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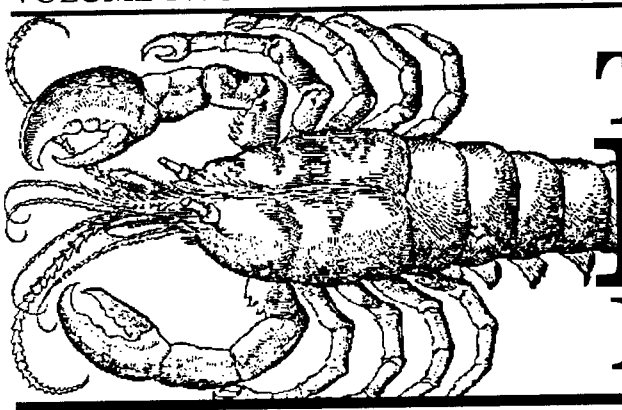

The Lobster NEWSLETTER

RECENT EVENTS

Spiny Lobster Larvae Cultured

For many years biologists have attempted to rear the larval stages of spiny lobsters without success. Descriptions of various phyllosoma stages have come from either painstaking matching and careful deductions from plankton samples or from larvae captured alive in the field and reared for some time in the laboratory. However, until now, the culture of individual palinurid larvae from egg stage to puerulus has not been possible. The difficulty in rearing comes from both the long larval life (a year or more in some species) and a nearly total lack of information about the environmental and feeding requirements of the larvae.

Jiro Kittaka (School of Fisheries Science, Kitasato University, Sanriku, Japan) recently reported in a series of three papers that he has cultured *Jasus lalandii*, *Palinurus elephas* and a hybrid, *Jasus novahollandiae x Jasus edwardsii* from egg to puerulus. These are all cold temperate species, and Kittaka chose to work with them because of the continuing problems in attempting to rear the larvae of warm-water species. Survivorship was very low, but the news that the possibility exists to close the life cycle in cold-temperate palinurids is exciting. Kittaka's papers are found in Nippon Suisan Gakkaishi (Bulletin Japanese Society for Scientific Fisheries) 1988 54 (1), 54 (3) and 54 (7).

Hurricane in Mexico

On September 16, 1988 hurricane "Gilbert" struck the Caribbean shores of Mexico very near the marine laboratory where Patricia Briones-Fourzan and Enrique Lozano-Alvarez work. Patricia sent the following report:

"Gilbert" affected the Lab quite a lot. The eye of the hurricane passed through Puerto Morelos, and the sea was the main cause of destruction. Fortunately enough, our Lab was very well constructed to stand winds of as much as 240 km/h and , even though Gilbert carried winds of 300 - 340 km/h, the buildings of the lab were not structurally damaged. The huge waves struck two buildings (the storehouse and the dining area), and all the floor-to-ceiling chancels and windows of the latter disappeared. The residence building also lost all the windows and the furniture was badly damaged. The research area stood well, although the sea water level reached inside the first floor and flooded some areas. A layer of sand as much as 1 m high remained after the sea retreated. The lab equipment had been put safe, so we lost no piece of it, and our vessels

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EDITORIAL

We were very pleased with the positive response to the first issue. We would like to think that the comments were directed not only to the attractive design (for which we thank Ken Davignon) but to the content. In the editorial of the first issue we asked for comments on the content and suggestions for features perhaps not included. Your suggestions were implicit in a number of letters and explicit in a few. In this edition we incorporated the content of a few of the letters in the text of some articles, and we have written a couple of the pieces ourselves. Nearly all the material you will read here was solicited or was submitted in response to something in the first number. As you glance through the Newsletter, you will find the topics quite biassed towards research and management on the North American continent. This was not by design, but is a product of our own location and mind-set. We are determined to make this a fully international newsletter, devoted to basic research, applied research and management of the wide variety of animals we call lobsters. Again we ask your assistance. If you have news of interest you wish to share with the community of lobster researchers, a query of any nature or a new research direction, why not let your colleagues say "I saw it in the Lobster Newsletter first!"

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RECENT EVENTS

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and motors were also in good shape. We did loose many books due to the flood (among them the blue lobster books). The power and water supply lacked for one month, but they have now been restored. So far, the Lab has been cleaned and some of the damage repaired, but work was certainly disrupted.

Puerto Morelos was evacuated hours before "Gilbert" arrived, so no human lives were lost. Unfortunately, 30 fishermen of Puerto Juarez, a village some kilometers north of Cancun died when their fishing vessels (which had been taken to a shelter port in Isla Mujeres) were sunk by the force of wind and the wave surge. In Cancun, the hotel zone was damaged in some areas, and some of the lovely beaches disappeared, although others grew.

