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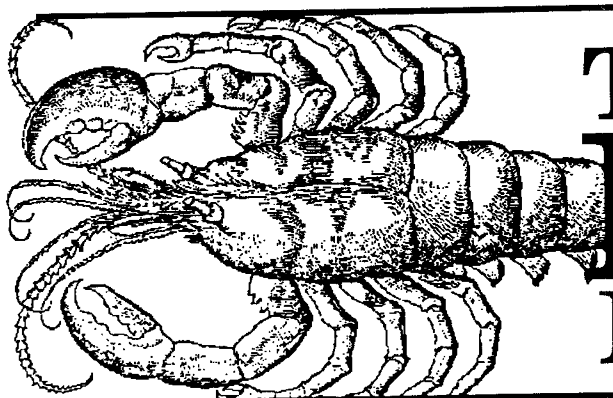

The Lobster NEWSLETTER

EDITORIAL

The lobster is easily the king of the crustacean class, and although it is neither "fish, flesh, fowl nor good red herring," he is excellent eating and that his race may increase is a wish generally felt and often expressed. Unfortunately, for many years past we have watched this race decline until some have even thought that commercial extinction, and that not far remote, awaited the entire fishery. What is the matter with the lobster?

Frances Hobart Herrick - 1909

These words ended an extremely useful treatise on *Homarus americanus*. Herrick went on to say "The lobster has attracted many naturalists and other observers . . . until it has become a focus of a wide literature . . . indeeed, few marine animals are now so well known." Herrick was referring to the American lobster. These same sentiments could be applied to most commercial species, spiny, slipper and clawed. Many are well known high priced food items, vulnerable to commercial overexploitation. They thus have long attracted the attention of fishery managers and fishery scientists. As well, because lobsters are intrinsically interesting, they form the subject matter of an incredibly wide variety of research. For example: up to 1981, 101 publications involved research on the commercially valuable California spiny lobster (*Panulirus interruptus*). Over half (57%) were on adult physiology and only one of those was on growth. The remainder involved the nerve, muscle or circulatory systems. Only 27% included studies (ecology of larvae, juveniles and adults) that were directly useful for stock assessment. Despite a 100 year old fishery, only five publications dealt with fishery problems.

There are few groups of organisms in which the research history is so long and so diverse. Basic and applied approaches to lobster biology are so frequently intertwined as to make them indistinguishable. Why so? Herrnkind (1977) put it succinctly: "Lobsters are in fact a very significant biological entity: widely distributed, speciose, large in size, long-lived, enormous in number, ecologically consequential. The group has exploited one particular body style through extraordinary larval modification, diversity of behaviour and varied adaptations to available niches. Understanding how lobsters achieve their biological success is an important scientific contribution . . . "

Our experience has been that most who work on lobsters share an affinity for the beasts, an interest in "seeing that they do well" in the face of extraordinary fishing pressure, and a desire to communicate with

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PERSPECTIVE

Why a Newsletter?

Although not having been personally active in lobster research for some years, I have followed northwestern Atlantic *Homarus* fisheries research with interest. I note with pleasure that enormous strides have been made in understanding of its population biology and ecology. The progress has been in part a product of both concentrating research effort in key areas and also in encouraging wide-ranging collaboration.

The concept of a lobster newsletter was a product of one attempt to enhance collaboration and communication (the sponsorship of the International Lobster Recruitment Workshop). The newsletter itself is another attempt to speed up the attainment of knowledge through communication.

In making introductory remarks to the second lobster workshop held in St. Andrews Canada in 1985, I quoted from a citation in the first workshop, (Munro, 1974) who in speaking of lobster fisheries, had said "Few of the biological and ecological details necessary for rational management are available. However this has not prevented the imposition of restrictions on the capture of berried females in many areas. Some of the measures have been

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EDITORIAL

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others whose research, although perhaps in another conceptual field, is relevant to "their animal". It seems to us that there is a real international community of lobster biologists, doing research in field and laboratory, on topics ranging from molecular biology through neurophysiology to ecology and fisheries science. Communication is at the heart of any successful scientific community. It is with this in mind that we venture forth with THE LOBSTER NEWSLETTER.
We hope that THE LOBSTER NEWSLETTER will become a forum for many things. With this issue we suggest a format and some of the features that have occurred to us. In addition to what you see here, we propose to include meeting announcements, comparative catch data, requests for assistance, letters to the editor, etc. We would like to hear from you with your thoughts about contents and style of the newsletter. Obviously, we also need contributions from all of you. A newsletter such as this will not be a success if only a few people contribute. The attraction of this newsletter should be in its diversity and eclectic nature. We encourage submission of many different kinds of material.

