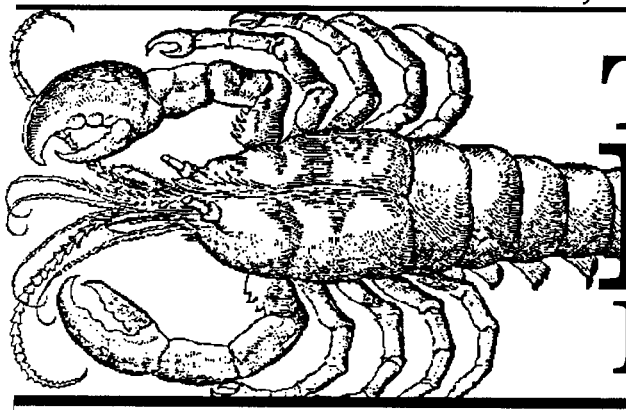
VOLUME FOUR JANUARY 1991 NUMBER ONE



The Lobster NEWSLETTER

NEW METHODS AND APPLICATIONS

Ultrasonic Telemetry

FROM: R. O'DOR AND D. WEBBER

The traditional method of studying animal movement and activity in the sea is tagging and observation, which only gives intermittent data and can introduce "observer" effects. Ultrasonic telemetry has the potential to to give more accurate measurements of position and activity. In the most rudimentry system, the position of the animal is fixed from the shore or boat by relating transmitter signals to at least two charted ocean or land sites, or by "zeroing in " on the strongest signal by boat (see Lobster Movement..., in, The Lobster Newsletter, Vol. 3, No. 1). However, accuracy is limited, and positioning is intermittent and frequently limited to daylight.

Our computer assisted system, capable of continuously monitoring position and physical parameters, is a significant improvement . The original prototype had a shore-based receiver and computer linked by cable to sea-based hydrophones. There were at least three limitations: it took considerable effort to move the system when animals migrated out of range; and, because the receiver analyzed signals from all four hydro-

CONTINUED ON PAGE 2

FISHERIES UPDATE

The Scalloped Spiny Lobster *(Panulirus homarus)* Fishery in the Sultanate of Oman

FROM: D.W. JOHNSON AND T.Z. AL-ABDULSALAAM

The spiny lobster, *Panulirus homarus*, is the principal lobster species fished in the Sultanate of Oman. Landings increased 200-fold between 1981 and 1986, from 15 tons to 3,000 tons (Al-Barwani et al, 1989). Fishermen use nonselective harvest methods including, primarily, tanglenets and a relatively small number of traps without escape vents. The annual

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RECENT EVENTS

Nomenclature Change

Jasus edwardsii and *Jasus novahollandiae* are spiny lobsters of the *"lalandii"* subgroup found in New Zealand and south-eastern Australia, respectively. They resemble one another closely, but George and Kensler (1970) separated *J. novahollandiae* from *J. edwardsii* because of differences in the banding on the antennal flagella and degree of sculpturing on the terga. A recent paper by Booth et al. (1990) suggests this isn't enough. They review published data, add some new data, and find that it is impossible to distinguish between the two. Therefore, they conclude, the two species should be one. The name with priority is *Jasus edwardsii*. From now on, the former *J. novahollandiae* should be referred to as *J. edwardsii*. Booth et al. also suggest that the continued taxonomic separation of other species of the *"lalandii"* group should be reassessed.

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CONTINUED ON PAGE 2

RECENT EVENTS

CONTINUED FROM PAGE 1

Decline in Submission Rate Stresses Editors

You will note that the issue of The Lobster Newsletter you are holding is, well — slimmer than the last you received. It is also late. The editors take the blame for the latter, but claim that the stress of living under the constant pressure of deadlines and the relative paucity of material received in the last several months has caused them to spend more time imbibing malt substances and less time staring at a wavering computer screen.

We are sure that help is on the way. Some of you have promised articles, and certainly they are simply lost in the mail somewhere. Many of you have (or will) receive requests from us to write "a little something" for the Newsletter. *All* of you have a story to tell or an insight to share. The interesting piece from Don Johnson on the *Panulirus homarus* fishery in Oman (see p. 1) is a good example.

