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## DISCUSSION

### Biological Session

Discussion Leader: K. M. RAE  
Discussion Panel: EUGENIE CLARK, WALTER GRESH  
R. WINSTON MENZEL, PAUL S. GALTSOFF

### Parasites and Fishery Problems

WILLIAM J. HARGIS, JR.

- Q. Gresh: How do you answer the public when they ask you whether they should eat wormy fish?
- A. Hargis: I would say that if they cook the fish they are not harmful. I advise never to eat uncooked fish.
- Q. Galtsoff: I wonder why you completely disregarded the distinction between pathogens and commensals.
- A. Hargis: The problem of classifying the symbiotic relationship is difficult, and I wanted to restrict the discussion specifically

- Q. Clark: to problems in which the whole group might be interested. Have you ever come across a "jellied" condition in fishes in your region? We recently had batches of jellied flounder brought in to our laboratory from the northern part of the Gulf of Mexico.
- A. Bullis: Flounder seem to suffer severely from this condition. On several occasions, trawling at the seventy-five to one hundred fathom depth range, between the Mississippi Delta and Pensacola we have caught affected *Paralichthys squamulentis*. They will not stand freezing or icing. Unless they are cooked as soon as they are caught, they deteriorate on cooking.
- Q. Clark: When skin diving away from cooking facilities, I often eat raw fish freshly speared. Do you think that there is any truth to the idea that offshore surface fish, such as mackerel and tuna, are comparatively free from parasites that are harmful to man?
- A. Hargis: I think in general that that would be an assumption that one could make.
- Galtsoff:  
(Comment) You can get very serious sickness from eating raw clams, and parasites have been found to be the cause of that sickness in the New England area. I would not recommend eating them raw.
- Hargis:  
(Comment) I would like to ask for collections of monogenetic trematodes. If you encounter fish with these parasites, cut the gills out of the fish, or put the fish, while they are still alive, in jars containing a saturated solution of chlorotone, or chloropropanol, label, and then two hours later add a little bit of formaldehyde to bring it up to about four to six per cent. It is important to have the host identified accurately. The worms should be relaxed before they are preserved. Some occur on the skin of larger fishes, dolphins, ocean sunfishes, etc., and these should be scraped off and pickled in the same way. If no other solutions are available Epsom salts followed by potable spirits are in order.

## A New Fishery for Scallops in West Florida

HARVEY R. BULLIS, JR. AND ROBERT M. INGLE

- Q. Menzel: You identified this scallop as *Aequipecten gibbus*. Why have you separated it from the bay scallop?
- A. Bullis: The taxonomy of *Aequipecten gibbus* is confused. The only satisfactory distinction that I have been able to find between *P. gibbus* and *P. irradians* is that the latter occurs in the grass flats, generally in the bays, and the *gibbus* in the open Gulf or Atlantic Ocean. Until the species complex is studied carefully throughout its range we will apply the names tentatively.
- Q. Galtsoff: Do I gather that you can separate the two species only from an ecological point of view?

- A. Bullis: It is difficult to separate them by shell characteristics, and a satisfactory separation is only possible, apparently, on the basis of ecology.

## Improved Techniques for Collecting Seed Oysters in the Chesapeake Bay Area

DAVID H. WALLACE

- Q. Clark: Did you get a higher percentage of survival, or larger oysters at the top of the baskets than lower down?
- A. Wallace: The ones on the outside of the baskets grew faster than those on the inner surface or in the middle of the basket. There seemed to be little difference in growth from the top to the bottom.
- Q. Clark: You mentioned that from oysters that were scattered over the bottom the recovery was only about sixty per cent. Is that due to the death of the oysters or to the fact that they cannot find them again?
- A. Wallace: It is due to three things. First, it is difficult to find them, second, there is more settling of the material to the bottom and finally, there are rather extensive mortalities when the shells are on the bottom with heavy sets attached.
- Q. Galtsoff: Are these baskets essentially like a tripod, and do they sit vertically?
- A. Wallace: Yes, they act like a tripod. When they are dropped overboard, they go directly down without falling over. If they are thrown they fall and land on their sides, but if they are dropped carefully they stand up.
- Q. Galtsoff: How many of these bags can you put on an acre?
- A. Wallace: Probably fifteen thousand.
- Menzel: I certainly agree with you that the industry should make more use of what the oyster biologists have found out.
- (Comment) Wallace: As a criticism of both biologists and oyster men, all too frequently the biologist, after carrying on studies and arriving at definite conclusions, then expects the industry immediately to take the results and put them to some practical application. I do not believe that it is quite as simple as that. The only reason that this bagging operation in the Chesapeake Bay is a practical one is because of the engineering advance to make it possible to make a bag at a very cheap cost. Up until three years ago these bags had to be made by hand and they cost forty-five cents apiece, which was too expensive. Now they are making them for sixteen cents with a machine. I feel strongly that we need another step between the biologist and the commercial industry, a developmental organization, which would take the findings of the biologist and translate them on a pilot plant basis into semi-commercial operation and eventually a commercial operation.