Very briefly, this is the situation. The staff of the Lab is fine and we've kept our spirits high. Again, thanks a lot for your concern, we really appreciate it.

LETTERS

We received many congratulatory letters from around the world indicating appreciation and support. Thank you all! We hope the Letters column will become a forum for short comments or questions such as the one below.

Firstly, I wish to congratulate the editors of the Lobster Newsletter with having produced an interesting first number. This new initiative is undoubtably appreciated by many.

In connection with Dr. Zimmer-Faust's article on aggregation in spiny lobsters I should like to pose a general question to those engaged in the biology of this group.

I still vividly remember an extraordinary scene from one of Jacques Cousteau's films on life in the sea, shown on Danish TV about ten years ago: across a sandy bottom somewhere (?Florida) marched a long procession of spiny lobsters. According to my memory, the commentator said that this was some sort of a prelude to spawning but that the nature and significance of the performance was unknown.

I wonder whether anything similar has been seen by others and recorded in the literature? I should also like to be informed of how this strange behavior may come about and what its purpose seems to be.

Torben Wolff
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Editors' comment: We hope the commentator (Bill Herrnkind) will answer Dr. Wolff's question about P. argus and that if anyone has seen other species march single file, they will write to the Newsletter. This seems an appropriate forum to share informal observations that might not make it into the primary literature.

EDITORIAL

CONTINUED FROM PAGE 1

In this issue we start a letters column, a listing of upcoming meetings and workshops, and present a couple of "news" items. The latter we did not anticipate at first as being a part of the Newsletter, but seemed a good idea. In the next issue we plan to add book reviews to the format. Illustrations will enliven the pages, and we urge you to participate in this as well.

The breadth and depth of research on lobsters is exciting. It is only by continued communication among all members of the community of people interested in these animals that the scope of work can be appreciated. The Lobster Newsletter is intended to be the focus of that communication. Again, we solicit your comments, suggestions and participation.

The Lobster NEWSLETTER

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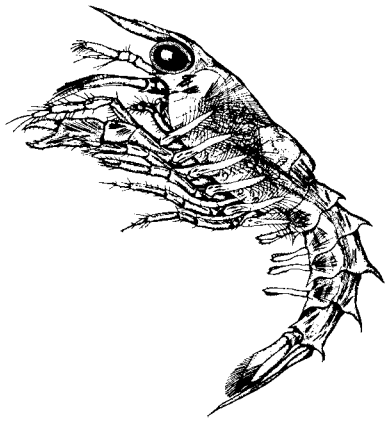
RESEARCH DIRECTIONS

Comparative Physiology and Biochemistry of Larval Lobsters

Development and metamorphosis of planktonic larvae, including those of decapod crustaceans, require efficient and coordinated utilization of available metabolic resources. Of the many factors affecting resource use during development, nutrition and bioenergetic capacity for assimilating and utilizing energy reserves are of prime importance. To better understand physiological adaptations during the early life history of the American lobster, *Homarus americanus* Milne Edwards, we have examined nutritional and bioenergetic aspects of development during key transitional periods of the life cycle: egg extrusion, embryogenesis, hatching, larval development, molting, metamorphosis, and settlement of the juvenile stage.

During the embryonic period, catabolism of yolk reserves serves as the sole source of nutrients for the developing embryo. Biochemical changes during embryogenesis reflect catabolism of various substrates for energy, notably lipid (in the form of triacylglycerol and phosphatidyl choline) and protein. Exposure to different thermal regimes results in considerable variation in the rates of utilization of energy substrates. Increased conversion efficiency of yolk reserves was noted among embryos incubated at elevated temperatures, suggesting that subtle differences in the energetics of embryogenesis may be apparent among populations with different thermal regimes.

At hatching and initiation of feeding, there is a shift in dependence from endogenous to exogenous energy reserves. We have examined the energetic requirements and digestive capabilities of all larval stages. Larval stages I through III have similar energy requirements and possess high activities for protease, lipase and amylase. Lipid is of prime importance as an energy substrate and the turnover rate for lipid can be quite rapid. Weight-specific metabolism increases with sucessive larval stages. In postlarvae, the dependency on lipid as an energy substrate is diminished and lipid reserves can serve a storage function. Weight-specific metabolic rates of premolt postlarvae are decreased in comparison with earlier stages but digestive enzyme activities remain high. Changes in physiology correlate with morphological changes in the developing midgut gland, specifically with the appearance of lipid droplets in the lipid-storing cells of the midgut gland of postlarvae. By two molts after metamorphosis, lobsters have energy storage and metabolic patterns similar to adult lobsters and the midgut gland has the adult morphology.