Stan Cobb
John Pringle

PERSPECTIVE

Continued from page 1

of dubious value, while others have needlessly restricted the development of the fisheries." With the notable exception of the Western Australia spiny lobster, Munro's description remains depressingly accurate in all too many instances.

It is encouraging now, however, to see within the scientific community determined efforts to define the key problems and delineate the gaps in our knowledge which prevent more informed management measures from being applied. The catchall term, recruitment, seems to cover the areas of most concern to management. Within this area are found the problems of:

1. abundance, location, maturation and well-being of the spawning stocks;

2. factors controlling production of larvae;

3. survival and growth of larvae to benthic stages;

4. survival and growth of juvenile benthic forms;

5. accurate assessment of numbers of lobsters of all forms prior to their entry to the fishery; and

6. good abundance estimates of the recruited individuals.

The list is not exhaustive nor comprehensive, but it does suggest the overall nature of the lack of information. In the past, lobsters have been managed as though their life cycle was encompassed within the period they are present in the fishery, i.e. one or two years, even though they might actually be from six to eight or more years old prior to being recruited to the fishery. Events prior to their entering the fishery have been virtually unknown and the quantitative information certainly was inadequate to influence management measures.

This situation is now changing. Methods are being developed which permit quantitative data to be collected on pelagic larvae for more lobster species, migration is now better understoood, data on fecundity and reproduction is becoming available, the prospects for surveying benthic-stage lobsters quantitatively and understanding their prospects are improving, and growth data on wild lobsters are being collected. These studies, taken together with the excellent bodies of information developed in laboratory studies on behaviour, physiology, reproduction, nutrition, growth and disease for particular species, are moving the understanding of lobsters rapidly closer to that necessary to provide the basis for wise management of the fisheries.

Instruments such as this newsletter should aid significantly in keeping scientists abreast of work in other areas and on other lobster species, and thereby more rapidly sharing information and promoting cooperation. It is by efforts such as this, when well done, that work can be accelerated, sharpening the definition of problems and addding the enthusiasm already evident in lobster studies generally. This is a desirable adjunct to the necessarily slower formal publication of results, and helps fill the gaps between workshops.

I offer you my Best Wishes for every success with this newsletter and hope that it fulfills everyone's expectations.

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The Lobster NEWSLETTER

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RESEARCH DIRECTIONS

Aggregation in Spiny Lobsters

Spiny lobsters often aggregate during the day in crevices and holes of coral and rocky reefs. A lack of refuge leading to multiple den use may be the cause of these aggregations. It is also possible that lobsters attract one another and they aggregate by choice. We recently found that chemicals released by both sexes of the California spiny lobster, *Panulirus interruptus*, are highly attractive to both sexes, causing them to aggregate.

In the field, juvenile spiny lobsters cohabit more frequently than the larger adults and no relationship is found between cohabitation and lobster gender. Laboratory tests show juvenile lobsters prefer shelters suitable for cohabitation; also, that cohabitation occurs more often than expected by chance alone. This gregariousness, in part, structures den residency patterns and lobster spatial distribution. Lobsters depart from dens at dusk and enter dens in greatest numbers shortly before dawn. Most lobsters probably do not recolonize the same dens each night, but find the closest shelter as day approaches. Thus, den choice is in part a lottery, although selection is influenced by low light intensity, presence of conspecifics, and physical attributes of the den.

Aggregations may function as an anti-predatory mechanism. Group residency reduces penetrability of a den to large mobile predators of which most, but not all, are diurnally active fishes. *P. interruptus* positions itself so that the robust spiny antennae point outward from the den. Cohabiting animals collectively wave their antennae to fend off predators. Chemicals released from freshly killed lobsters repel conspecifics; this would appear to facilitate defense and predator avoidance. If aggregations serve in predatory defense, then lobsters express an ontogenetically changing sociality that evolved under conditions of variable predation risk. Our data suggest that smaller lobsters should have greater vulnerability, while larger lobsters find refuge from predation in their greater size. These predictions are yet untested.