You also will note a certain lack of balance in this issue. All the articles we received were fishery-related. That is OK to happen once in a while, we suppose, but the Newsletter will become pretty monotonous if that is all we get. There is a great deal of fascinating, fundamental research being done on lobsters all around the world. Let everyone hear about it!

The Editors

NEW METHODS...

CONTINUED FROM PAGE 1

phones consecutively, 30 s could elapse between positions. Hence, positioning of a fast moving animal was inaccurate. Finally, physiological data could not be gathered from the same tag. An automated buoy system, described below and tested on lobster *(Homarus americanus)*, was developed to overcome these limitations.

The buoy-system consists of as many as 16 buoys anchored at strategic locations. The buoy is constructed of polyethylene plastic, which houses a VEMCO VR-15 ultrasonic receiver, both a radio receiver and transmitter (three frequencies) plus two 12 V batteries, which serve as ballast as well as power. A hydrophone is attached to each buoy, along with a transponder transmitter which calculates distance between buoys. A bottom mounted transmitter compensates for tidal induced buoy movement. Each buoy "listens" and can collect data every 1-600 seconds depending on need. The on-shore radio communicates with each buoy on separate frequencies

The experimental animal is equipped with one of two transmitters types; a "pinger" for tracking movement, or a "physiological tag", for example a muscle implant which could send the frequency of mandibular muscle contractions in a study of feeding. The data are used to formulate the two hyperbolic equations necessary to plot the position of the transmitter. The graphics software displays tracks of the movements of the animals on screen; the data are stored for future analysis.

The current prototype was tested in Jeddore Harbour, Nova Scotia. Four egg-bearing female lobsters were tagged; three with location "pingers", while the fourth carried a temperature sensing tag. The sonobuoy array was located 1 km from shore. Every 20 minutes the system gave detailed data for each lobster simultaneously , over 4 km^2. Data were continuously recorded for five days, the length of the trial. A study could last 90 days, the average life of the transmitters.

Individual animals varied widely in activity patterns, e.g., total distance travelled ranged from 1.5 km to 15 km. Temperature variations were larger than expected and varied up to 3°C over a tidal cycle, depending on precise location.

The system performed beyond expectation. It will be of great assistance to experimentalists longing to validate laboratory-based premises in situ .
The study was carried out in conjunction with personnel from the Halifax Fisheries Research Laboratory, Fisheries and Oceans Canada, P.O. Box 550, Halifax, NS. For further information, please contact the authors.

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The Lobster NEWSLETTER

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FISHERIES UPDATE...

CONTINUED FROM PAGE 1

potential yield in 1981 was estimated to be 50 tons, in a Regional Survey by FAO. In 1985, the harvest was about 2,400 tons and in some areas the fishery was showing signs of collapse. Degradation of the fishery was due to overfishing, to the selective fishing of aggregations of berried females, and to a failure to protect immatures. Nevertheless, by 1988, lobster had become the major revenue producer of the Oman National Fishery Company, with an export value of US$43.9 million. The work summarized here results from monitoring of commercial landings for three seasons (September through February, 1987-1990). We measured and noted the reproductive condition of more than 29,000 lobsters along 1,100 km of coastline. The major landing sites are shown in Figure 1, along with the fishing districts.

Growth rates and maximum sizes of lobsters caught in some areas of the fishery equal or surpass those reported for other parts of the world, while other areas have greatly reduced size structure. The mean size of lobsters captured in Oman is decreasing more rapidly in some areas than others. Average sizes at various localities ranged from 62 to 82 mm CL, and 21% to 96% of those processed were immature. Only 46% of the lobsters processed during the 1988-1989 season were larger than the minimum legal size of 80 mm CL; a decrease from 50% in 1987-1988.

The minimum size limit of 80 mm CL favors the harvest of males, as evidenced by a sex ratio among legal-sized lobsters in the catch of approximately 2:1. However, females have become a larger proportion of the catch, increasing from 42% of the total landings in 1987-88 to 47% in 1988-89. At the same time the incidence of legal sized females in the catch increased from 34% to 39%. This may reflect a change in the location of fishing to include deeper waters that previously had been unfished.

