

THE FISHERIES AND FISHERY RESOURCES OF MEXICO^{1/}

By M. J. Lindner*

In recent months, all of us have been reading vivid and picturesque accounts of the vast fishery potentiality of Mexico and the unlimited possibilities of utilizing and expanding these resources. From these accounts, it would appear that the waters about Mexico were teeming with fishes and all one need do to become a millionaire is to buy a fish net. However, when we examine the situation more carefully, we find that it may not be as portrayed, and we also find that there appear to be certain fundamental problems that must be solved before Mexico can expect to increase her fishery production much beyond that which she is producing today.

I wish to call attention to certain facts, ideas, and possibilities which seem to me to have been overlooked or to which insufficient attention has been paid. My purpose is to stimulate thought and discussion with respect to the fisheries of Mexico, along certain lines that appear to have become lost in a maze of recent publicity. I should like it clearly understood that the remarks I make herein are strictly my own personal ones and in no way do they represent or reflect the views of the U. S. Fish and Wildlife Service, nor those of the Dirección General de Pesca e Industrias Conexas.

In the broad biological usage, the term "fisheries and fishery resources" of a country generally includes those fisheries and fishery resources of the high seas as well as those confined within the narrow territorial limits defined by international law. I am using this term in the biological rather than in the international-law sense, which determines the limits of ownership. But there appear to be other limits to the fisheries and fishery resources of Mexico.

The extent to which a fishery may develop is limited. Any single fishery is limited by the magnitude of the fish population and by the available market for the fish.

In other words, we cannot have a fishery unless we have both fish and markets for those fish, and the extent to which any one fishery may grow is limited by the numbers of that fish that the waters can produce, and it is also limited by the amount of that fish which can be sold.

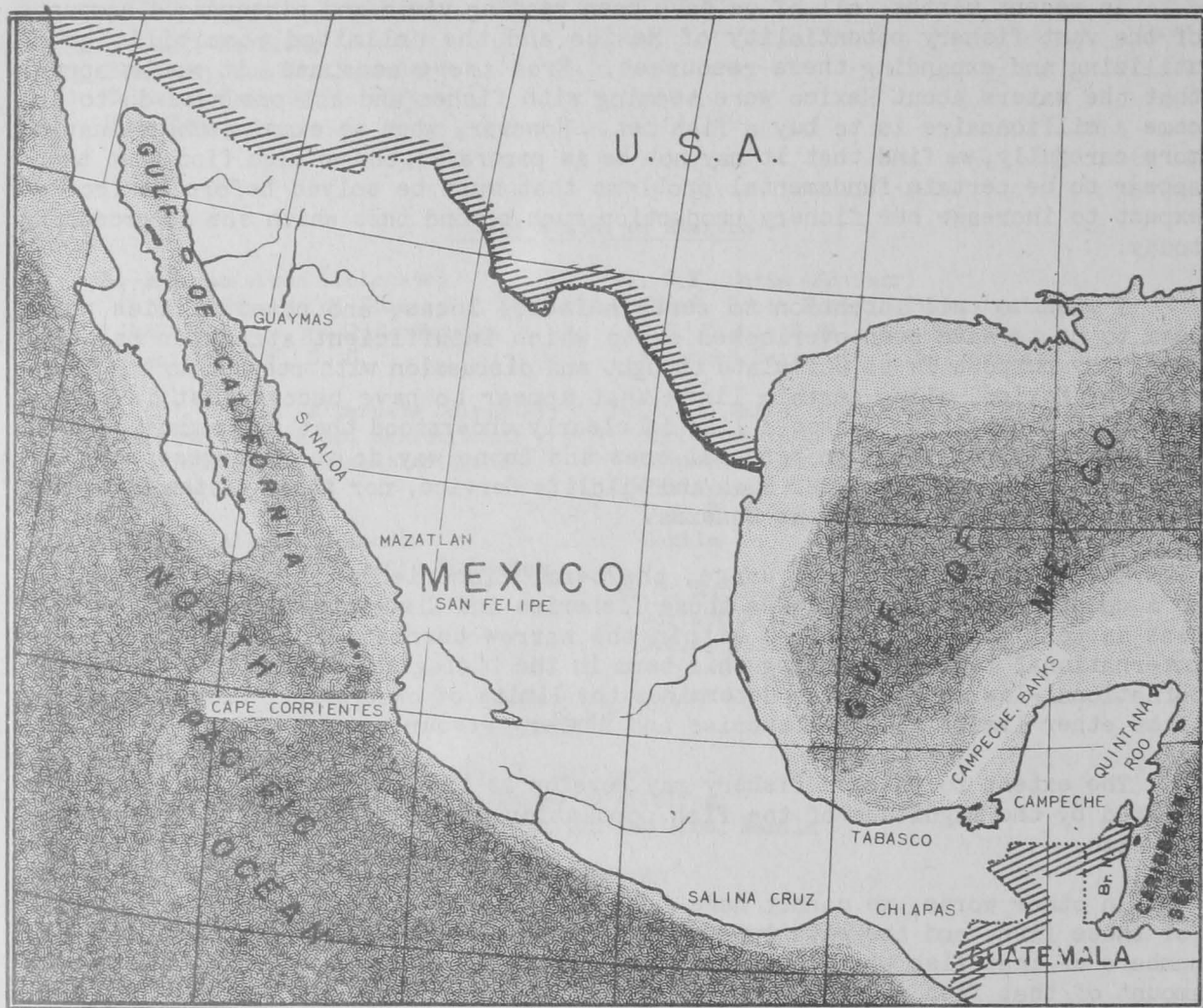
I shall deal mostly with fish populations, but before entering upon this topic, I shall make a few remarks about markets for fishery products.