The transitions from hatching to attainment of the juvenile stage are reflected in differences in physiological and biochemical processes that influence food selection and diet. Accumulation of energy reserves may be related to life style. Active, rapidly growing animals with quick molt recoveries (stages I, II, and III) store less reserves than larger, slower growing animals with more prolonged molt recovery periods (juveniles and adults). Thus, the transitions observed between stage I larvae and postlarvae may reflect comparative energetic strategies for different habitats. Postmetamorphic animals accumulate greater proportions of lipid, as evidenced by both biochemical studies and histological studies of the midgut gland. The reason for this accumulation and the triggering mechanisms are unknown. On a caloric basis the accumulation of lipid (primarily as triacylglycerol) of late postlarvae accounts for 3 to 5 days of metabolic reserves. As new feeding behavior must be adopted in benthic habitats and active swimming may occur in search of suitable benthic substrates, settling lobsters may rely temporarily on stored reserves. Premetamorphic larvae show little evidence of lipid storage and appear to utilize lipid rapidly and have little capacity to survive long periods without food.

The physiological and biochemical observations of our studies have several implications for assessing the early life history of lobster populations. The large changes seen in energy storage and utilization patterns between pre- and post-metamorphic animals suggest that lipid stores may offer advantage for newly settled lobsters providing sufficient reserves to allow searching for a suitable substrate, burrow construction, and adapting to a new habitat before feeding is a necessity. These studies also suggest that the transition between planktonic and benthic existence coincides with the capacity for increased energy storage. Late postlarvae may be at a considerable energetic advantage in selecting a benthic habitat and may delay settlement until after this energetic transition.

Judith McDowell Capuzzo
Woods Hole Oceanographic Institute
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MEETING ANNOUNCEMENTS

In this section we will post announcements we have received or seen in other publications. Since we address an audience whose interests focus on ,but are not limited to, lobsters, we will announce international meetings or workshops about decapods, and in some cases, crustaceans in general. Regularly scheduled (annual) meetings will not be included.

The University of Thessaloniki (Biological Section) will sponsor the *Fourth Colloquium: Crustacea Decapoda Mediterranea* in April 1989 in Thesaloniki, Greece. Languages are French or English. For further information, write:

Dr. Ath. Koukouras
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54006 Thessaloniki, GREECE

Benthic macrocrustaceans of the tropical eastern Pacific are the focus of an international meeting to be held at the Marine Station of Mazatlan, Sinoloa, Mexico in February or March, 1990. The meeting, *I Coloquio sobre Macro-Crustaceos Bentonicos del Pacifico Este Tropical*, will consider contributions dealing with taxonomy, ecology, zoogeography and fisheries. Languages will be English and Spanish. For further information, write:

Dr. Michael E. Hendrickx
I Coloquio MCB-PET
Estacion Mazatlan UNAM
P.O. Box 811, Mazatlan
Sinaloa 82000 MEXICO

An International Workshop on Lobster Ecology and Fisheries will be held June 9 - 12, 1990 in Havana, Cuba. Topics include:

- Distribution and settlement of larvae
- Artificial shelters and ecology
- Behavior and movement
- Structure and dynamics of populations
- Fishery and handling
- Culture.

Participation is limited. Languages are English and Spanish. If you are interested, contact:

Dr. Julio Baisre
Chairman, Planning Committee of the Workshop,
Ministerio de la Industria Pesquera
Barlovento, Santa Fe (19100)
La Habana, CUBA.

Abstracts, which must be accepted by the planning committee, are to be submitted before November 30, 1990.

Should you happen to be in a globe trotting mood, follow up the workshop with the: *Third International Crustacean Conference*, to be held at the University of Queensland, Brisbane, Australia in early July, 1990. This conference will cover a comprehensive range of topics in crustacean biology and biogeography, including a section on commercial aspects and potential. For further information, or to offer suggestions for symposia, contact:

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AUSTRALIA 4067.

TERMINOLOGICAL TRIBULATIONS

In the last newsletter, we suggested some common terminology for lobsters of different types and locations, and asked for suggestions. The response we received from several colleagues was immediate, and to the point: We are mistaken in calling *Panulirus argus* the *Florida* spiny lobster. We humbly agree and thank Julio Baisre, Patricia Briones-Fourzan, John Munro and Austin Williams for writing. From now on, it will be the *Caribbean* spiny lobster, which, as Patricia said, does it more justice.

