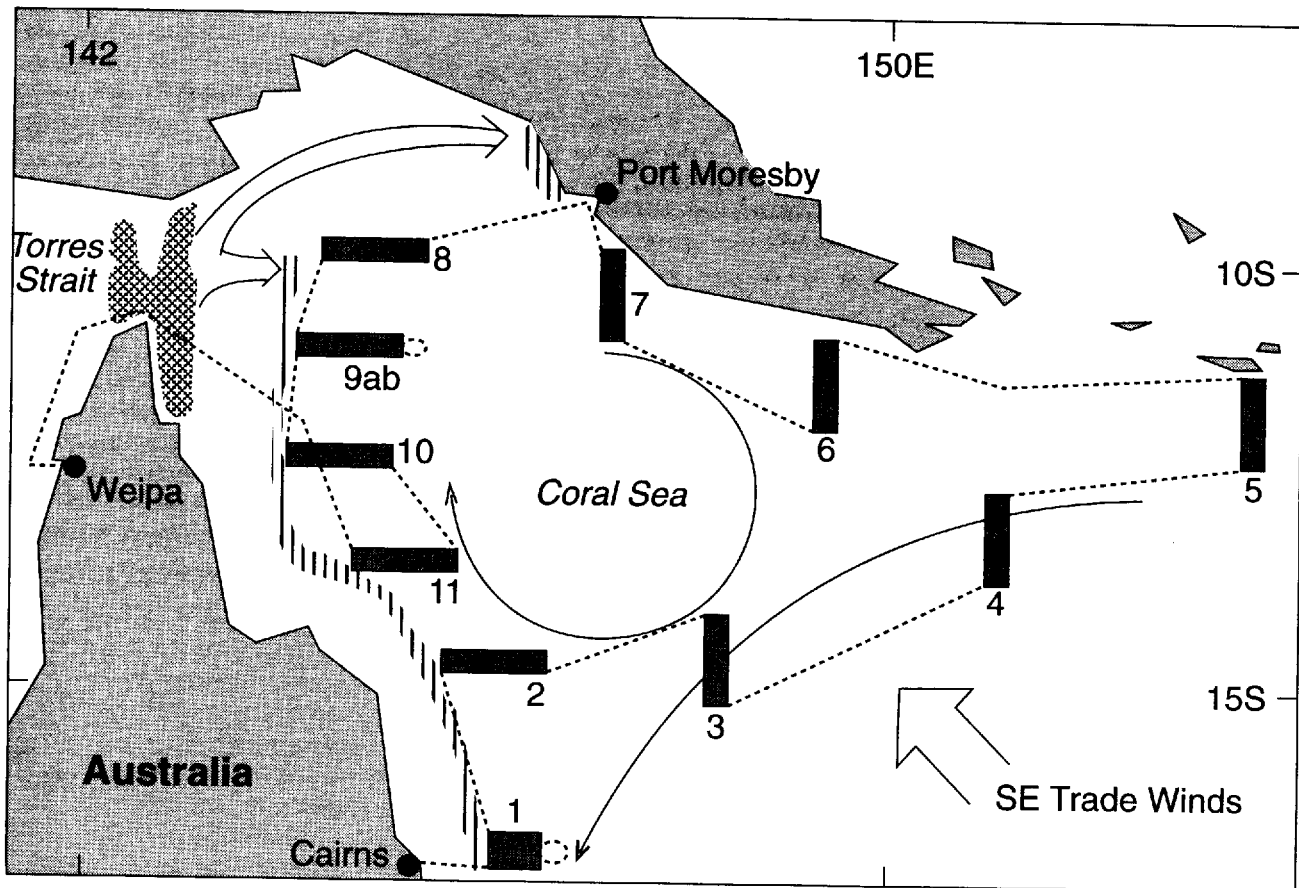


Figure 1: Map of Torres Strait and Gulf of Papua Showing the main lobster fishing grounds around the central and western reefs and islands (■), the migration pathways (⇒), breeding grounds (· · · · ·) in the Coral Sea, and proposed track and numbered sampling locations of the *FRV Southern Surveyor* cruise in May 1995 (-----).

FISHERIES AND AQUACULTURE UPDATE

Stage II Phyllosoma of the Mediterranean Slipper Lobster *Scyllarides latus*

U. Fiedler and E. Spanier

Knowledge of the larval stages of the Mediterranean slipper lobster *Scyllarides latus* is very limited despite the commercial importance of this species (Spanier et al. 1990). In the Mediterranean Sea, family Scyllaridae is represented by the genus *Scyllarides* (*S. latus* [Latreille, 1803]) and the genus *Scyllarus* (*S. arctus* [Linnaeus, 1758]) and *S. pygmaeus* (Bate, 1888) (Holthuis, 1991). Larval development of most of these species is poorly known.

In plankton samples from the eastern Mediterranean Sea, most scyllarid larvae caught were *S. arctus* (to be reported in The Lobster Newsletter later). Two phyllosomas are probably *S. latus* (see accompanying Figure). Reference to descriptions of phyllosomas of *S. arctus* by Stephensen (1923), and *S. pygmaeus*, and *Scyllarides herklotsii* from the Atlantic waters off west Africa suggest this specimen is a Stage II phyllosoma of the Mediterranean slipper lobster, *S. latus*, which has not, until now, been illustrated.

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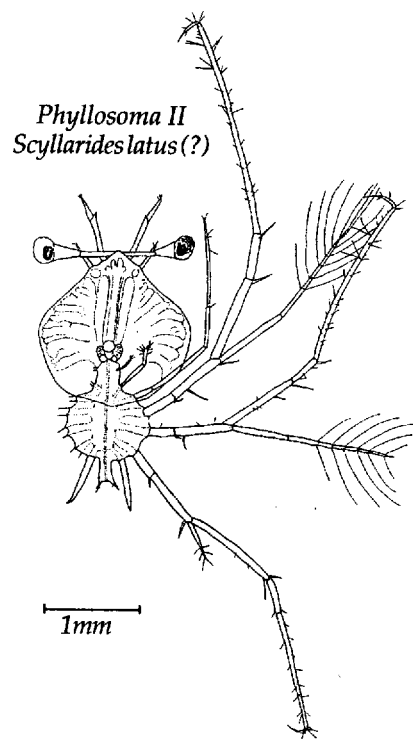
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