Communal denning is common throughout the family Palinuridae. Fishermen have, in some cases, used knowledge of this behavioral trait to their advantage. In Florida, fishermen commonly place sub-legal sized spiny lobsters in traps, having observed that this increases trap attractiveness and enhances catch. Our findings support their observations. Fishermen should be aware, however, that death of sub-legal sized lobsters in traps will cause repellency and may reduce the catch to a level below that of a conventionally baited trap.

Ecologists, who use baited traps to make population estimates, should recognize that each successive lobster capture is not independent of previous captures. Lack of independence could bias population estimates. As well, population censusing by divers must account for the tendency of spiny lobsters to aggregate. Stock assessment via diving surveys must include an area significantly larger than the scale of patchiness in lobster spatial distribution. Among other questions, our laboratory is asking how and why spiny lobsters aggregate. Answers will have a direct bearing on management of spiny lobster fisheries

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Spiny Lobster Research at CSIRO, Western Australia

Research has formed the basis for successful management of spiny lobster (*Panulirus cygnus*) populations in western Australia since the early 1950s. Because of its commercial importance, *P. cygnus* (known locally as the western rock lobster) has been subject to intensive study, the nature of which has varied principally because of increasing knowledge of the fishery, the animal and its environment.

Initial studies concentrated on the collection of catch, effort, and catch composition data from the commercial fishery. These data on the early development of the fishery have proved invaluable to its management. A modern sophisticated data collection system, subject to continual reexamination, is used today to monitor changes in effort in the fishery. Presently we are attempting to contain the expansion in this effort by management measures. Studies in recent years were aimed at reducing mortality of undersized lobsters. This has been achieved through reduced handling of the undersized by introducing escape gaps in the traps and improving handling techniques by the fishermen.

Demonstrated relationships between the levels of puerulus settlement and recruitment to the fishery have been used to predict catches four years in advance. These data are now supported by indices of pre-recruit abundance, which enable the prediction of both recruitment and total catch. The current principal biological research is aimed at understanding the mechanisms affecting recruitment to the fishery and the effect of high exploitation rates on the recruit to prerecruit ratios. The most recent achievement has

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been the linking of oceanic events off Western Australia with levels of larval (puerulus) settlement, and hence recruitment. The mechanisms that bring this about are unknown and will be investigated over the next few years.

The most exiting area of future research lies in mariculture. Recent developments have suggested that culture through the long larval phase may be possible. Plans for a major research thrust in this area have been prepared, and are under consideration.

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HALL OF FAME

Dr Wilfred Templeman

The name W. Templeman features prominently in bibliographies on Homarid lobsters. Over a 26-year period starting in 1932, he produced 37 scientific papers and articles on various aspects of the ecology and population biology of the American lobster and its fishery in Atlantic Canada. Many of Dr. Templeman's contributions were pioneering efforts that have withstood the test of time and still are referenced widely.

Dr. Templeman, during summer, conducted research on Maritime lobsters from the St. Andrews Biological Station while studying at the University of Toronto (1930-33) and lecturing at McGill University (1933-36). During this period he demonstrated the relationship between body proportions and size at first maturity in lobsters and demonstrated major differences between geographic areas. He also found local differences in other aspects of lobster life history such as times of spawning, hatching, molting, growth and the effect of female maturity on growth. The effect of local temperature regimes on lobster life history was demonstrated by comparing animals from both the warm southern Gulf of St. Lawrence and the cold Bay of Fundy and its approaches. Detailed descriptions of behavior associated with mating, egg-laying and hatching were provided and the effect of temperature on embryonic development was documented. Some facets of lobster movement were elucidated and initial estimates of exploitation rates derived from tag-recapture data. While at St. Andrew's, Dr. Templeman carried out his comprehensive study on the influence of temperature, salinity, light and food on the survival and growth of lobster larvae, and also his initial work on the distribution of lobster larvae in the wild.

Dr. Templeman returned to his native Newfoundland in 1936, to head the Department of Biology at Memorial University College in St. John's. He continued summer research on lobsters for the Newfoundland Government Laboratory between 1938 to 1944. Documentation of the details of various aspects of lobster life history, including larval studies, was carried out in different areas around the island. These studies included tagging to determine the extent of local movements and estimates of exploitation rates. This work provided the basis for descriptions of, and the effects of light and wind on, the vertical and horizontal distribution of larvae. Dr. Templeman's concepts on larval ecology are still part of the ongoing discussion of recruitment mechanisms in the American lobster.