We also asked for suggestions for a common name for the Synaxids. Patricia Briones-Fourzan suggested "hairy" (or to be a little more refined, "hirsute.") John Hunt responded with the following doggerel:

A philosophy perhaps not flawed
To call a Nephropid clawed
And most certainly its timely
To call a Palinurid spiny
I agree that its chipper
To call a Scyllarid slipper.
But, is it so moral
To change the name coral?
Following the lead of morphology
Rather than that of ecology;
I propose taking this tack:
Let's call all Synaxids fuzzy-backed.

The editors refuse to be liable for the quality of poetry in this publication.

A letter from Austin Williams was most informative:

"A committee, including active participation of Ed Bousfield and associates and Alaskan workers, has drafted "Common and Scientific names of Aquatic Invertebrates from the United States and Canada: Decapod Crustaceans." This is in press with the American Fisheries Society as Special Publication No. 17 and its appearance is expected sometime this year. It is patterned on the now classic "Common and Scientific Names of Fishes." Regarding the lobsters:
1. We agreed on the common name "Caribbean spiny lobster" for *Panulirus argus*. The range

extends far beyond Florida, and even the Caribbean is a little restrictive, but descriptive.
2. The Synaxida are recognized as 'furry lobsters.'"

The question about what to call the post metamorphic stage of the clawed lobsters also attracted some attention. Jan Factor (State University of New York, Purchase, NY, U.S.A.) wrote:

"I have never understood the use of "larval instar" or "fourth larval stage" to describe the fourth stage of *Homarus americanus*. As you point out, the first three (truly larval) stages undergo a host of coordinated behavioral, physiological, and external and internal anatomical changes upon metamorphosis to the fourth stage, which is in many ways a miniature adult. I applaud your call for the use of "postlarva" for the fourth stage. The fourth stage is the first in a long series of postlarval stages that increase in size but undergo no dramatic changes from molt to molt. Since the next abrupt transition the the lobster's life history is sexual maturation, the series of postlarval stages can be thought of as juvenile, leading up to the sexually mature adult stages.

"A terminological distinction seems justified for those decapods with a distinctive secondary (or intermediate) larval stage, the clearest being the megalopa of crabs. Even though postmetamorphic, the megalopal stage is anatomically distinct from the first juvenile stage (often called the "first crab" stage.) There is no similar postmetamorphic, yet prejuvenile, stage in the clawed lobster. We should abandon the use of "larva" and "instar" for the fourth stage. At the same time, I would urge that we not adopt or invent any special term for the lobster's fourth stage. It is simply the first postlarval or first juvenile stage, which are, in this case, the same thing."

Guy Charmantier (Universite du Languedoc, Montpellier, France) agreed with using the term postlarva to designate stage IV, and pointed out that about 90% of the postmetamorphic characters are acquired at the transition from stage III to postlarva.

AKELLA SASTRY
A Remembrance

A. N. Sastry, a professor at the University of Rhode Island and a long-time member of the lobster research community died in December1987. One of his students, Jeff Hughes, wrote this remembrance .

Coming into his office on any given afternoon, one would most likely see Dr. Sastry writing... recording new-found insights from recently acquired publications on magnetism and life, or electrochemical properties of cell membranes, or any of a vast array of subjects which fascinated and challenged him. He always stressed, that for him, learning was a life-long endeavor. "I was curious," he would often say, "so I did what was needed to learn more." He was a persistent writer, recording and composing inspirations, plans, proposals, book chapters, journal articles; all extensively outlined and frequently revised. "Science is fun" was a feeling he revealed in many discussions on the early thrill felt at discovery through research, the excited anticipation with which he met each day's arrival at the lab. Dr. Sastry enjoyed discourse. He would interrupt his reading and writing for what he felt was a priority - talking with students about their research. He believed strongly that a major obligation of faculty is to nurture students and provide them with the intellectual challenge and encouragement necessary for them to grow into scientists and scholars. During the course of such discussions, Dr. Sastry would reveal a personal side not often seen in public: warm, open and willing to share his understanding and love of science, a man who down-played his own contributions, yet maintained pride in his independence and an optimism for future projects. That optimism, tinged as it was by a sense of frustration at not having accomplished more (there was so much!), was extended to his students. Leaving Dr. Sastry's office this student always felt better than upon entering. He was the one capable of synthesis, of seeing the "Big Picture," of keeping the bits and pieces of research meaningful within the larger perspective of science, of nature.

