This c h is not sufficient to play a very impor ean stock to its former level of producti nt further depletion during future mon ut the closed season is a step in the right direction and the voluntary agreement demonstrates a spirit of cooperation on the part of the industry and a genuine interest in safeguarding the future of the mackerel supply. There have been other examples in this State of voluntarily imposed restrictions in our fisheries industries, but we believe this is the first state-wide self-imposed closed season involving such a financial sacrifice on the part of packers and fishermen.—*W. L. Scofield, California State Fisheries Laboratory, May 20, 1938.*

MUST THE SCIENTIST ALWAYS BE ON THE DEFENSIVE?

EDITOR'S NOTE.—The following editorial was submitted by one of the research workers of the *California Division of Fish and Game*, who prefers to remain anonymous. Although it is not our policy to publish unsigned articles, we feel that this editorial should be presented for the consideration of our readers.

The accepted criterion which distinguishes man from the so-called lower animals is the superior development of his brain. During the vast stretch of time when man was slowly differentiating from the other animals, the brain was apparently merely a depository for accumulating impressions of the natural environment in which he found himself—and queer reactions some of those impressions must have produced. As time went on, there appeared men whose brain cells were superior or at least more active than those of their fellows. These accomplished individuals were not satisfied merely to absorb impressions; they analyzed them and at once found themselves in hot water. Their reasoning and conclusions tended to show and sometimes to prove that many beliefs and prejudices, backed by tradition, were either false or ridiculous or both. From that early beginning up to and including the present time, workers in the field of the natural sciences have been on the defensive. Man is a conservative and resents any departure from accepted tradition. He also resents being made ridiculous. People will go to absurd lengths to defend a premise which they have endorsed after accepted facts and even their own common sense have proved that it is false.

An understanding of these inherent traits, products of ancient impressions, makes it at once apparent that Galileo was simply asking for trouble when he discoursed on the solar system, that Vesalius unleashed a tremendous blast of vituperation by proving that men and women have the same number of ribs, and that Spallanzani, a pugnacious individual by contrast, was forced to defend belligerently his demonstration that spontaneous generation was a myth. These illustrations and many others are cited in our day with tolerant amusement as indicative of man's ignorance in his infancy, the supposition being that he has now reached maturity. Observation, however, does not substantiate this optimistic assumption. At any rate the biologist is still on the defensive.

The present human environment is largely artificial but to maintain himself, man is compelled to recognize the existence of a vast number of other organisms that live in an environment which is still natural,

except where man has meddled with it. We call the study of these organisms biology, and the attempted manipulation of the natural environment conservation. In its broadest sense conservation means the management of natural resources to the end that they will continue to yield food and material for human needs without jeopardizing the basic supply. The biologist is conceded a definite position in this attempt to adjust organisms and ecological conditions to human necessities. He is encouraged to investigate the workings of natural laws and their application to human welfare, but almost without exception a natural law which does not conform to tradition is roundly denounced along with the man who discovers it. Even when no tradition or prejudice is controverted, biological work is regarded with suspicion as it is something beyond the ken of the ordinary man, who generally has only a very vague idea of the structure and functions of his own body.

Although the average citizen is largely dependent on the natural environment and its inhabitants he knows little or nothing about it. He delegates to governmental bodies the task of conserving his natural resources. The various governmental subdivisions employ trained men to acquire the necessary information by which their policies are determined. Because of their familiarity with special fields, these departments are able to present information to legislative committees and law courts for the guidance of these bodies, but at that point we run into our old friend tradition again. Having presented the results of his labors the biologist can not defend them. He must remain in the background as a spectator while lawyers, business men and others question his disinterest, deliberately misinterpret plain statements and befog simple issues with soaring flights of oratory, which admittedly are sometimes much more effective in gaining the end sought than detailed facts and cold logic. It is only fair to admit however that most biologists would not defend themselves or their work under such circumstances if it were traditionally permissible. There are not many Spallanzanis and Huxleys. With few exceptions, scientific workers can not be reached by politics or money as they set no value on power or wealth but value highly their scientific reputation. What does it matter if their work is minimized or altogether suppressed by political log rolling? They go back to their work, content that they have done their job, done it well and added to their own stock of knowledge—and that is about the only reward they generally receive or want.

To demonstrate that this is not idle speculation, suppose we examine an actual case, which is one of many. During a recent fisheries investigation a great deal of testimony was written into a report of a congressional committee and a fifteen-page pamphlet (in fine print) was appended. The pamphlet was in the interests of operators who were seeking to escape governmental supervision and to secure a more extensive exploitation of sardines, in opposition to the biologists' claims that more extensive fishing might deplete the supply. This pamphlet is of interest. In the first place it was written by an attorney who used it as the basis for his testimony before the committee. Although many of the statements are half truths, there is an impressive show of data to support a conclusion diametrically opposed to that of the biologists, but on analysis most of the figures not obviously gleaned from official reports have all the earmarks of good guessing. There are many quota-