Dr. Templeman also addressed a number of practical concerns of the lobster fishery. Among these were conditions for holding and shipping lobsters to minimize mortality, an alternative to plugging or banding for inactivation of claws, recognition of berried females whose eggs had been scrubbed, and the effect of trap lath-spacing on number and size of lobsters caught.

Dr. Templeman was appointed Director of the Newfoundland Government Laboratory in 1944. His research interests and responsibilities broadened considerably to include most of the commercial, and many non-commercial, fish species of the Northwest Atlantic. Here, Dr. Templeman's direct involvement in lobster research ended, although he continued to publish papers on lobsters for a number of years. The Newfoundland Government Laboratory became the St. John's Biological Station of the Fisheries Research Board of Canada in 1949. Dr. Templeman continued as Director until retirement, in 1972. He then joined Memorial University of Newfoundland as the first J. L. Paton Professor of Marine Biology and Fisheries, a post he yet holds.

Dr. Templeman is also affiliated with the Science Branch of the Department of Fisheries and Oceans, Newfoundland Region. He works from an office at the Northwest Atlantic Fisheries Center, St. John's, where he maintains his prolific publication rate.

The lobster research community takes this opportunity to thank Dr. Templeman for his most noteworthy contribution to our knowledge of the American lobster. Best wishes for continued good health, happiness and scientific productivity are extended.

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NEW METHODS AND APPLICATIONS

Molting and Reproductive Cycles: New Tools from Endocrinology

Recent advances in the chemistry of endocrinology will eventually provide new tools for the measurement and understanding of crustacean physiology. One area of active research is the isolation and purification of the peptide hormones which control molting and reproduction. In addition, a new class of hormone, the terpenoids, is being characterized in crustaceans (Lafer et al. 1984). Broad-brush surveys of crustacean endocrinology are available (Charniaux-Cotton 1985; Fingerman 1987; Skinner 1985; Quackenbush 1986; Rao 1985); here I wish to touch on only two points important to laboratory and field biologists.

Anyone who works with crustaceans, in lab or field, must contend with their cycles of molting and reproduction. Often, the molt cycle duration will vary between animals and with local environmental conditions

Assumptions made about molt cycle duration are often wrong and therefore misleading. It is quite simple to accurately molt stage animals; an easy, microscopic examination of the pleopod is all that is required. Aiken (1980) described the visible molt stages for homarid lobsters, and Lyle and McDonald (1981) have done the same for palinurids. The Drach (1939) molt stages are the basis for more recent work, and these molt stages are now directly correlated to a host of internal physiological events (Skinner, 1985). As a rule of thumb, the longest stage is intermolt (C and D_0) about 90% of the overall cycle, and the shortest stage is proecdysis (D_1-E) about 10% of the overall cycle. The molt stages are easy to learn; rookies can stage 20-30 animals in an hour. The durations of each stage is a most sensitive indicator of the quality of the environment, as well as the behavioural activity of individuals (Atema, 1986; Skinner, 1985; Tamm and Cobb, 1978). Direct molt staging is the only way to precisely describe the growth within a population of lobsters.

Reproductive activity in females also can be staged using external features. The pleopod cement glands of homarid lobsters have been directly correlated with gonadal development. Aiken and Waddy (1982) described several stages. Currently, there is no cement gland technique for palinurid lobsters. However, female spiny lobsters grow extra long ovigerous setae on the pleopods in anticipation of eggs to come. Their presence is a quick measure of reproductive competence (Gregory and Labisky, 1981). Determining the size at which a lobster is reproductively competent is an important criterion for resource management strategies, as well as studies of ecology, physiology and behaviour (Hunt and Lyons, 1986; Lyons, 1986). Removing the crustacean eyestalk neuroendocrine complex usually results in accelerated gonadal and somatic growth. Gonadal growth in sexually mature eyestalk-ablated animals is dramatic, while immature animals respond only slightly (Quackenbush and Herrnkind, 1981). Using this simple technique, the minimum size for reproductive competence can be determined. This test provides a direct functional determination for size and maturity. Indirect and more precise determination based on immunoassay techniques of both molt and gonad stages may become available. The present, simple morphological determinations allow field biologists to directly compare their observations to more sophisticated lab measurements.