Dr. Sastry's broad-ranging research interests are embodied, in part, in his published works. Other ideas were nascent, in preparation, or in proposal form at the time of his passing. Included among the topics of unfinished work were: thermodynamic efficiencies of growth; genetic consequences of contaminant exposure; evolutionary consequences of geographic variation in scallop reproduction; marine molecular biology from an ecological perspective; and the relevance of biological hierarchies to prediction of pollutant effects in estuaries. He strove to interweave various research threads, to interrelate often distant branches of inquiry, in an attempt to reveal the dynamics of ecosystems. To this he applied a wonderfully eclectic mind and prodigious energy.

Throughout his career, Dr. Sastry was devoted to excellence, with a keen appreciation for the work of his intellectual forebears and colleagues, and a ceaseless thirst "to know". Over his desk hung this quote from Abraham Maslow:

"Science needs all kinds of people...since each person can ask different questions and see different worlds."

In the best human tradition, A.N. Sastry listened, then offered us his vision.

FISHERIES UPDATE

Northwest Atlantic: *Maine Lobster Institute*

The Maine Lobster Institute was born in 1987. It is a consortium of academics, industry representatives and resource managers. The Institute's objectives are to identify industry problems, bring resolution to these problems and enhance communications between such disparate groups as lobster *(Homarus americanus)* researchers and consumers. The latter is aided by "The Lobster Bulletin", first published in November 1987. It's prime objective is to inform readers about the activities of the Institute. Further information can be attained by contracting Dr. D.J. Dow, Executive Director, 30 Coburn Hall, University of Maine, Orono, Maine 04469.

The advancement of resource management is frequently held up, not because of insufficient science, but through a breakdown in trust between users and the resource management team. The Maine Lobster Institute is an attempt to remove this road block.

Readers with similar experiences, or knowledge of other methods, successful in enhancing communication between science and science users, are encouraged to share them with readers of The Lobster Newsletter.

Northwest Atlantic: *Minimum Size Limits*

The American lobster, *Homarus americanus*, is comercially fished from New Jersey, U.S.A to Newfoundland, Canada. International demand as a gourmet food item results in excellent prices to fishermen. Present minimum legal carapace length, in combination with high exploitation rates, prevents an optimization of yield—per—recruit. Egg production per recruit is low as well. Biological advice, over numerous years, has always included an increase in minimum legal size. Rarely have fishermen been in favour of this measure. Attempts to incorporate it into lobster management plans have met with little success.

There has been a breakthrough, albeit a small one. An American federal law (for federal waters — those beyond 19.2 km), recently promulgated, states that the legal carapace length will increase 0.79 mm (1/32") per year for four years beginning in 1988. The states of Maine, Massachusetts, and Rhode Island passed similar legislation. Fishermen in these waters employed the new measure this year. New York has just passed similar legislation. Here the minimum legal carapace length will increase by 0.79 mm in 1989, given that Connecticut enacts a similar regulation. Connecticut's regulation will be in effect January 1, 1989. Thus Connecticut and New York will be one year behind Rhode Island, Massachusetts, and Maine.

It is uncertain whether New Jersey and New Hampshire will follow the pack. Legislation similar to New York's, will be introduced in the respective state legislatures. Passage is not guaranteed.

The five year program cannot be guaranteed smooth sailing, even for those states which have initiated it. For example, Maine, the state that has the most to gain from lobster conservation, has dissatisfied fishermen waiting for the opportunity to repel the regulation. Apparently there is little chance for sabotage prior to 1990. Ironically, it may be the failure to enact the legislation in one state, New Hampshire, that could bring the program to its' knees. Lobstermen in western Maine feel a unilateral increase by them, would give New Hampshire fishermen (they fish contiguous waters) an unfair advantage. Certain animals returned to the water by Maine fishermen will be of legal size if captured by New Hampshire fishermen.

Scientists have long advocated an increase in minimum legal size. Canadian researchers have not been successful in their attempts to convince harvesters that one molt length (~12 mm at ~2 mm per year for six years) is necessary. The American plan falls short of that and the benefits may be indiscernable. Nevertheless, the longest journey begins with the first step, albeit a small one.

Hawaii: *Research in Support of Management*

Hawaii has a commercial lobster fishery for the slipper *(Scyllarides squamosus)* and spiny *(Panulirus marginatus)* lobsters. Annual yields range between ~200 t (1984) and ~1000 t (1986) and ~45 t (1977) and ~1400 t (1985) respectively, for each species (Clarke et al 1987). The total annual value to fishermen ranges between 4 and 6 million dollars.

The fishery began in 1975, following an estimation of spiny lobster abundance in the Northwest Islands by NMFS (Honolulu Laboratory) scientists (Uchida and Tagami 1984) . Annual sampling of Uchida and Tagami's (op cit) sites with similar gear to their's has continued. The data permit the development of an annual stock assessment. Changes in lobster abundance appear to have induced changes in size distribution and onset of fecundity. Female size at first egg bearing has decreased with increasing fishing pressure.