There are two types of markets for fishery products; the foreign market and the local market. Of the two, the local market is the only certain market. It is the only market over which a country has complete control. The control of the foreign market lies largely in the hands of the importing country. At any time the importing country may place import restrictions such as quotas, or she may increase her import tariffs. Either of these actions conceivably could, almost overnight, wipe out a large fishery enterprise depending on a foreign market. As we all know, many of the major fisheries of Mexico depend entirely on foreign markets.

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In Mexico, practically all of these export fisheries can be classed as luxury, and as we shall see later, it appears in many instances that these luxury fisheries are being utilized nearly to the maximum extent, but with little likelihood of other luxury fisheries being developed.



The Mexican local market is not yet highly developed and there appear to be many problems which must first be solved before appreciable changes will occur in this market. These will be mentioned later, so let us now turn our attention to the subject of the fish themselves.

First, let us start with the fundamental subject of fish food. Without large quantities of food we cannot have great numbers of fishes. From indirect evidence it appears that extensive areas of waters about the Mexican coasts do not produce food in quantities comparable to those portions of the globe where fish are extremely abundant. The old concept that the seas in higher latitudes are richer in fish than the tropical and subtropical seas, is no longer acceptable. Nor is it acceptable that phytoplankton^{2/} is everywhere the basic food in the sea. However, we can still rely on the maxim that if we are to have an abundance of fish we must have an abundant supply of food for those fish. Now, from where does this fish food come?

^{2/} Plankton consisting of floating plant life.

Basically, this food comes from three general sources; from the phytoplankton, from detritus from decomposing phytobenthon,^{3/} and from detritus from the land. Considering first the phytobenthon, we find that nowhere along the coasts of Mexico is it abundant except along the west coast of Baja California. With this exception, we can disregard phytobenthon as an important food source in Mexican waters. We then have two remaining sources of food, phytoplankton and detritus from the land. Of these, we shall consider first the phytoplankton of the coastal waters.

Unfortunately, no adequate studies of the comparative abundance of phytoplankton have been made along the Mexican coast. Hence, we do not have a really accurate basis for determining the relative plankton productivity of these waters. We can, however, arrive at general conclusions by other means. One method is by the transparency of the water. Highly transparent water is not rich in plankton. Much of the coastal water near Mexico can be considered as being relatively transparent. Coming within this category are the Caribbean waters of Quantana Roo, the Gulf waters over the Campeche Banks, and most of the Pacific coastal waters south of Cape Corrientes.