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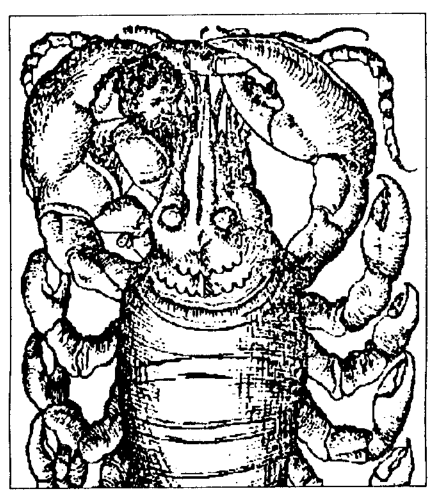

NEW METHODS...

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Modified Tucker Trawl for Lobster Larval Studies

Recent studies of the transport, distribution and vertical migration of larval lobsters in the waters offshore of southwest Nova Scotia, Canada were successfully carried out using an opening-closing trawl (see Figure) large enough to filter approximately 10^4 m3 of water during 30 minute tows (Harding et al. 1987).

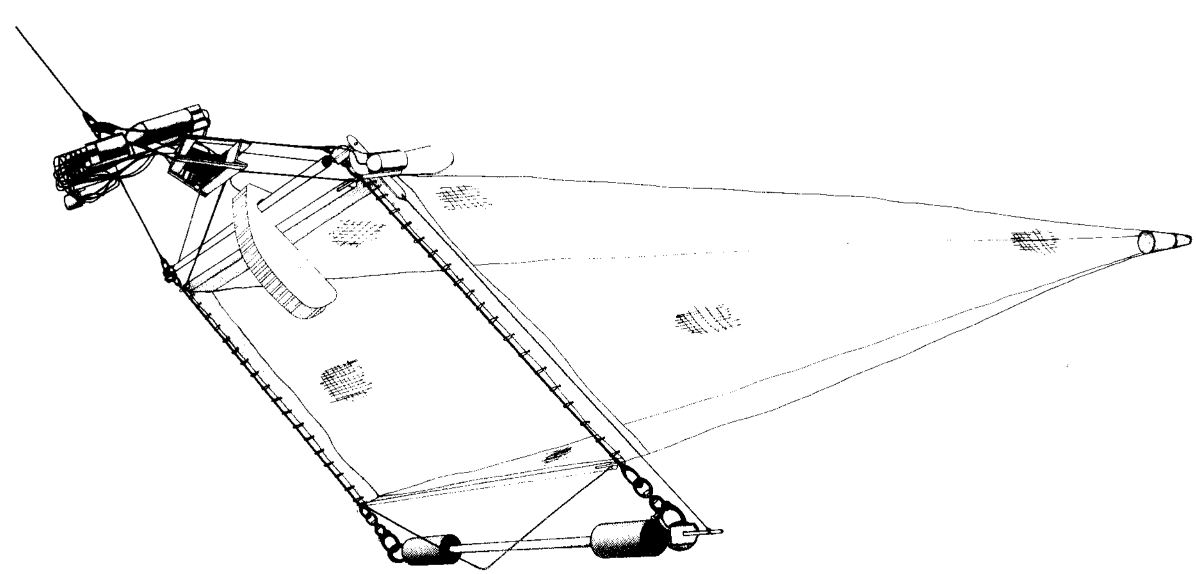
Clarke (1969) extensively redesigned the Tucker Trawl (see Tucker, 1951), giving it acoustical opening-closing and depth telemetering capabilities. Our trawl is similar to the Clarke version, but has additional sensors and a different release design. Sensor data and power is transmitted through a seven conductor, armoured cable used to tow the net. Almost complete interchangeability of electronic components with our half-scale BIONESS (Sameoto et al. 1979) was an important consideration in the design of our Tucker trawl.

The trawl is 2.5 m wide by 2 m in height, the net length is 8 m. The net is fabricated from 1600 mm mesh Nitex cloth with only longitudinal seams. Tests during net development showed no extrusion and rarely any damage to stage I lobster larvae. Soft-shelled stage I, II and III lobster (intermolt stages A and B) are regularly captured in reasonable condition.

The uppermost bar serves as a spreader for the lateral cables and as a mounting support for the flowmeter guard. The top and bottom of the net are attached to heavy-walled, reinforced steel pipes. Lateral cables are connected to a weight bar which hold 15 cm diameter lead rings. The net is opened when the bar holding the net bottom is released and slides down the lateral cables to rest on the weight bar. The net is closed when the bar holding the top of the net is released and slides down the cables.