We now feel there is sufficient and adequate data to employ models. We have developed both a stock assessment and predictive model from a dynamic production model.

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If deemed accurate, they will be used to provide annual biological advice to management.

Regulations to permit the enactment of resource management measures are in place. They include a minimum legal carapace length for both target species. An escape vent is now required on all traps to reduce the incidence of prerecruits in the catch.

A biological research program has been developed to permit an improvement of the biological advice. Currently, we are attempting to to negate the hypothesis that peurulis recruitment is stock (bank) specific. To date larvae from both species and all stages have been found in close proximity to each bank, suggesting a bank-specific stock recruitment.

Clarke, R.P, S.G. Pooley, P.A. Milone, and H.E. Witham. 1988. Annual report of the 1987 Western Pacific lobster fishery. Administrative Report, Southwest Fisheries Center H—88—5:48pp.

Uchida, R.M. and D.T. Tagami. 1984. Biology, distribution, population structure, and pre—exploitation abundance of spiny lobster, Panulirus marginatus (Quoy and Gainard 1825) in the Northwest Hawaiian Islands, p. 157—198. In R.W. Grigg and K.Y. Tanoue [ed] Proc. Second Symp. on Resource Env. in the NW Hawaiian Island, May 25—27, 1983. Univ. of Hawaii, Honolulu, HI. Vol. 1. UNIHI — Seagrant—MR—84—01

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Status of Spiny Lobster Management in Florida

The two central management issues in the spiny lobster, *Panulirus argus*, fishery in Florida are extreme overcapitalization and the practice of using live sublegal lobsters as attractants in traps. At present, there are about 750,000 traps and 4,638 license holders of which 1,845 are trap fishermen in the Florida fishery. Total annual harvest has averaged about 2,497,000 kg (5.5 million pounds) over the past five years. Evidence for the the extent of overcapitalization is the rapid catch rate decrease early in the season. During the summer of 1985, catch rates of legal—sized lobsters in research traps decreased 77% within two weeks of season opening. Stock assessment data indicates that a 500,000 trap decrease would not impact total harvest. One solution to overcapitalization is to limit license number, followed by gradual reduction in trap number once license holders are defined. Management agencies are exploring several options to resolve this problem. The outcome is uncertain.

Trap fishermen in Florida use sublegal—sized, spiny lobsters as live attractants in the their traps. Use of these "shorts" likely became widespread when the fishery expanded into Florida Bay during the late 1960s. This expansion coincided with a reduction in minimum size from a 1 pound (454 g) lobster (~79 mm carapace length — CL) to a 3 inch (76 mm) CL lobster. Further expansion occurred in the mid 1970s when it became illegal for American trap fishermen to fish in Bahamian waters. In some heavily fished areas of Florida Bay, as few as 10% of the lobsters are legal—sized. Biologists first suspected a problem during a tagging program conducted in 1978—79. Fishermen that reported capturing a tagged short lobster often stated they were using it as "bait"; they were to report again when it was released. Most of these fishermen were never heard from again. Researchers mimicking the fishery practice of transporting shorts on board vessels, found that 26.3% of attractant shorts died in four weeks; as many as 47% of all shorts used as attractants died either from exposure or causes related to extended confinement during the course of the season. Physiological studies have determined that exposure decreases hemolymph pH levels by more than one—half unit. Further studies suggest that hemolymph chemical changes do not directly cause mortality, but rather induce secondary physiological damage, which manifests in aberrant defensive and escape behavior. Actual mortality in traps is most likely caused by increased predation rates of affected lobsters. Even though individual trap catches are enhanced through use of attractant shorts, exposure and confinement related mortality creates a fishery wide loss of several thousand tons of harvestable lobsters. The Florida Department of Natural Resources has developed an escape gap designed to allow most sublegal—sized lobsters to escape while retaining legal—sized lobsters. In field tests under present fishery conditions, catch rates of legal—sized lobsters in traps equipped with a 52.4 mm (2 1/16 inch) escape gap and baited with cowhide were 50% less than that of standard traps containing three live lobster attractants. Use of an escape gap reduced sublegal catch by 90%. A model has been developed that estimates harvest impacts of placing escape gaps in traps.