Also, as a general rule, where plankton is abundant in coastal waters there are numerous large schools of plankton-feeding isospondylous fishes such as herring, sardines, and anchovies. So far as is known, only the waters north of Cape Corrientes have these types of fishes in quantities. Some of course, do occur in the Gulf of Mexico, but apparently they are not nearly so abundant as are the comparable forms of the northwest coast. With these brief statements, we shall leave the phytoplankton and consider the detritus from the land.

The detritus from the land comes from two sources; that brought down by the rivers and that formed by the decomposition of plants in the lagoons and in the marshes of the deltas. There is no way of distinguishing between the contributions of the rivers and that of the other sources, as generally the rivers terminate in either lagoons or marshy deltas, so no separation will be attempted of the land food sources. It is obvious though, that in Baja California, rivers can be of but little importance as a source of basic food. Likewise, the waters off the Yucatán peninsula cannot be supplied with any great amount of basic food from the land. On the other hand, food from the land, including the plankton of lagoons and marshes, seems to be the principal food source throughout much of the Mexican coast. Such important fishes as the mullets, the robalos, and the milkfish, are to a great extent dependent on this source of food, as are also the shrimps.

It is probable that food of land origin is more important in the Gulf of Mexico than that of any other origin. The same probably applies to eastern Oaxaca and to Chiapas. It undoubtedly also is important on the mainland in the region between Guaymas and Cape Corrientes. Important as the land in Mexico appears to be as a source of marine food, it probably does not compare with other sections of the world which are known to produce large quantities of fishes. A great part of Mexico has but little rainfall, there are but few important rivers, and there are not many sections with extensive marshlands.

It is also generally true that in coastal waters, bottoms of sand, shell, and coral are poor in detritus when compared to adjacent bottoms of mud and clay. Large stretches of the bottoms along the Mexican coasts have sand, shell, and coral bottoms. This is particularly true of the bottoms near the Mexican coast in the Gulf of Mexico and the Caribbean Sea.

^{3/} Plant life in or upon the sea bottom.

Taking all of the foregoing into consideration, it is probable that the richest waters about Mexico are those around Baja California. It is also probable, because of the lack of basic food, that the actual pounds of marine life per unit area in the waters and sea bottoms throughout the Mexican coasts, will average considerably less than those of the North Sea or of the Grand Banks. By this, I do not mean that the waters about Mexico are poor in fish life. But I do mean that these waters are not necessarily rich in fish life, and that because Mexico has extensive coastlines on two oceans does not in itself warrant statements to the effect that Mexico has unlimited fishery resources, nor should the estimated production of these coastlines be compared to the production of those of the greatest fish-producing areas of the world. The fishery resources in the waters about Mexico are limited to the amount of basic food these waters can produce, and it does seem probable that this food is not particularly abundant over large areas of the coast.

Now, let us depart from the food problem and turn our attention to some of the more important fisheries in the waters about Mexico in order to see what conclusions we may arrive at with respect to them.

The greatest fishery by far of any in the waters about Mexico is that for the tunas along the west coast of Mexico, in particular, the waters surrounding Baja California. The tunas are primarily fishes of the high seas where, as is well known, they are not taken in appreciable amounts by Mexican fishermen, but on the contrary, almost all are caught by fishermen from the United States who return with their product to the canneries in San Diego and San Pedro, California. That the tunas are abundant is obvious from the catches, but there are those who believe the tunas may be undergoing depletion. At the present moment, Mexico is embarking on an enterprise to expand her tuna fisheries. It is probable that the extent of the success of this enterprise will depend upon various factors, such as: the continued abundance of the tunas, the degree to which Mexico can develop and maintain foreign markets, and the extent to which she can develop her own markets.