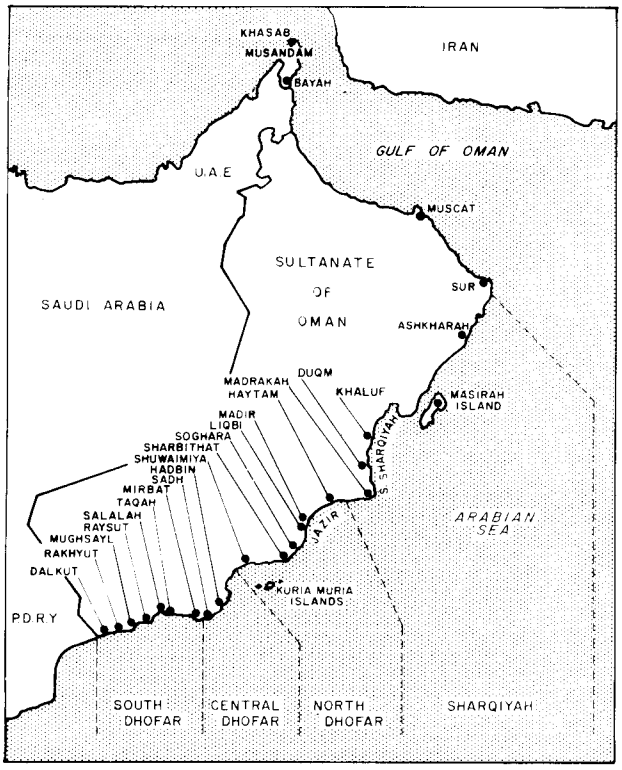

Figure 1. Major lobster landing localities in the Sultanate of Oman.

Reproductive maturity is reached by 50% of females in the 80-85 mm CL size class, although a few females mature and incubate eggs when as small as 55 mm CL. In a heavily fished population, the size composition of all egg-bearing females measured showed less than 5% were under 70 mm CL; 46% were 70-85 mm; 37% 85-95 mm and 12 % exceeded 95 mm CL. Of the females harvested in 1988-1989, 61% had not yet reached reproductive maturity.

A suggested life cycle of *Panulirus homarus* in Oman is shown in Figure 2. Aggregations characterize two stages of the reproductive period: a breeding aggregation of premolt females, and brooding aggregations of berried females. Eggs are released inshore and spend 4 to 11 months in the plankton before the puerulus returns to inshore areas. In Oman, berried females were present in all months of the season (September — February) but there are distinct peaks that vary among regions. Along the Jazir coast, in the North Dhofar region, 50% of the females carried eggs in mid-September, 1987; this had decreased to less than 15% by early October. By contrast, 50% of the females may be incubating eggs through October and November in Sharquiyah; in Central Dhofar the peak is in December and January; in South Dhofar the peak extends into February.

Management regulations for the fishery include a closed season, gear restrictions, minimum legal size and protection of berried females. However, the regulations have not been enforced, and each year that passes without suitable enforcement compounds the ongoing degradation of portions of the Sultanate's lobster fishery and diminishes the long-term benefits that are available. The lobster fishery in the Peoples Democratic Republic of Yemen has a management history similar to that of Oman; its present harvest is about 25% of the past peak catches and consists of smaller lobsters which bring less value. Clearly enforced research-based regulations are needed in Oman. Some relevant observations follow.

Harvest seasons which consider size and sex composition of the population, as well as peak

reproductive periods are needed. These would enhance reproductive success and might prevent recruitment overfishing. The current open season encourages the illegal harvest of egg-bearing females, hence decreases the reproductive potential of the population.

