
A Critique of Present Biological Research on Oysters

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Research on oysters of one variety or another has been carried on in the United States for almost 50 years, and even before 1900 experiments on transplanting oysters were being attempted. It appears that far more research has gone into oysters than any other species of marine animal. However, the results have been used in only limited ways by the industry. Let us stop to consider for a moment the oyster industry as it is now and its condition 50 years ago.

Harden F. Taylor (1951) and his associates showed a drastic decline in production. According to their statistics, 172,885,000 pounds of oyster meats were produced per year during 1889-1892, representing 16.1 per cent of all food fish produced in the United States. By 1908, the catch had declined to 152,046,000 pounds of oyster meats, 9.6 per cent of all food fish, and by 1938-40 the average catch amounted to 89,740,000 pounds, representing 3.1 per cent of all food fish.

The decline has been common to all areas along the Atlantic Coast, but less on the Gulf. Statistics for 1950 indicate the same relative position of the various states and little change in the production. The causes for these fluctu-

tuations are most important and could well form the basis for a symposium. However, it is impossible to analyze the factors here.

Biological research on oysters may be divided into a number of headings, including: factors influencing spawning and setting, with attempts to predict time and intensity of the set, studies on control of parasites and enemies, feeding and fattening of oysters, factors determining the productivity of oyster bottoms, breeding experiments and environmental studies. Some of these matters are being studied at five Federal, ten State laboratories, and at least half a dozen universities and private organizations. The writer is not familiar with details of all research being carried on regarding the Eastern oyster on the Atlantic and the Gulf, but most of the projects are being conducted by state and federal laboratories, and fall within one or more of the categories listed above.

Some might wonder about the concern of this paper in biological research, since production has been affected so little in the past. The answer, of course, is that any industry that has steadily lost and is losing ground in production is an industry that needs research desperately. The demand for oysters today far exceeds the supply. The industry must meet this demand with a quality product in sufficient supply. If the industry succeeds in increasing production substantially, a large group of consumers will be available who are already educated to the palatability and the nutritional value of the oyster.

It is the writer's opinion that political considerations, rather than the lack of knowledge, has most frequently been the reasons for the decline in the industry. Individuals in the industry have also resisted, in some cases, the use of new methods. The oyster industry has set up a committee on shellfish research. This group meets with agencies to discuss needs of the industry and the type of research they believe should be carried on. In so far as is practical, those in charge of research projects have been most cooperative, and have in many cases drastically modified their programs to conform more closely with industry needs.

This does not necessarily mean so-called applied research, as will be illustrated. Consider first some of the work being carried on by Dr. Philip Butler at the Pensacola Laboratory of the U. S. Fish and Wildlife Service. Most observers will concede that selective breeding of oysters is far from practical on a commercial basis. And yet the industry has strongly urged the federal agency to continue and expand these studies. They believe that this type of research might well revolutionize the future of the industry. Agriculture, by the use of hybrid strains developed through research, had been able to increase production in the face of lost fertility of soil and ever-dwindling acreages. There are no obvious insurmountable hurdles in this direction with the oyster. The suggestion has been made that this research could be done better in a location other than Florida, particularly in the north, because of more adequate facilities. However, the advantages of rapid growth, and early sexual maturity of oysters in the south, making possible the observations of many generations in a few years, greatly shortens the time necessary to produce results.

Another so-called pure science project being carried on by the Federal government, of which the industry has expressed approval, is the comprehensive study using radioactive tracers of the feeding of oysters and their utilization of nutrients from the food taken. While there is no known practical application of the knowledge that will be gained, it may be invaluable in perfecting culture

techniques to obtain fat oysters high in glycogen, or with other desirable characteristics.

It is estimated that about \$250,000 is spent each year on oyster research by the Federal Government and the States. Most federal funds are spent on fundamental problems, with less emphasis on such things as surveys, and other limited projects which yield local results and are more properly in the province of the states. Many states have recognized their needs for shellfish research. Almost every oyster producing state now has a biologist attached to its staff. The only states who have not progressed that far are those where the Federal Government continues to perform local services. The southern states particularly, in the last ten years, have gone a long way to remedy their research deficiencies. A good deal of the credit for this progress has been the result of the activities of the Gulf and Caribbean Fisheries Institute, the Marine Fisheries Commissions, and similar organizations.

The function of the state should be to supply information on which to develop a system of oyster culture within that state. Most states do not have the facilities, money or staff to carry on long term research, which, when completed, could be generally applied. Actually, it is doubtful whether Governors would recommend such expenditures or State Legislatures would approve them. By the very nature of things then, we have a diversion of the type of research, which should be carried on by the Federal and State agencies. This is obviously not a rigid rule but appears logical. This does not necessarily mean reduction in the calibre of research. It is possible, and likely, that local ecological studies designed to meet the needs of a given area in a southern state might well prove to have general application over a wide area in the Gulf and South Atlantic. The fact that a problem is being studied in a limited area does not justify careless methods or observations. To be successful in modifying local methods and procedures as an aid to increase production the state scientist must be as precise and as analytical as if he were trying to determine basic principles which would apply everywhere in the industry.

Recently there have been a number of demonstrations of the assistance which can be rendered to a state in its oyster culture program. As a direct result of studies and examinations of the Chesapeake Bay, Mr. G. F. Beaven, Shellfish Biologist, recommended the establishment of a seed area in an area of that Bay which had never been considered valuable as seed grounds. Today, Punch Island Bar, the area in question, is one of the most important seed bottoms in Maryland. The State has increased greatly its supply of seed oysters by using this new area discovered by scientists.