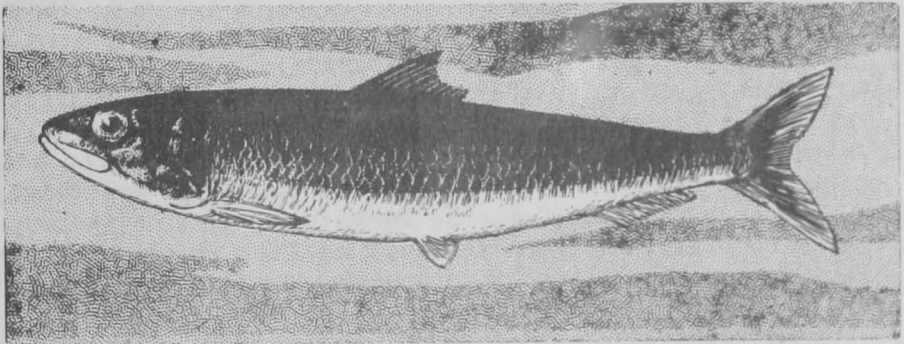
The next most important fishery is that for shrimp. This fishery appears to be limited in the amount that can be produced. Indications are that the shrimp fishery in the Gulf of California between San Felipe, Baja California, and Altata, Sinaloa, has already reached its maximum productivity and that future production in this area will depend upon the variations in the annual productivity of the shrimp. This is evident from the fact that in spite of the increasing numbers of boats entering this fishery, the total production of the fishery has increased but little in the past two seasons. At the same time, the average catch per day per boat has dropped considerably. On twenty-some boats for which we have continuous records, the average daily catch per boat during the 1946-47 season was but 43 percent of the average daily catch for these same boats during the 1945-46 season. We do not yet have the records for these boats for the 1947-48 season, but from all reports the average catches did not approximate the 1945-46 high. We do know, though, that still more boats entered this fishery during the past season, but that the total catch remained about the same as that of the previous season. It might be argued that the decline in average daily catches since the 1945-46 season is a result of migrations of the shrimp or of natural fluctuations in the shrimp supply rather than the fishery having reached its maximum productive potential. These explanations do not seem to be true, however, for the returns from preliminary tagging experiments we conducted in this area during the fall of 1945 indicated an intensive fishery even at that time.

Here again it seems that food may be the limiting factor--a coastline of about twice the length of that of the State of Louisiana, apparently can produce only about 20 percent the amount of shrimp.

Apparently the only manner in which the catch of shrimp along the west coast of Mexico can be increased is by an expansion of the fishery into new areas. This brings up the question, what shrimp-producing areas remain that are not now fished? From our knowledge of the environmental factors that control the distribution of shrimp, it appears that there are two such areas remaining--that between Mazatlán and Cape Corrientes, and that between Salina Cruz and the Guatemalan border. The productivity of these areas probably will not compare with that of the Gulf of California.

Passing from the Pacific to the Gulf of Mexico, we find a concentration of shrimp along the coast of Tabasco and western Campeche. This fishery is of quite recent origin but from the reports of the fishermen as to the trend of their catches, it is possible and even probable that this fishery has already reached its maximum productivity. There are no other areas along the Mexican coast in the Gulf of Mexico or in the Caribbean that appear even to approach the potentiality for shrimp production that the Campeche area has.

Probably the next largest fishery is that for shark. It is almost exclusively a west coast fishery. Shark are taken primarily for their livers, which are rich in vitamin A, and the west coast sharks, as a rule, have livers of higher vitamin potency than do the sharks in the waters of the Gulf of Mexico and the Caribbean Sea. The future of the shark industry does not look encouraging. The sharks have already demonstrated symptoms which lead us to believe that they can be readily depleted. Also, synthetic vitamin A has been produced in laboratories, and it is probably only a question of time before it will be available commercially.



