

- (1955); also 33 Dep't State Bull. 1025 (1955).
22. 34 Dep't State Bull. 296 (1956).
  23. 34 Dep't State Bull. 894 (1956).
  24. Reeves, The Codification of the Law of Territorial Waters, 24 Am.J.Int'l L. 486 (1930); for documentation, *ibid.* Supp. 25 seq.
  25. United Nations, Report of the International Technical Conference on the Conservation of Living Resources of the Sea (1955); and Papers Presented at the . . . (1956).
  26. Bishop, International Law Commission Draft Articles on Fisheries, 50 Am.J.Int'l L. 627 (1956); for the United States position, *ibid.* at 1037.
  27. United Nations, Yearbook of the International Law Commission 1956 (1956); and Report of the International Law Commission Covering the Work of its Eighth Session (1956); for the United States position, see Greenbaum, 36 Dep't State Bull. 60 (1957).
  28. Brittin, Art. 3 Regime of the Territorial Sea, 50 Am.J.Int'l L. 934 (1956).
  29. Kwang Lim Koh, The Continental Shelf and the International Law Commission, 35 B.U.L.Rev. 522 (1955).
  30. Text in 36 Dep't State Bull. 61 (1957).

## DISCUSSION

### Shrimp Session

Discussion Leader: LAWRENCE W. STRASBURGER

Discussion Panel: MARY SCHULMAN, A. J. HARRIS, DONALD H. MCKEE,  
BERLIN FELTON

### Aims and Progress of Gulf Fishery Investigations'

#### Shrimp Research

THOMAS J. COSTELLO

- Q. Strasburger: In your statement you made a remark with regard to the way the white shrimp enter the estuaries. Can you elaborate on this?
- A. Costello: Probably the biggest factor is that the white shrimp larvae and post larvae are completely at the mercy of currents. Where the currents are favorable a large group enters through the passes. At Galveston we have about four years of data of abundance of small shrimp at East Pay Lagoon, and we find that the entry of the white shrimp depends largely upon the direction of the currents. White shrimp larvae and post larvae enter in large numbers perhaps for a day and a half and then for a week or two they will almost disappear.
- Q. McKee: Would the method of staining or tagging shrimp work equally well on brown and pink shrimp?
- A. Costello: The stains are usable on all species of shrimp, as far as we know, and I suspect that they are probably usable on other marine decapods as well. There are three colors of stains, red, green and blue. All are almost equally distinct, although I think that the blue is the best.
- Q. McKee: How long will these stains last?
- A. Costello: At least three months, and perhaps longer.

- Q. Felton: Will this stain affect the quality of the shrimp?
- A. Costello: No. They all have the U. S. Food and Drug Administration clearance.
- Q. McConnell: In many areas in Louisiana the salinity has gone up in the last few years. We have also had a distinct reduction in white shrimp, particularly in the east side of the Mississippi River. Are these related?
- A. Costello: Mr. Chin in our laboratory has done a lot of work with the salinity tolerance of white shrimp. The adults can stand very abrupt changes of salinity. I doubt very seriously if salinity alone could have any dire effect on the white shrimp.
- Q. McConnell: We have always found in Louisiana that every time the Mississippi River is high we have a very high production of white shrimp. There has been no high rivers in Louisiana for many years. Is there anything that you have done that might lead you to see any connection here?
- A. Costello: No, but an ecologist would say that to make a body of water more productive, flood the lowlands around it.
- Q. Gunn: In 1954 at a special meeting of the Gulf States Marine Fisheries Commission in Biloxi, a program was developed for research on shrimp. Some of that program is being pursued to a rather full extent at the present time. One aspect has to do with establishing statistics, the other is sampling of the catch for size and species composition. The development of marking techniques seems to be progressing very well. When do you think that we will be able to get the states started on a marking program?
- A. Costello: Any laboratory that wished to tag shrimp should go through the Commission to avoid duplication of stains.
- Gunn  
(Comment): One reason I am anxious to bring this up here is that we are going to need cooperation of all the shrimp operators in collecting marked shrimp.
- Q. Gunn: One item of the research project calls for an ecological study of the nursery grounds. Is this ecological survey at the present time being confined to Galveston Bay? It was originally planned that this study would be carried on in all of the states. It was estimated that it would cost \$190,000 for the first year and \$90,000 per year after the first year. I haven't seen any such appropriation in the budgets. It would be interesting to know what plans have been made to pursue this ecological study, which was supposed to take five years.
- A. Costello: To date we have four study areas. They are not in Galveston Bay exactly, but they are in that general area. Albert Collier is assigned to report on the data that he has accumulated for the past five years and thereafter he will head up a new research group which will deal with coastal ecology.