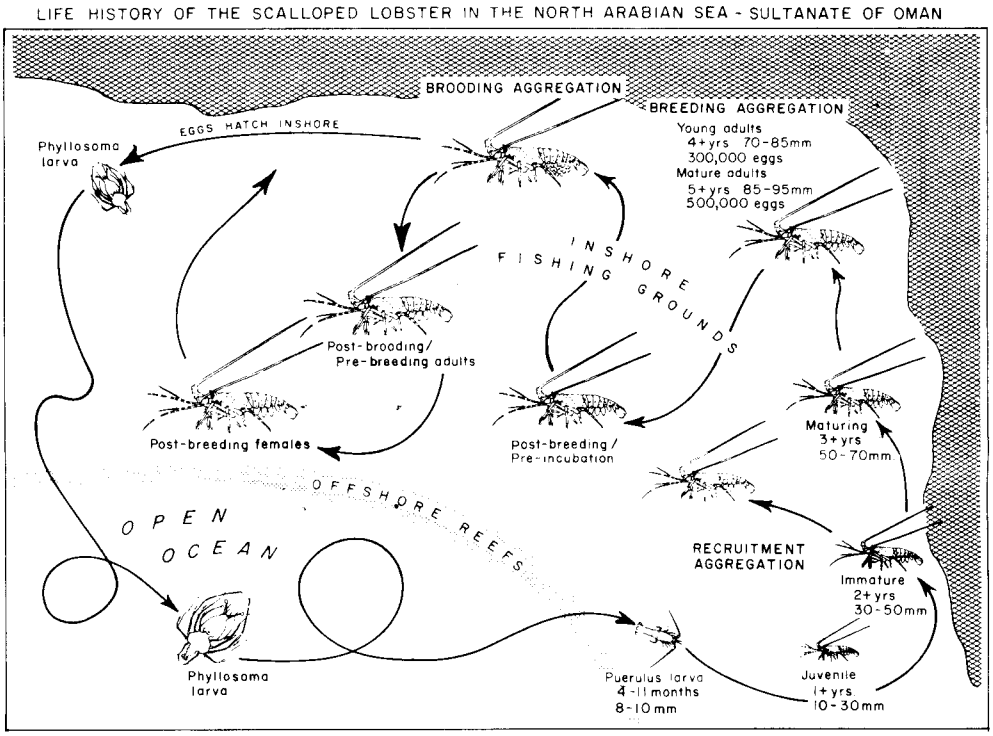

Figure 2. A suggested life history for the Scalloped Spiny Lobster, Panulirus homarus, *in Oman.*

Gear limitation to trapping only was decreed in May, 1986, but 1986 was a grace period, the regulation was sporadically enforced in 1987, waived in October and November of 1988 and has not been enforced since. Capture in traps improves the quality and value of the catch. It can also reduce illegal landings and the mortality of immatures and berried females. Some Omani fishermen have learned that traps provide a higher catch per unit of effort, and so prefer them. However, the continuing use of tanglenets and traps without escape vents is wasteful.

Minimum legal size calls for the release of all lobsters less than 80 mm CL. Enforcement of this regulation would contribute to the protection of the breeding stock and enhance yield per recruit. The use of traps with escape vents would complement the minimum size regulation and reduce the need for enforcement at the harvest level.

Potential earnings of fishermen can be maintained or even increased with proper management and enforcement of recommended fishing regulations. The use of traps with escape vents during seasons which protect reproductive potential will increase average size of individuals captured, as well as size and quality of the catch. Enforcement of management recommendations may result in reduced income at first, but subsequent years should show increased earnings. Total earnings will decline drastically if regulations are not enforced and the fishery is allowed to continue to decline.

Research on the *P. homarus* fishery is continuing. The extensive fishery complicates the already difficult task of estimating the size and dynamics of the lobster population. We are now analyzing trends in quantity and the biological parameters of the catch. Fishermen report an offshore migration during November and December, and research on the potential for harvest in deeper water during this period of low reproductive activity should begin. Understanding the migratory patterns hinted at in Figure 2, as well as seasonal and monsoon-related movements should improve management planning. This information is essential to the establishment of regulations which will allow the fishery to be managed on a sustained yield basis. Research, both ongoing and proposed, addresses these needs.

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FISHERIES UPDATE...