- Q. Gresh: Why are more of the states not using the baskets rather than dumping the shell out indiscriminately?
- A. Wallace: Most state operations are not properly managed. That is a great tragedy. Many states are spending large sums of money in their oyster culture practices and ending up with very little. I am speaking in generalities and I am sure that there are places where that is not true. However, I would not recommend bagging of shells in every case. For example, in South Carolina I am sure it would be useless because the conditions there are so different.
- Q. McConnell: In Alabama, would you recommend bags instead of planting the shells on the bottom?
- A. Wallace: I do not think that you would gain much by putting the bags on the bottom and leaving them there. What you might very well do is to put the bags over, get the spat sets and within two or three weeks, before you have had excessive predation, move the bags into areas where you have good growing conditions and break the bags up to scatter the shells.
- Ingle:  
(Comment) In Florida we are trying to establish fishable oyster grounds for the industry which will be there in perpetuity. We spray the shells off the barges, but we pile them up six to nine feet deep. We are not interested in cultivating oysters for the people to go out and harvest in a year and make a quick killing. We are interested in making and maintaining natural reefs. From our point of view, what we are trying to do seems desirable and we are doing that rather than put shells in the bags as you recommend for private industry.
- A. Wallace: I am not advocating that everyone drop what they have been doing and start putting shells into bags. In certain circumstances we have basic factual information which indicates that this is a good technique. Where the conditions are proper for this type of operation, it can be made into a successful commercial way of growing first quality seed.

## **Progress in Atlantic Coast Shad Investigations**

GERALD B. TALBOT

- Q. Gresh: How important is the sport catch of shad compared with the commercial catch?
- A. Talbot: Although sport catches are increasing tremendously in shad rivers, as yet they are very slow in comparison with commercial catches. Roughly not more than five per cent of the return came from sport fishermen. The sport fishermen take the biggest toll of shad from a few rivers like the St. John's River in Florida. In the St. John's River last season it was estimated that some sixty thousand fish were taken by sport fishermen. It is rapidly becoming more valuable as a sports fish there than as a commercial fish.

- Q. Galtsoff:** Your results are significant not only for practical purposes, but from the point of view of a theoretical biologist, because they give such good support of the home stream theory. But there still remains to be gathered another piece of evidence to be completely sure that the theory is accurate. That is to tag the young shad as they leave a certain stream and have them recovered there again as adults. Do you plan to carry out this aspect of the work to get definite proof of the parent stream theory?
- A. Talbot:** One difficulty is that the female spawns an average of 250,000 eggs. The survival is rather high in the rivers, and if the run merely maintains itself, only two fish come back from 250,000 potential. Therefore, astronomical numbers of tags would have to be put on to get any kind of return of fish tagged as young. Then again, these very small plastic tags in the body cavity of the fish are not readily seen when the fish is cleaned, so that many of those returned would not be seen. However, the indirect evidence is becoming so strong that we have very little doubt about the validity of the home stream theory in shad. For the last six years we have been able to predict in advance within 10 to 15 per cent what size of run would be returning to the Hudson River and the Connecticut River.

## **The Tagging of Yellowfin and Skipjack Tunas in the Tropical Pacific Ocean**

GORDON C. BROADHEAD

- Q. Clark:** Do you suspect that large numbers of tags are missed in studies on other types of fish?
- A. Broadhead:** There are actually two points. This first is that tags are missed because nobody sees them, and the second that tags are missed because of lack of interest.
- Q. Galtsoff:** Is there some other method of marking tuna fish, by branding or by some kind of harpoon, so that you do not have to bring the fish up on deck?
- A. Broadhead:** Almost everything has been tried. We did try the harpoon-type tag on skipjack, which takes about half the time to apply. It is satisfactory, except that this tag is only about a quarter visible. Also, tunas are rapid swimmers and we need a very specialized type of tag that creates very little water resistance.
- Q. Menzel:** Are any of those fish caught immediately after being tagged?
- A. Broadhead:** In the case of skipjack they are caught quite soon after. We have one recovery from the same school at the same time that we were tagging the skipjack. From yellowfin tuna we usually get very few recoveries for the first month. Our longest return is about two years.

- Q. Bullis: How far do the yellowfin tuna migrate?  
A. Broadhead: These fish do not migrate great distances. The longest migration was around nine hundred miles, and one or two hundred miles is quite uncommon.

## **Accumulation of Radioactive Materials by Marine Organisms**

WALTER A. CHIPMAN

- Q. Galtsoff: Would it be possible to use selected cultures of plankton which concentrate radioactive materials very rapidly for the removal of radioactive substances from the water?  
A. Chipman: The results of tests to date have shown that there is only a limited uptake of certain radioactive materials, so not all are removed. The most dangerous ones are not concentrated by the plankton in sufficient quantities to allow plankton to be used in this way.
- Q. Galtsoff: Is the problem of pollution by radioactive waste really a very serious one when more and more nuclear reactors will be of the fusion rather than the fission type?  
A. Chipman: Fusion reactors will come, but they will not come soon enough. We will have a tremendous expansion in the use of fission reactors so that we will be confronted with disposal problems of fission waste for years to come.
- Q. Menzel: What is the possibility of contamination from atomic ships?  
A. Chipman: There is a terrific expansion planned in atomic merchant ships, quite apart from warships. These ships will have at least one reactor and each of these will require a cooling system. In passing through the reactor the coolant material will become radioactive. The induced radioactive nuclides are removed from the coolant on ion exchange resins. The coolant and resins appear to be the chief concern in possible contamination from atomic ships. At present the resins from the United States merchant ships are to be taken ashore and disposed of, probably by burial. We do not know what the plans will be for the disposal of materials from ships from other countries. They might not be as careful. There is also the problem of possible contamination of estuary areas from shipwreck.
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