The Florida Marine Fisheries Commission has responded to this issue by requiring use of live wells on board vessels to transport shorts, and beginning August 1, 1990 prohibiting possession of undersized spiny lobster for the purpose of luring, decoying, or otherwise attracting noncaptive spiny lobster. In a planned amendment to the spiny lobster

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fishery management plan, the Gulf of Mexico and South Atlantic Fishery Management Councils will require live wells also. Estimates from the model indicate that use of live wells on board vessels should increase future harvests by 18%; escape gap use should increase these harvests by from 49—62%. Escape gaps may constitute management's best option to improve spiny lobster harvest.

Alternative measures to live wells, such as mandatory escape gap use, will be presented at future management meetings.

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Marathon, Florida 33050
USA

FOR FURTHER READING:

Heatwole, D.W., J.H. Hunt, and F.S. Kennedy, Jr. In press. Catch efficiencies of live lobster decoys and other attractants in the Florida spiny lobster fishery. Florida Marine Research Publications, No. 44.

Hunt, J.H. and W.G. Lyons. 1986. Factors affecting growth and maturation of spiny lobsters, *Panulirus argus*, in the Florida Keys. Can. J. Fish. Aquat. Sci. 43: 2243—2247.

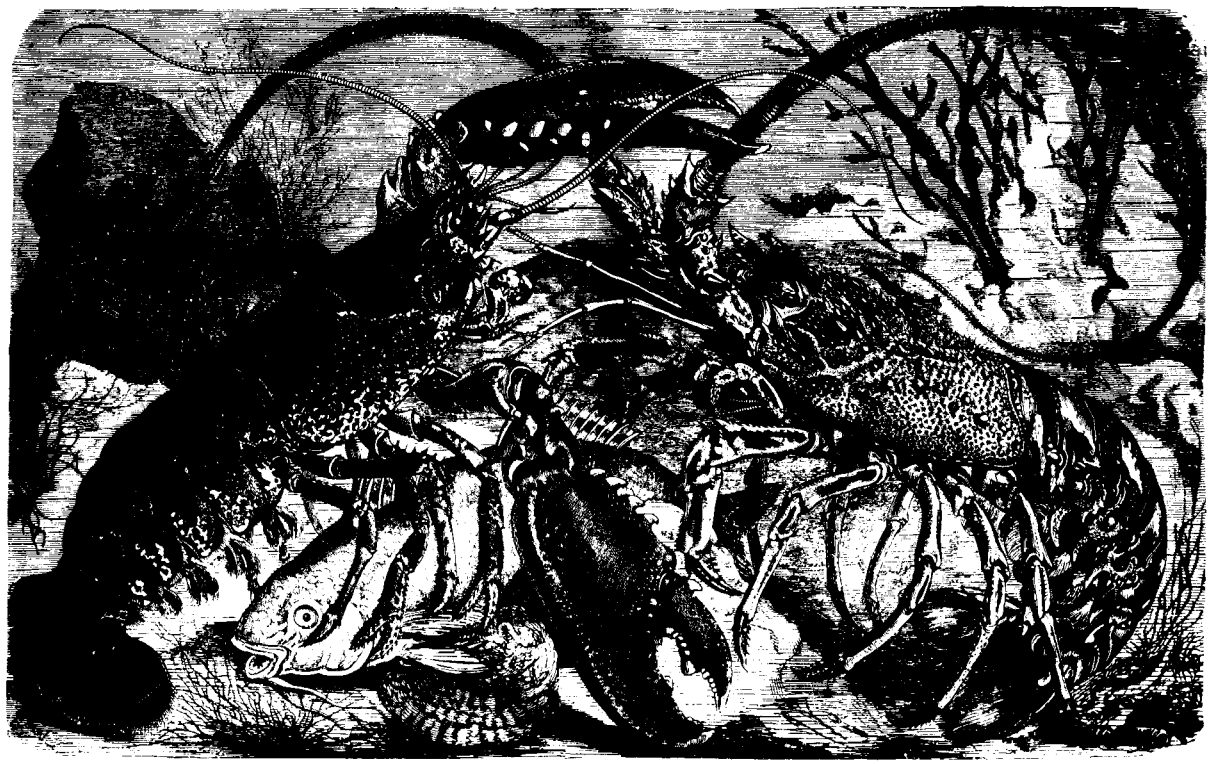
Hunt, J.H., W.G. Lyons, and F.S. Kennedy, Jr. 1986. Effects of exposure and confinement on spiny lobsters, *Panulirus argus*, used as attractants in the Florida trap fishery. Fish. Bull. 84; 69—76.

Lyons, W.G. 1986. Problems and perspectives regarding recruitment of spiny lobsters, *Panulirus argus*, to the south Florida fishery. Can. J. Fish. Aquat. Sci. 43: 2099—2106.