CONTINUED FROM PREVIOUS PAGE

Management of the Cadmium-Contaminated Lobster Fishery of Belledune Harbour

FROM: J.F. UTHE, C.L. CHOU AND D.P. SCOTT

In 1980, the presence of elevated cadmium levels in American lobster *(Homarus americanus)* captured within Belledune Harbour, New Brunswick, Canada, forced the Department of Fisheries and Oceans to close the lobster fishery in the area. The source of cadmium was a lead smelter adjacent to the harbour. DFO research showed that the contamination extended some distance outside the harbour, particularly in the southeasterly direction. This first survey also showed that cadmium levels were highest in the digestive gland with concentrations ranging 13.7 - 372 parts per million wet weight (ppm). The large range in cadmium concentrations in lobsters captured at the same time and place suggested that management of the fishery might prove difficult to implement in an efficient manner unless this variation could be explained. Cadmium concentrations in raw tail muscle were very much lower, however, cooking the intact lobster resulted in contamination of the tail meat by cadmium, which presumably resulted from the disintegration of the digestive gland during cooking.

Negotiations with National Health and Welfare resulted in specific cadmium tolerances being set for both digestive gland and cooked lobster meat for Belledune lobsters. Further studies by DFO Science developed a simple cooking method to avoid contamination of the lobster meat, permitting lobsters with unacceptable cadmium concentrations in their digestive glands to be utilized. This enabled DFO to implement a management plan in the area which minimized the effect on local fishermen without posing any threat to either human consumers or the image of lobster as a wholesome, enjoyable foodstuff. The plan, put into place in 1980, utilized a closed fishery zone (Belledune Harbour) surrounded by a controlled fishery zone (from 1 mile northwest of the harbour mouth to 4 miles southwest). Lobsters captured within the controlled fishery zone received special processing to yield frozen meat packs which, after inspection, were marketed.

The management plan also studied the relationship between lobster size and sex, and cadmium levels in tissues. The results of this study led to the development of an efficient monitoring program which used an annual survey strategy. Each survey consisted of a relatively small number of lobsters from each of relatively few sampling sites. This monitoring program , developed and implemented by DFO scientists at Halifax, Nova Scotia, and Winnipeg, Manitoba, allowed DFO to manage the fishery in response to the effects of pollution controls being installed by the lead smelter. This allowed rapid reduction in the extent of the closed and controlled fishery areas as the system responded to pollution contols. The current situation is that only Belledune Harbour itself is being managed as a controlled fishery, with the original controlled fishery area now reopened to normal fishery and marketing practices.

Up to 1989, all costs associated with both monitoring and management of the Belledune lobster fishery were borne by Brunswick Mining and Fertilizer Ltd, the operators of the lead smelter. In 1990, the monitoring program was modified to take into account the potential effect of the installation of an electric power generating station on the shoreline of the harbour.

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ANNOUNCEMENTS...

LNL Mailing List Available

Recently, several of you have suggested that it would be very useful to have the names and addresses of all the people who are on mailing list of The Lobster Newsletter. We concur. To make the list more useful, we will also include Telephone and Fax numbers if they are available. A sheet is inserted in this issue that will allow you to provide us with any change in address and your phone and fax numbers. You will also note that the form asks for a possible title and submission date of an article or note for the Newsletter. This will let us plan a little bit, and perhaps also to send you a gentle reminder as we are preparing the next issue.

ANNUAL FISHERIES YIELD

Listed below are the landings per species per location, for the countries from which information was received. We thank the following for their cooperation: USA-B. Holgren, P. Briggs, E. Smith, J. Nelson, A. Valliere, J. Krouse and B. Estrella; Australia-R. Brown; and Canada-A. Pelletier, D. Gillis, J-P. D'Alloire, L. Savard, G. Roach, A-M. Russel, G. Nowlan and R. Duggan.

Our objective is to report commercial landings for all countries. For those with 1990 data for their respective country or location, please submit it to JD Pringle by December 1, 1991. These landings will appear in Vol. 5, No. 1.