CALIFORNIA SARDINE

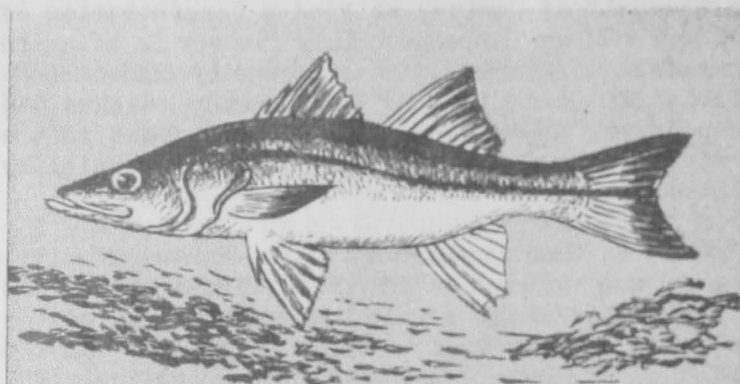
The California sardine, another important fishery, is, in Mexico, limited to the waters along the west coast of Baja California. The future of this fishery is, at the moment, a matter of speculation. The catch of this species in the United States, which normally exceeds that of Mexico by at least a hundredfold, has declined in the past several years at an alarming rate. There are two schools of thought regarding this decline. One is that the sardines have been depleted and the other is that for some unknown reason, they are now undertaking abnormal migrations. Irrespective of either of these hypotheses, it does appear that the California sardine could be much more important to Mexico than it now is. It is difficult to understand why this species has not assumed greater importance in Mexico than it has. The probable explanations are many, but none seems to be directly related to the abundance of fish.

Off Mexico, the Pacific mackerel inhabits almost the same waters as does the California sardine. Like the sardine, it seems to be more abundant than indicated

by present production. Also like the sardine, it is basically a "cheap fish." The enigma of the California sardine also appears to be the enigma of the Pacific mackerel. These problems appear to be basic, and apparently they must be solved before Mexico can increase her production of these fishes.

Now let us turn to the totoaba. This fish is limited to the waters of the Gulf of California. It also appears to be definitely limited in annual production. If the reports of the fishermen can be believed, this species may even be undergoing depletion. In any event, the totoaba cannot be relied upon as a fish supply capable of being greatly expanded.

The robalos, another relatively important group of fishes, occur on both coasts of Mexico. The robalos apparently are heavily fished only in parts of



ROBALO

the Gulf of Mexico. Those of the west coast are relatively untouched. This probably results from the fact that robalos are not in demand as an export item, their only importance being that for local consumption, wherein again we encounter the "cheap fish" problem. How greatly the robalo fisheries can be expanded remains to be determined, but it is undoubted that they can be increased when the demand becomes greater.

The snappers (guachinangos and pargos), like the robalos, are found on both coasts. Here again, like the robalos, they are more heavily fished in the Gulf of Mexico than in the Pacific. Unlike the robalos, however, the snappers do have a limited export demand. Considerable doubt exists as to whether the production of snappers in the Gulf of Mexico can be increased appreciably. For some years past, the catch from the Campeche Banks has shown no increase and the fishermen have been complaining of the scarcity of fish on these banks. The snappers of the Pacific are still largely an unknown quantity.

The abalone, several species of which occur along the west coast of Baja California, is restricted to a narrow littoral belt, most of which is now being fished. It appears to be readily susceptible to depletion and the possibility of greatly increasing the catch of abalone seems remote.

The lobster (sea crawfish or spiny lobster), of which there are several species, is found on both coasts of Mexico. It is now fished commercially along only the Pacific coast of Baja California. Nowhere does it seem to occur in concentrations comparable to the shrimp and the sardine. Areas not now fished, but which, in the future, may come into production, are along the Gulf of California side of Baja California and around the Yucatán peninsula. The lobster fishery of Mexico will never be a great fishery for the simple reason that there are not enough lobsters.

The mullets are also found on both coasts of Mexico. In various places they appear to be quite abundant, and nowhere, except possibly in the lagoons of Chiapas, are they exploited near capacity. The mullets are definitely "cheap fish" and here again we encounter the phenomenon of almost non-utilization of an abundant "cheap fish."

The Spanish mackerels, like the mullets, are abundant on both coasts, are "cheap fish" and are not now utilized in proportion to their abundance.