## **Weekly Shrimp Sampling in Apalachicola Bay, with Biological Notes and Regulatory Applications**

ROBERT M. INGLE

- Q. Strasburger: Is not the method of regulating shrimp fishing, that you spoke of this morning, subject to political pressures?
- A. Ingle: Yes, it is subject to political pressure and if the political climate is such that it will yield to that pressure, I imagine the system will not work. In Florida it is favorable right now. Neither state or national laws can impose any regulations on the nationals of any other country that fish Tortugas. Florida has not attempted any extension of this rule, which covers only nine counties in the state. Nationals of one other country, Cuba, fish in that area and proper discussions have already begun in order to promote an agreement with Cuba to regulate the nationals of our two countries.

### **Mesh Size Regulations as a Possible Method of Managing the Tortugas Shrimp Fishery**

JAMES D. REGAN, C. P. IDYLL and EDWIN S. IVERSEN

- Q. Bullis: Is it your opinion that there are two separate spawnings in the Tortugas grounds?
- A. Iversen: The conclusions drawn so far are tentative, but it seems that this is so.
- Q. Bullis: Is the size of the shrimp at capture influencing the sex ratio of shrimp? It was our observation in 1952 on the *Oregon* when we were dragging on the brown shrimp grounds that in shallow water the sex ratio was high in favor of the males, whereas offshore in the extreme ranges the population became almost all female. Have you found anything similar to this with *P. duorarum*?
- A. Iversen: Yes. With the small size meshes (1¾" in the cod end) there is approximately a 50-50 ratio. There is an unbalanced ratio with an increase in mesh size, and these nets are letting more of the small males go.

### **Acceptability of Frozen Shrimp**

CARL R. FELLERS

and

### **Studies on Shrimp Spoilage and on the Effect of Chlortetracycline at Various Temperatures**

LIONEL FARBER

- Q. Strasburger: What was the pH of the shrimp in your studies of frozen shrimp?
- A. Fellers: We did not think that pH was of any great significance.  
Farber: I can substantiate that with shrimp that are really spoiled, their pH doesn't seem to have any correlation with the spoilage.
- (Comment):

- Q. McKee: Did you conduct any tests on raw shrimp meat alone and breading alone in your analyses?
- A. Fellers: Yes, we have a good deal of data on such points. For the most part the quality of the shrimp didn't change very much after it was processed, because the shrimp were either good or bad when they were breaded. I don't think that the breading itself constituted anything at all to the state of decomposition of these shrimp.
- Q. McKee: You mentioned that of the 24 lots you checked there was a large difference in the quality of the shrimp. That possibly could have been caused by mishandling in transit or in the plant, is that right?
- A. Fellers: Yes. We have separate data for all 24 lots. We found as great a variation within a particular brand as we found among brands, so we feel that just because you buy brands that are good today, they are not necessarily good tomorrow, or the same brand is not necessarily good in another city. Some brands can consistently run better than others, but we found all the way from very bad shrimp to very good shrimp in the same brand.
- Q. McKee: Was all of your work done on frozen shrimp that you picked up from the general trade?
- A. Farber: Yes, we got it from brokers.
- Q. McKee: Then you had no background or history on the samples. Could you really test the product under these conditions? You have no history of the catch, the length of the drag, how long it was in ice before being frozen or any of the handling data.
- A. Farber: That is true, except that we could judge the quality of the material to start with. It happened that packages of frozen shrimp from two brokers were judged to be in poor condition and we did not use those. We only picked those that we judged to be good to start with. We started part way in the sequence from the time the shrimp were taken out of the water to when they reached the consumer, so that our values are probably only relative and may not be comparable to the raw material taken out of the water. Nevertheless, I think that the data show that even under our conditions, changes do take place and we can measure them.
- Q. Harris: Has anything been done about studying the economics of the use of antibiotics in the event that the use of these become legal? Will the cost of shrimp be greatly affected by use of these antibiotics?
- A. Miller: In Canada approval has been obtained for the use of chlortetracycline on fish but not shellfish. We are negotiating with the Food and Drug Administration for such approval in the United States. Now relative to the economics. At five ppm the cost of the chlortetracycline would add approximately \$2.00 per ton to the cost of the ice.
- Q. Fieger: Dr. Fellers, how long were your breaded shrimp stored