Country	Species	Location	Seasons	Landings (t)
USA				
	H. americanus	New Jersey	1989	820
		New York	1989	919
		Conneticut	1989	927
		Rhode Island	1989	2,557
		Massachsetts	1989	6,589
		New Hampshire	1989	402
		Maine	1989	10,626
		USA Total		**22,840**
Canada				
	H. americanus	Nova Scotia	1989	19,017
		New Brunswick	1989	8,611
		Prince Ed. Isl.	1989	10,187
		Quebec	1989	3,203
		Newfounland	1989	3,118
		Canada Total		**44,136**
Australia				
	Panulirus cygnus	Western Aust.	1987/88	12,027
			1988/89	12,312
			1989/90	10,200
	Jasus novaehollandie	Western Aust.	1986/87	25
			1987/88	17
			1988/89	17
		South Aust.	1986/87	2,208
			1987/88	2,468
			1988/89	2,275
		Victoria	1987/88	382
			1988/89	N/A
		Tasmania	1986/87	1,750
			1987/88	1,888
			1988/89	1,857
		New S. Wales	1988/89	2
	J. verreauxi	New S. Wales	1988/89	120

BOOK REVIEWS

Shrimps, Lobsters and Crabs - Their Fascinating Life Story

Dorothy E. Bliss 1989 (Reprint. Originally Published in 1982.) Columbia University Press, 562 West 113th Street New York City, NY 10025. ISBN 0-231-07202-3 (Cloth); 0-231-07203-1 (Paper). xvi + 242 pp, illustrated. US$35.00 (Cloth); US$19.50 (Paper).

REVIEWED BY W. HERRNKIND

When the late Dorothy Bliss prefaced this book with the comment that it would provide "... many facts and answer many questions about shrimps, lobsters and crabs," she wasn't kidding. She left few topics untouched and many aspects are described in substantial detail.

Here is a sampler: systematics geared to quick recognition; functional features of gross external anatomy as well as internal organs and neurosensory structures; biogeographic distribution in respect to ocean conditions; the nature of fisheries for major commercial species, fishing practices and anecdotes: mating and migratory behavior, larval forms and life cycles, including evolutionary implications; basic physiology and endocrinology underlying molting, metamorphosis and environmental adaptation; a realistic, pragmatic report on the mariculture potential of crustaceans. Her concise, lucid, but never watered-down, explanations of reproduction, molting and functional morphology of the edible crustacean trio could be assigned reading for an introductory college zoology course. But, this was not her intended audience. Rather, she aimed the book at the lay person who, after having digested both a lobster dinner and its outrageous

price, contemplates the nature of the beast. The book is well suited to such folks, but they might choose to sample small portions at a sitting because the contents are rich and filling. Unlike many popular writers, she serves up systematics, morphology and physiology using correct and accurate scientific terminology. This foreign vocabulary lesson is facilitated by her explanations of the Greek or Latin derivation of the words. Now, those terms make precise sense; and the idea of calling the leaf-shaped phyllosome of *Panulirus argus* an infant lobster seems overly patronizing as it is. Thank you, Dorothy, for respecting the inteligence of your readers.

She emphasizes the commercial or otherwise well-known species including the various penaeid and crangonid shrimps; clawed and spiny lobsters; and blue, rock, hermit and king crabs. Amidst this, she highlights less familiar forms like bromeliad crabs, parasitic barnacles, scyllarid lobsters and her beloved land crabs. In doing so, she provides an admirable object lesson to the lay reader of why it is valuable to study creatures that seeem to have no apparent value to humans. These animals, have supplied answers to basic biological processes like regulation of molt and metamorphosis, which are often less examined in commercial species. This brings up another of her main objectives, and a recurrent theme heard clearly emanating from otherwise unlikely chapters; that of human exploitation of, and impact on, crustaceans. Progressing through the topics on distribution, reproduction, development and growth, the reader gains comprehension of the constraints limiting crustacean numbers, the potential for deleterius human impact, and the biological challenge to develop mariculture as an alternative to meet growing demand. No reader of this book is likely to utter the simple-minded query many of us so often hear: "How come you just don't raise them on sea farms?".

This is a clearly written and scholarly book packed with information and explanations about your and my favorite group of living creatures. It can be read and comprehended by anyone likely to be attracted to its title. Bliss does what she set out to do. It is not a literary work and it is entertaining mainly in being extremely informative. It suffers some by being written before extraordinary recent findings about crustacean biology, many of which are chronicled for the specialist in the Biology of Crustacea volumes, coordinated by Dorothy Bliss, the series' Editor-in-Chief. Perhaps someone among us will step forth to honor Bliss's excellent popular book with a sequel to the ever fascinating life stories of *lobster*s, shrimps and crabs.