We could continue on in like fashion with the other fishes of Mexico but there is no particular reason for doing so as none of the other species is now of particular importance nor does it appear that they are likely to become important in the immediate future.

When we consider in review the currently important fisheries of Mexico, we find that with the exception of the shrimp, not one exceeds a production of 9,000,000 annually. This amount is indeed small when compared to the yields of the major fisheries of the world. We also find that many of these, such as the abalone, shark, totoaba, and shrimp either have reached or exceeded their maximum production or are rapidly approaching this level. We further find that many of the more important fisheries such as the tunas, shrimp, abalone, totoaba, shark, and lobster, are taken almost exclusively for export. As a matter of fact, in 1941, according to the published statistics of the Dirección General de Pesca e Industrias Conexas, about two-thirds of the edible fishery products taken along the Mexican Coasts in that year were taken either by foreign boats or for export. Since that date, with the increase in tuna and shrimp catches, the fishery products caught for export or foreign markets as compared with those caught for local consumption, will probably show a still greater disparity.

In addition to those points already mentioned, we find that all of these exported fishery products fall within the luxury or semi-luxury classification. The difficulty with this situation is that Mexico does not appear to have many more luxury fishes of any importance, nor do those now being fished appear to be capable of sustaining greatly increased yields.

Of more fundamental importance to Mexico than any of the other points touched upon, is the evident fact that the really abundant "cheap fish" are not being utilized in any degree comparable to their abundance. Furthermore, such anomalies occur in Mexico wherein fish that should be cheap actually command luxury prices. Why is it that the only really important fisheries of Mexico, either for export or for local consumption, are luxury items? Why have the sardine and mackerel fisheries of Baja California not kept comparable pace with these same fisheries but a few miles to the north? These and many more similar problems are what I call here the "cheap fish" problem of Mexico. This to me, is the basic problem of the Mexican fisheries.

No country of which I am aware, has become a truly important fishing country without first solving its local "cheap fish" problem. It is on "cheap fish" that most of the major fisheries of the world are based, and I believe that Mexico will not assume her rightful place amongst the fish-producing countries of the world until she has solved her "cheap fish" problem.

Now comes the important question. How is Mexico to solve her "cheap fish" problem? Frankly, I do not know. There are such a multiplicity of factors that appear to be the causes of the condition, that there evidently is no one certain and easy solution. On the contrary, there appear to be a multiplicity of solutions required. It may be the answers will be found amongst the following: increased competition throughout the fishing industry, starting with the fisherman and ending with the retailer; volume production and sale with small profit on individual items; improved packs; increased local consumption; higher standard of living for the masses, technological research to develop acceptable packs of those fishes that

are abundant but not in demand; advertising campaigns; improved and increased transportation facilities; better handling methods; increased ice facilities; better fishing methods, etc.

As you can see, these solutions are not easily attainable, nor can they be arrived at overnight. It will probably be some time before all of them are accomplished. Likewise, it probably will be some time before Mexico solves her "cheap fish" problem. However, the sooner this problem is solved, the better it will be for Mexico and also for the world as a whole.



FISHERY MOTION PICTURES

The Fish and Wildlife Service has available fishery motion pictures and also a number of educational films dealing with subjects that are very closely related to commercial fishery operations. Most of these films are 16mm sound motion pictures which may be borrowed free of charge upon request. Requests for booking the films should be made as far in advance as possible. Each request should indicate clearly the address to which the shipment is to be made. The shipments are usually made by express, the borrower paying transportation charges both ways. No charge is made for the use of the films. The user will be held responsible for any undue wear or tear of the film caused by faulty handling or dirty or faulty projectors. Sound films must not be run on silent projectors.

Films must be returned on the same reels on which they were received and must be returned to the same office from which they were borrowed.

Report of attendance cards are furnished with each film and should be filled in after the showing and returned as directed on the card.

Films borrowed are furnished with the understanding that there shall be no admission fees charged for programs on which the films are used, except when shown in theaters as part of a regular program. The taking of a "free will offering" for the purpose of defraying expenses of employing an operator is not construed as a violation of the regulations regarding admission fees.