The attack angle of the trawl mouth must be determined when calculating water volume filtered. A third lateral cable pivots a pressure case containing a Humphrey™ pendulum. This sensor provides a continuous measure of the trawl mouth angle. The mechanical components of the release are similar in design to those of the BIONESS sampler (Sameoto et al. 1979), but are heavier in construction and employ a greater mechanical advantage to compensate for the high tow loads. Cables from the net bars are suspended from levers which are held in place by a slotted shaft. The levers are released when this shaft is rotated by a stepping motor mounted behind the release. The stepping motor and its controlling package are examples of the components compatible with our BIONESS sampler.

The trawl is fitted with an Applied Microsystem™ CTD (model Expanded CTD-12) which logs data from depth; temperature and



Tucker trawl as modified for larval lobster sampling. Trawl is is open position.

conductivity sensors, net roll and mouth attack angle, counts from sensors recording the opening and closing of the net, and counts from flowmeters :TSK™ , which are modified by removing all dials and gears and fitting a magentically-activated Hall Effect sensor (Honeywell Micro Switch Model 103SR13A): mounted inside and outside the net.

Data transmission from the CTD to the surface is via a 20 ma current loop. The signal is converted from the current loop format to RS232 format with an applied Microsystems™ (Model 637) RS232 converter. Data handling software, written in FORTH, is run on an IBM XT (640 K memory) which stores both raw and converted data.

To date, over twelve hundred successful hauls have been completed. Several modifications are planned, including the addition of a light sensor, and the fabrication of a release mechanism with a greater mechanical advantage. The planned mechanism is part of an attempt to improve the present success rate of 96 percent. I am more than willing to discuss or answer any questions concerning the design, construction or performance of this modified Tucker trawl.

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REVIEW

Recruitment Workshop Proceedings

THE BIG RED BOOK (Can. J. Fish. Aquat. Sci., Vol 43, No. 11 1986) is a must for all lobster biologists. Refereed versions of 34 out of 67 papers presented in seven theme sessions at the 1985 lobster recruitment workshop, St. Andrews, N.B., cover Homarid, Palinurid and Brachyuran fisheries, recruitment studies, physiology, behaviour and modelling and permit the following personal overview of the state of the art.

Homarus americanus presents a paradox. Fisheries are managed (minimum legal size, trap limit, closed season, limited entry), but catch trends signal prolonged depletion (G. Ennis), yet verified collapse is rare. What does this signify? (M. Fogarty), a question I also ask, incidentally, of *H. gammarus*. Initially we see only partial answers. Homarid size frequency distributions within a stock are poorly known, and hypotheses about sources of recruitment and causes of interannual variability are numerous but conflicting (G. Ennis). New knowledge emerged about Gulf of Maine inshore/middle ground migration (A. Campbell), homing (D. Pezzack and D. Duggan), egg production (A. Campbell and D. Pezzack) and Gulf of St. Lawrence larval distribution (C. Hudon). These features may reflect the securing of optimal conditions for larval development and settlement, and underline the importance of offshore sources, but the stock recruit relationship remains ill-defined.

However, Fogarty and Idoine take Scarrett's (1964) pathfinding Northumberland Strait larval data and show no density dependence between larval stages I, II and III, but a strongly asymptotic relation between brood stock size and larval stage IV production. This could stabilize abundance over a range of annual larval densities, which suggests the site of compensation is the settlement - pre-recruit phase, about which we should now try and learn much more. This conclusion reinforces my own views about the role of habitat carrying capacity, and lends purpose to studies of larval behaviour (G. Ennis), settlement choice, and niche-related competition of juveniles (A. Richards and S. Cobb).

These studies will have a bearing on the success or failure of stock enhancement treated only summarily in the volume (G. Conan), but in more detail at the workshop. Since species with a compensatory stock-recruit curve might collapse sooner than those with an over-compensatory curve (C. Bannister and J. Addison), this suggests we need to define stock reduction accurately, and to know when collapse is imminent. This adds particular relevance to the various long term, and beautifully executed, studies on reproduction (D. Aiken and S. Waddy), sexual selection (J. Atema) and related topics (see Session 7), which modulate or control stock fecundity, and give bite to niche-related density limitation in adults (discussed in the fractal analysis of J. Caddy, and J. Addison's model of density dependent size composition bias arising from niche bottlenecks).