All too frequently in the past, some oyster biologists have been swayed by the political pressures from scientific interpretation of their findings. To yield to such pressures is damaging both to the scientific integrity of the individual researcher and to the entire industry. Political considerations grow few oysters, while sound scientific findings can be the salvation of the industry.

The great need in the south is not to obtain a "set" of small oysters, which is the big problem north of Virginia, but rather to develop oysters that will fatten well, and not be subject to widespread mortalities before they can be harvested. The inevitable argument of the advisability and practicability of tonging versus dredging on public bars is another problem facing both the administrator and scientists alike. Last but not least is the necessity to protect

the oyster from the possible effects of industrial pollutants. The research on selective breeding and effects of environment on characteristics of oysters has already been mentioned. These studies may make it possible to grow oysters which will fatten and be disease-resistant. More desirable characteristics might be developed on beds by introduction of selected strains, which have demonstrated their ability to build up glycogen and resist disease or certain types of pollution.

We must isolate and better understand the factors causing mortalities. The work on *Dermocystidium marinum* has already made us aware that there may be factors at work not known before. The studies dealing with carbohydrates in sea water may also be significant. The tracking down and complete isolation of every factor which might limit or control the size of the population is of the utmost importance. The rapidly expanding industrialization of the southern areas of our country is another fact which should not be overlooked. It is probable that the mortalities which have occurred in recent years have been brought about by a complex of conditions, producing many divergent pressures upon the organisms.

No mention has been made here of the results of much of the research done along the Gulf Coast in the last several years. Most of the publications which have been released have reported findings of only the early part of the investigations. When the final results of these studies are published and careful analysis made of this research, it is possible that the effects of the complex interrelationships of ecological conditions will become clearer. For example, it might be that while *Dermocystidium* infection of a bed of oysters alone would cause serious mortalities, this disease plus some pollutant in the water would be enough to destroy the bed. Conversely, pollution might not be a limiting factor alone, but pollution plus the temporary lack of one essential constituent might be damaging.

There are problems other than these mentioned which should be studied. Oyster pests is one of these. Drills and other marine animals abundant in the south do serious damage in certain areas, and on some instances almost destroy oyster populations. Practical methods of control of these pests should be studied. In the north much study has been devoted to the control of these enemies since they destroy hundreds of thousands of dollars of oysters there each year. Scientists have developed traps and dredges to catch drills, but control is being practiced successfully only in limited areas in the Chincoteague Bay in Virginia and in parts of Long Island Sound. The most successful techniques for control being used were not developed by scientists but by oystermen themselves. These are the suction dredge and rotary screen. Scientists in the south might profitably devote considerable time to control of drills, and certainly those in the industry would be most grateful for any helpful results.

Attracting or repelling drills by chemicals has been under observation by the Milford Laboratory for some time. While certain chemicals appeared promising, the project has been suspended indefinitely because of lack of funds. Any success in this direction would be most helpful to the industry.

Another pest doing millions of dollars of damage is the starfish. Again, considerable study has been given this form, but the old method of mopping up the "stars" is still practiced by most of the growers, even though it is obviously inefficient and outmoded.

There is another matter which is most important to the oyster industry and

which will probably be of more than passing interest to the shellfish biologist of the south. One of the dominant characteristics of southern waters is the long spawning season and the ability of the oysters to seed themselves successfully. This is in sharp contrast to areas along the Atlantic Coast north from Maryland, where oysters grow and fatten well but where setting is limited and may occur on a commercial scale only once in every 3 to 7 years. The northern oystermen are desperately in need of seed. If a suitable strain of oysters could be developed which could be successfully transplanted to the northern areas, a profitable business could be developed in the south producing seed for the north oyster grower. To the complaint that the south would merely be selling seed to the north to have its own oysters sold back to southern consumers later, it should be said that there is little likelihood that the south would suffer materially from such competition, since northern and southern markets are generally different and the oysters from the two areas are handled in a completely different manner. Instead an entirely new, profitable industry would have been created.

Mr. Lunz and Mr. Beaven have reported elsewhere in this journal their experiments in transplanting seed from South Carolina waters. While these experiments have had only limited success, they should be continued, and similar attempts made in other areas.

A complaint which has been directed at state oyster biologists is that studies they are carrying on are of neither a long term nature, nor directed at a specific local problem. It is contended that such research is a luxury which can be catered to only by private institutions, who are not responsible to the public for funds. There would seem to be some justification for this criticism. It is suggested that each oyster biologist examine carefully his own activities and ask himself certain questions: "Have my major efforts been directed at solving a biological problem? Do I appear to be making progress in this direction? Is there any useful application of the conclusions I have reached?" If he can answer in the affirmative he is probably on the right track.

Some of the biological problems of the oyster industry have been listed; there are many others. Most of the oyster problems are so complex with so many ramifications, that it will take the best efforts of all the oyster scientists to solve them.

The industry has never looked more hopefully or earnestly to the scientists than today for assistance and guidance in solving the manifold problems in oyster culture, with which he is faced. The oyster scientist has a great opportunity to demonstrate the value of research, since there is probably no marine species which lends itself so well to field and laboratory investigations.