tions which appear very convincing, but a perusal of the scientific reports from which they were taken shows that most of them are half quotations or they have been cleverly placed in different settings, which altogether change their meaning. The writer refers to "pseudo-scientists" and sarcastically to "experts" in speaking of men who have devoted their lives to the study of a subject, about which he admittedly knows nothing. He announces that it is his opinion that this or that biological conclusion is erroneous and that his clients are being persecuted by a lot of "hired propagandists" and "political scientists." This should prove to any intelligent person that the sardines can not be depleted. After all, our attorney has nothing to lose. It is all a part of the game from his viewpoint and by speaking (and writing) with a voice of authority, he may and probably will convince many people that the interests he serves are persecuted benefactors of the race. He is considered clever if he wins his case and no stigma attaches to him if he loses. He says that a "thing is so" when the biologist says "it appears to be so," as our scientific man must always protect himself by demonstrable facts. Even if he were not influenced by the ethics of his calling, his fellows are a critical and heavy handed lot. A few bad mistakes, a hint of charlatanism and his reputation is ruined.

It is of interest to note that the issue involved in the above mentioned investigation was so befogged by oratory and appeals to the emotions that no definite action was taken and now, after a lapse of two years, the depletion of the fishery predicted by the biologists has reached serious proportions.

Suppose we have a look at "predatory animal control," another highly controversial subject, about which the biologist voices a conviction at his peril. To champion **any** species of mammal, bird or fish that tradition places on the "black list" is on a par with proclaiming yourself an Orangeman in a meeting of the Hibernian society. The sportsman, the farmer and the general public maintain fixed convictions in respect to the relationship between so-called predators and "game." A few casual observations are all that is necessary for confirmation. Yet the biologist who has the temerity to defend any predator must produce exhaustive and incontestable data to clear himself of the taint of heresy, and even then any future work he may do is viewed, at least by laymen, with suspicion because he has dared to contradict an established prejudice. This attitude is so pronounced that much worthwhile work is buried in obscure scientific journals where it will be reasonably safe from lay observation, or remains unpublished. In the meantime the sportsman and the farmer proceed to eliminate "predators" at every opportunity, failing to make a distinction between the harmful and the really beneficial species. The results are sometimes deplorable. The "game" animals and birds, in many cases are not in the least benefited and sometimes are actually harmed, while the people are forced to spend enormous sums of money in an endeavor to check real pests such as ground squirrels, rats and insects—a task which constituted the life work of most of the late and unlamented "predators."

This discussion, with concrete cases, could be prolonged but enough has been said to indicate our meaning. So the next time you cut yourself badly and the doctor uses some new-fangled disinfectant, don't start an argument with him over the relative merits of the boiled cow

dung and spider webs your great grandmother used in contrast to his germ killer. Also, the next time you encounter a sportsman with his gun and his limit of quail, don't shoot him. He is a predator, of course, but for all you know he may be a good husband, a kind father and a worthy citizen.

RADIO TELEPHONES ON FISHING BOATS

During the 1936-37 sardine season a few purse seine boats were equipped with radio telephones. Their value as an aid to the fishermen was soon recognized. Several more local purse seiners seeking tuna in Mexican waters the following summer added radio telephones to their equipment. At the present time roughly one-third or about seventy-five of the purse seine boats on the Pacific Coast are equipped with sets. Practically all of the remaining boats have radio receivers so they can pick up information sent to other boats, but can not themselves broadcast. Many more sardine boats will install radio telephones before the next sardine season (1938-39).

Prior to the introduction of radio telephones on fishing boats, fishermen hesitated to reveal the location of their catches. The first boats to obtain transmitters even went as far as to agree on prearranged codes for the names of localities. In this way they could tell their friends where they were finding fish and at the same time mislead others. This system was soon found quite unsatisfactory, so that now all boats are glad to give information to anyone in exchange for similar information.

Since sardine, tuna or mackerel schools travel from place to place the boats finding fish tell the other boats so that they may move into areas where fish are known to be present. Previously a boat would often scout for days without finding fish or knowing where fish were being caught. Frequently, such boats would return to port to question other fishermen unloading their vessels. This was not only time consuming but information thus obtained was often unreliable due to the traditional reluctance of the fisherman to have others fish where he does. Radio telephone is especially helpful to purse seiners going down into Mexican and Central American waters for tuna, as they scout over several hundred square miles while fish frequently "show" only in very localized areas.

Besides broadcasting fishing conditions, the sets are valuable in disseminating weather information. Business is often transacted over the air and not infrequently fishermen notify worrying families that they are in a snug anchorage during a blow. Fish dealers, canneries and reduction plants can be notified as to when to expect fish. They then know when and how large a crew to call, so that no time is wasted in unloading and processing the catch. In case of engine breakdowns or other trouble, aid may be summoned by calling a Coast Guard station or the nearest telephone company station. In case of injury to a crew member, medical advice can be asked and not infrequently Coast Guard planes have responded to reports of serious accidents by taking doctors to the scene.

Drag boats fishing for bottom fish off central and northern California find the radio telephone useful for the same reasons as do the purse seiners. Furthermore, the companies operating these boats can direct their boats to deliver their fish at different ports; or tender boats