The dominant theme for several species of Palinurids was the distribution of the fascinating and protracted larval phase, with associated hypotheses about gyral retention, adaptive planktonic behaviour, and puerulus settlement (W. Lyon, D. MacDonald, B. Phillips, D. Pollock and J. Pringle).

This fruitful area of research has made much progress but, as Phillip's session summary emphasizes, is still far from complete. Study of mechanism and cause could be overshadowed by the

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Recruitment Workshop Proceedings...

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Western Australian success in fisheries prediction based on lagged correlations between fishery catch and puerulus (B. Phillips) or juvenile (N. Caputi and R. Brown) abundance. For the nominally effort-limited, Western Australian spiny lobster fishery this is a valuable management tool. Nevertheless, I encourage spiny lobster scientists to maintain ecological studies as insurance, in case the correlation breaks down. In any case, compensatory pre-recruit mortality in this species deserves further study.

For the fascinating Brachyuran group the greater range of catch variability is summarized and compared by G. Jamieson, but the field is too great for an in-depth study in one paper. Perhaps it deserves its own workshop. L. Botsford provides a polished paper on environmental forcing in dungeness crab, with wide methodological and conceptual implications.

Crustacean biologists often stress the difficulty of applying fin-fish based models to their fishery assessments. I feel their concern is misplaced. This volume suggests they should instead be employing the growing ecological understanding which, though still someway from providing an integrated view of population dynamics for predictive purposes, nevertheless gives modellers plenty of food for thought as to the assumptions they do, or should, make. It is too early for me to say how I will modify my approach to lobster fisheries science, but I feel this volume reflects real progress in disciplined study and understanding since the workshops of 1977 (Perth, W.A.) and 1978 (St. Andrews, N.B.). I suggest future workshops might focus less on proliferation of species detail as such, and more on synthesis, comparative dynamics and ecological strategies, and just plain "what if" discussion. But the Big Red Book stands as a successful tribute to chief organizer A. Campbell and colleagues, and a fitting memorial for Martin Johnson, to whom it is dedicated.

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TERMINOLOGICAL TRIBULATIONS

1. What's in a Name?

Editing this first issue of The Lobster Newsletter has presented us with a few minor dilemmas. For example, what common name should we use when discussing the Palinuridae? A portion of the world's lobster investigators employs "spiny lobster"; the remainder use "rock lobster". The first reflects morphology, the second, habitat. Both are obviously legitimate.

We both are sometime administrators and hence wish to impose ORDER. A decision was required. The rationale was simple. Given that we are attempting to describe an animal and not a habitat, we favour, and will use, the term "spiny". We are pleased that this is also in line with the descriptors "clawed" and "slipper", used for the Nephropidae and Scyllaridae respectively. If anyone has a suggestion for the Synaxids, please submit it!

The above is only a partial solution, unfortunately. What colloquial term should be used to identify *P. cygnus* and *P. argus*, assuming such terms are required? Again, we have resorted to the nephropid model and will use geographic location. Just as *H. gammarus* and *H. americanus* are respectively the European and American lobsters, *P. argus* and *P. cygnus* will be described as the Florida and Western Australia lobsters respectively. How is that for ORDER!

John Pringle
Stan Cobb

2. When is a Larva a Post Larva?

For some time I have worried about the terminology for the last (fourth) larval instar of clawed lobster. The first three instars are mysis in form, while the fourth is nearly identical to the adult. The metamorphosis that occurs between third and fourth instars involve significant behavioral and physiological transformations as well as the more obvious morphological change. Yet we make no linguistic distinction between the pre- and post metamorphic stages. It seems useful to apply a new word to the last instar that clearly identifies it as different from the preceding three. There is clear precedent for this; the spiny lobster postlarva is called a puerulus, slipper lobster postlarvae are called nistos, and crabs have megalopal stages.

I have no great name to suggest for the postlarvae of nephropid lobsters; however, I do urge that all who work on, or write about, clawed lobsters start to refer to the last larval instar as a postlarva. Not only is the term more descriptive, but it changes one's perspective while emphasizing the difference between the first three and the last instars. From now on I will use the term postlarva. I hope that others will also.

Stan Cobb

FISHERIES UPDATE

Spiny Lobster Resource Management: Changes Along the South African West Coast

The spiny lobster *Jasus lalandii* has been fished for many years on the west coast of South Africa. The late 1960s were years of great change in the lobster industry as a whole. Catches in areas north of about 32 S (Namaqualand) declined severely. To the south, in contrast, stocks appear to have remained at a fairly constant level. Detailed catch statistics are available only since 1969, but earlier records support this generalization.