frozen? The reason I ask this is that during the freezing the bacterial counts usually decrease markedly.

- A. Fellers: We do not know how long some of these shrimp have been on the market, although some companies translated their codes to us so that we know whether it has been three months or eight months or so. As it happened, some of the samples with high counts were among those that had been frozen the longest. Now we don't know whether the count was very high in the early stages or not. We find that the kind of bacteria makes a lot of difference, and certain bacteria (Enterococci) are not killed by freezing, while other kinds are. There is a very considerable variety of bacterial species on a shrimp. There are many species that are of no significance in shrimp spoilage.
- Farber: We have begun some work on the effect of individual species of bacteria in relation to spoilage. Certain species such as micrococci do not seem to have any effect, because during spoilage they actually decrease in numbers, whereas other species increase.

### **Experiments on the Control of Shrimp Spoilage with the use of Antibiotics**

C. ISAAC CAMBER, JAMES ALEXANDER and MARY VANCE

- Q. Strasburger: You said that in previous work done in 1953 there was a yellow discoloration noted in the shrimp when 10 ppm CTC were used. And then I gathered that in the latest work the yellow discoloration was not noted until you reached 100 ppm. Would you clarify this please?
- A. Alexander: In the original work done in 1953 the shrimp were stored in an antibiotic solution over the entire storage period. The latest work involves dipping for one, five, fifteen, or thirty minutes and then storing the shrimp on non-treated ice.
- Q. Costello: Did I understand you to say that you noted a better effect from a five minute dip than you did with a thirty minute dip of aureomycin? This would not seem to be logical from a microbiological point of view.
- A. Alexander: Our results indicate that there is an optimum time for dipping and that a one minute dip was less effective than a five minute dip, while lengths over five minutes were less effective again.
- Q. Butler: Do you consider that sufficient work has been done on a commercial scale to warrant the use of the chemical by the industry?
- A. Alexander: We have not run any commercial scale tests. However, we feel that our laboratory data is practically complete and we are now about ready to enter this particular phase.

## **Recent Development in International Fishery Problems**

STOJAN A. BAYITCH

- Q. Jackson:** You said in effect that the International Law Commission has concluded that 10 or 12 miles might be the answer to this great problem of territorial jurisdiction. On reading the International Law Commission report—its recommendations and also the commentary—I'm certain that they took particular pains to try to express the view that in the custom and usage of international law, three miles might be regarded as the minimum of territorial limitations and that 12 miles might be the maximum. I don't think they intended to convey the impression that 12 miles should be the proper distance. Rather, it left open the determination of the proper distance between three miles and 12 miles. The report definitely indicated, however, that there was nothing in international law that could justify any claim beyond 12 miles.
- Q. Anderson:** What is the status of the Texas towers? Would it be possible, for example, for a foreign country to place one of these towers on the fishing ground more than 12 miles off our coast and use it as a fishing base; and if so would they be entitled to 3-12 miles around it?
- A. Bayitch:** Such fishing bases set within the United States Continental Shelf area would be a violation of our sovereignty; only more so if they would be within the area of continental waters belonging to a state.
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