Lyons, W.G., D.G. Barber, S.M. Foster, F.S. Kennedy, Jr., and G.R. Milano. 1981. The spiny lobster, *Panulirus argus*, in the middle and upper Florida Keys: Population structure, seasonal dynamics, and reproduction. Florida Marine Research Publications, No. 38: 38 p.

Lyons, W.G. and J.H. Hunt. In press. Catch rates of spiny lobsters, *Panulirus argus*, in traps equipped with escape gaps, and potential benefits to the south Florida fishery. Proc. Gulf and Caribb. Fish. Inst. (Manuscript available from J.H. Hunt).

Vermeer, G.K. 1987. Effects of air exposure on desiccation rate, hemolymph chemistry, and escape behavior of the spiny lobster, *Panulirus argus*. Fish. Bull. 85: 45—51.



Annual Fishery Yields

Listed below are the annual landings (wharf value), per species, for those countries from which information was received.

Country	Species	Stock Location	Year (Season)	Landing (t) Remarks
South Africa	*Jasus lalandii*	28°S–35°S 16°E–19°E	1985/86 (Nov–Jun) 1986/87 1987/88	3,892 TAC 3,980 TAC 3,860 TAC
	Palinurus gilchristii	33°S–36°S 19°E–28°E	1985/86 (Nov–Jun) 1986/87 1987/88	968 TAC 968 TAC 968 TAC
	P. delagoae	28°S–33°S 30°E–34°E	1986 (Jan–Dec)	44 TAC
New Zealand	*Jasus edwardsii*		1986	5,219
	J. verreaux		1986	8
U.S.A.	*Panulirus argus*	Florida	1987/88 (Jul–Mar)	2,442
	H. americanus	New Jersey	1987	634
		New York	1987	521
		Connecticut	1987	937
		Rhode Island	1987	2,414
		Massachusetts	1987	6,084
		New Hampshire	1987	318
		Maine	1987	8,958
		American Total		19,866
Canada	*H. americanus*	Nova Scotia	1987	18,423
		New Brunswick	1987	7,455
		Prince E. Is.	1987	8,727
		Quebec	1987	2,658
		Newfoundland	1987	2,180
		Canadian Total		39,443

To complete a world—wide compilation we reckon landings should be included from the following countries and possibly more; Australia, the United Kingdom, Ireland, Norway, Sweden, France, Spain, Portugal, Iceland, Brazil, numerous Caribbean states, Chile, Mexico, California, Japan, etc. We encourage a single individual from each country to annually submit the yields to J.D. Pringle. Thank you.

MAILING LIST

We now have over 400 names on our mailing list and it is expanding rapidly! We are very pleased to have reached so large a community of people interested in lobsters. If you are a new reader and would like to receive future copies, please let us know. If we should correct your address, drop us a line. And if the Lobster Newsletter is not particularly useful to you, please write asking us to take your name off the mailing list.

For additions or deletions, write:

J. Stanley Cobb
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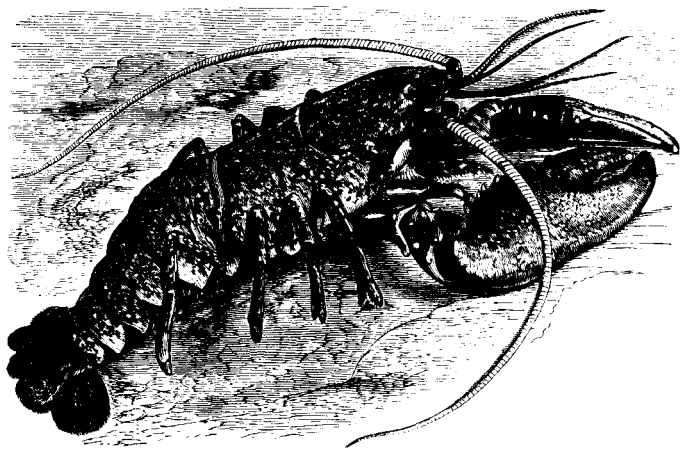

A REQUEST

We like to include an occasional illustration such as the old woodcut of a clawed lobster on the first page of the newsletter. If you have favorite line drawings (or half tones, but they are a little more difficult) of lobsters of any life stage or of equipment, or anything you think appropriate to use as "clip art" for the newsletter, would you send us a copy? Either a black and white photo or a good photocopy can be used. Please let us know the source. The older the better, both for interest and because we won't have to worry about copyrights. Thanks!

January 1989

The Lobster NEWSLETTER

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ADDRESS CORRECTION REQUESTED