The decline in catches in the northern region was thought to be the result of a lowering of the minimum size limit from 89 mm carapace length to 76 mm in 1963 (Pollock 1982). This led to a short-lived increase in catches, followed by a severe decline. By 1970, catches had declined to such low levels that the 89 mm size limit was reinstated in 1970 in an attempt to rehabilitate the resource. However, catches in the north remained incredibly low for the next 15 years.

In 1985, the size limit was reduced again in the northern region, to 75mm, on an experimental basis. This measure was adopted after tagging results showed that lobster growth rates (moult increments) were comparatively small, and that females were reaching sexual maturity at a smaller size than on the grounds further to the south. The immediate effects of this reduction size limit were, as expected, an approximate doubling of catch per unit effort (by weight), a decrease in mean size landed, and an increase in the proportion of females in the landings. The 75 mm size limit still affords protection from capture to all adult females for at least 11 years before they become eligible for capture (Pollock 1987). Stock size and total egg production of Namaqualand females is estimated to be small in comparison to total egg production by all female *J. lalandii* throughout the commercial range. Thus the contribution to the 'larval pool' has not been seriously diminished by the introduction of the reduced size limit in this region.

To date, the experiment has been a mixed success. Improved catch rates have increased the profitability of fishing, and certainly raised the hopes and prospects of local fishermen. However, the extremely shallow water distribution of adult lobsters in the region continues to plague attempts to capture them. Namaqualand lobsters avoid offshore oxygen-depleted bottom waters by crowding into a narrow subtidal fringe within the kelp beds, especially in areas protected from heavy swells by rocky reefs (Pollock and Shannon 1987). These areas can only be entered and fished from small boats under very calm conditions - and such conditions are very rare on the Cape west coast!

Most fishing from northern ports such as Port Nolloth is conducted from small outboard-motor powered dinghies which rarely venture further afield than about 20 km to the north or south of port. Weather conditions are treacherous, and fog prevalent, so that unless positive attempts are made by the industry to introduce larger vessels capable of working further from port, it is unlikely that the Namaqualand resource will be fully utilized.

Studies by Pollock and Shannon (1987) suggest that the long-term productivity of the Namaqualand and Namibian sectors of the spiny lobster resource is not likely to improve to any great extent unless and until the environmental conditions which produce oxygen-depleted bottom waters reverse or alter significantly. The root cause of the low oxygen syndrome and its associated effects on benthic fauna appears to be eutrophication associated with an increase in upwelling and phytoplankton overloading during the past two decades in the northern Benguela system. These conditions may be reversible if they are driven by climatic and oceanographic cycles.

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Annual Fisheries Yields

Most involved in research on, and the fisheries science of, commercially important taxa, are curious about annual yields. We will, in response to that curiosity, record submitted national, annual landings in the June issue. We need the data (in metric tonnes and wharf value) for each species by early May. Rather than solicit contributions from individuals, we ask that the appropriate person from each country identify him or herself. Please submit your name and address to John Pringle by December 1987 if you are willing to take on this small task.

AN EXHORTATORY NOTE

In preparation for the first edition of THE LOBSTER NEWSLETTER we reviewed the formats and contents of many newsletters. Some urged their members to contribute material without the request of the editors. None said it better than PNDR Informations:

> N'hésitez pas à envoyer des petits textes, illustrés de préférence: questions, réflexions, discussions sur des résultats, informations diverses, enfin tout ce qui fait la vie d'une activité scientifique peut en être la matière.
>
> Ne soyez pas timides, le bulletin n'ce pas pour vocation de remplacer la publication mais seulement (et c'est déjà beaucoup) d'être un organe de liason entre les chercheurs du programme. Il sera ce que vous en ferez.

We agree. This newsletter will be what you make it. We encourage you to participate. Write to either of the editors: our addresses are on Page 2.

MAILING LIST

We are distributing this first issue of THE LOBSTER NEWSLETTER as widely as possible. Names were collected from several sources to make up our first mailing list. If you want to receive the newsletter but did not have a copy addressed (or if it was incorrectly addressed) to you, please let us know. Should your library receive the newsletter?

On the other hand, if the newsletter would not be particularly useful to you, please write asking us to take your name off the list. Thanks very much.

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