The Compleat Crab and Lobster Book

Christopher R. Reaske. 1989. Lyons and Burford Publishers, New York. ISBN 1-55821-024-5(cloth); 1-55821-036-9 (paper). 150, p., illustrated. US$ 16.95 (cloth); US$ 9.95 (paper).

REVIEWED BY J. S. COBB

For ages crabs and lobsters, epicurean delights and fascinating beasts, have sparked the interest of writers, fishermen, cooks, vacationers, and little kids. Christopher Reaske is a bit of all these, and his book, not written for a scientific audience, is an entertaining collection of lore, recipes, and natural history. The blue crab and the American lobster of the east coast of the United States are the focus of attention, but Reaske goes on delightful and unexpected tangents. In explaining the biology of lobsters, for instance, he winds his way from molting and size at maturity through the etymology of the name (Old English: lopustre) to military allusions to armor and British "red coats" at the Battle of Concord.

The natural history of crabs and lobsters opens the book and is followed by sections on recreational fishing and on crustacean cuisine. Readers of this newsletter would be disappointed by the natural history, but recreational fishing is well explained. The recipes start from basics, such as how to steam a crab, and progress to more complicated dishes, appropriately referenced to some of the author's favorite cookbooks. Reaske emphasizes the importance of licenses and regulations and explains some of the biological reasons supporting them. Interspersed throughout are digressions on lobsters and crabs in art and literature. The book ends with an amusing compilation, culled from many sources, of crab and lobster trivia. Can you imagine the shock it is to a reviewer to see his own name in the "trivia" section? Heavens!

If you are looking for an authoritative addition to your office bookshelf on the natural history and fishery for crabs and lobsters, this isn't the book. However, Aunt Minnie, whose eyes glaze when you start to explain (in a simple but exciting way, of course) how M, Z, and F are measured in your lobster population, might get a kick out of it. For readers of this news-letter, including myself, it is what my grandmother might have called a *divertisement*. As such, I enjoyed it thoroughly.

ANNOUNCEMENTS

National Shellfish Association

The annual meeting of the National (USA) Shellfish Association will include a full day session on lobster biology and ecology, including all life history stages. The meeting will be held 23-27 June, 1991, at the Sonesta Hotel, Portland, Maine. For further information, contact the workshop organizers:

Dr. L. Incze
Bigelow Laboratory for Ocean Sciences
McKown Point, West Boothbay Harbor
Maine 04575 USA

Dr. J. D. Pringle
Halifax Fisheries Research Laboratory
P.O. Box 550
Halifax, N.S. CANADA B3J 2S7

Crustacean Society

The Crustacean Society will hold an Inter-American Meeting in Charleston, South Carolina, USA, during 11 - 14 June, 1992. Three concurrent sessions, poster presentations and at least one symposium are planned. Meeting headquarters will be at the Mills House in the historic district of downtown Charleston. Accomodations will be available at the Mills House and other nearby hotels. Dormitory housing and a budget meal plan also will be available as an option.

For additional information, please contact:

Elizabeth L. Wenner
South Carolina Wildlife and Marine Resources Department
P.O. Box 12559
Charleston, SC 29412 USA.
Telephone: 803-762-5050

Xerces Society

The Xerces Society is an international, non-profit organization dedicated to the conservation of invertebrates worldwide. To promote invertebrate conservation, "The International Conservation Register of Invertebrate Specialists" is being developed. The Register is a computerized database that will make the knowledge of invertebrate scientists accessible to conservationists and land use planners.

The Register contains information on the taxonomic, geographic and habitat expertise of various scientists. In general, Register members will be asked simply to provide referrals for whom to contact about a specific conservation problem. The goal is to assist conservationists, land use planners, and government agencies to gain access quickly to the informal network of invertebrate specialists, in order to promote a more thoughtful approach to the development of sensitive habitats.

To ensure that the Register will be used only for its intended function, the Xerces Society screens all requests for information.

If you are interested in learning more about the Xerces Society, please contact:

The Xerces Society
10 South Ash Street
Portland, OR 97204 USA
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January 1991

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