

of the California salmon is affected by the fact (if it is a fact) that the fish never spawn but once. I have a theory of the salmon of this river. It may not be scientific, but it is mine, and I can give reasons for it. It is this : the female salmon seldom or never spawns but once. The exceptions to the rule, if any, are few, and the second product of these exceptions is found in a salmon differing slightly from the mass of fish found in the river. A goodly, though not the larger part of the male salmon that have assisted in reproduction, return to the ocean and 'live long and grow broad,' and return to the river many times. On their return these fish constitute that class far above the average size. They reach 30, 40, 50, and even a greater number of pounds in weight, while the average weight for which our meshes are sized is from 16 to 20 pounds. The female spawn is not ripe for delivery, nor the male fish sufficiently mature for milting, until they have made repeated trips between the ocean and the river. The yearly broods return periodically and in regular cycles; the youngest fishes arrive earliest in the season, which begins about the 1st of November, and do not penetrate far the first time. In the order of their birth, the other broods arrive and return to the sea until in August and September, the great seed run, consisting of mature fish, always on time, always urgent in their movements and purposes, passes up to the headwaters. Salmon of different ages are always coming in and going out to sea. The older the fish the longer his stay in fresh water. The younger the fish (after he once leaves for the ocean), the more of flirting about the bays and brackish water near the mouths of the river, with short excursions up the river. The foregoing is the outline of a theory, though it is derived from, and apparently justified by known truths in the history of the Sacramento salmon during the last twenty years. I believe it to be correct; that is to say, that in any year representations of the brood of any other year not yet extinct, enter the river, and that not one-fifth of the fish that enter the river in any given year go to the headwaters that year, but that more than four-fifths return to the ocean, and, consequently, that all the fish that come in to the river each year, but one-fifth go to the headwaters for purposes of reproduction."

6. The habits of the Sacramento salmon, while on their spawning grounds in the McCloud river, have been closely observed by Deputy United States Fish Commissioner Livingston Stone, and the result of his investigations has been published by Congress in the Report of the United States Fish Commissioner, Spencer F. Baird. But little is known of their habits while in the ocean. They probably feed on shoals not many miles from the shore. They are occasionally taken in the nets of fishermen, in the ocean not far from Golden Gate. Many grilse, and a few mature fish, make their appearance in the bay of San Francisco in December, and remain several weeks feeding upon smelts and other small fish. During this period thousands are taken with hook and bait on lines from the Oakland pier, and other wharves. Many more are also taken in the nets of fishermen. After leaving the salt water of the bay, they go to the brackish waters where the currents of the Sacramento and San Joaquin meet the tide from the ocean. After entering the fresh water of the river they cease to feed. No food has ever been found in all the tens of thousands caught in the Sacramento. As it is of importance to obtain a knowledge of the habits of the salmon while it remains at the mouths of the rivers, playing back and forth between brackish and fresh water, before it makes its long and perilous journey to the head of the stream, we select from our correspondence extracts from a letter from Mr. Samuel N. Norton, of Rio Vista. Mr. Norton is a practical fisherman of many years experience, and the record of his close observation is of much value. He says : "I will give you a synopsis of one year's trip with the salmon, showing the general habits of the fish in all years while remaining in or passing through that part of the Sacramento river lying between its mouths and the point where the Feather river empties into it. For this purpose the Georgiana Slough, the Three-mile-Slough around the head of Shearman Island, the San Joaquin river between these sloughs and the bay, and the Montezuma Slough leading into the northern arm of Suisun Bay from the Sacramento river, are considered as mouths of the river with like functions and processes as the main trunk of the river. Indeed, some of the best fishing ground, at certain seasons, is found in the Montezuma, Three-mile and San Joaquin. To commence with an anachronism, the spring run begins in the fall! In November and December a very few small (as fisherman use the word—say twelve or fourteen pounds each) bright salmon appear in the river, and if no rains occur, or only slight rains, an increase in their numbers is noticed, yet they are always very scarce in those months. There are never enough to half supply the local demand of the San Francisco and other home markets. At first, in November, we pick up occasionally on their return, the last dregs of the old seed run which occurred during August and September. These are usually male fish, very dark, ill-conditioned, lank-jawed, disconsolate looking fellows, who through misfortune, incompetency, or other cause—to me not more than presumable—seemed to have failed in their mission up the river, or to have fallen into disgrace. The last of these soon disappear. The bright ones are the *avant couriers* of the great spring run, which thus, as I said, begins in the fall. With the first heavy rains the fish that have penetrated the river recede, or as we say, back down before the thick muddy stream, retreat to tide-water in the bays, and remain there reconnoitering and waiting a steady river current. Now is the time for good fishing in the bay and just in the mouths of the river. The fish are not very plentiful, but none being caught within the river proper, there is a great demand and great price against a small area of fishing ground, where all that had before penetrated the river are now concentrated. When the river becomes steady, that is, neither rising nor falling, the fish start up again, no matter how high the water may be, and by the varying moods of the river in sudden rise or fall, is the spring run mainly governed. Sudden rise or fall alike will check them. Thus it often happens that for many weeks the fish will be taken in numbers at Benicia and Collinsville, in smaller numbers at Rio Vista, and none at all further up. Again, there have been seasons when a steady run commenced in the early part of January, and by an almost uniform rate of increase reached its culmination in May. But this is exceptional. The spring run may be stated as commencing in November and ending in July, and having its greatest strength in May. Under the most favorable conditions the months of November and December might be classed 'very scarce'; January and February, 'scarce'; March, 'not scarce'; April, 'plenty'; May, 'very plenty'; June, 'not scarce'; July, 'scarce.' Under unfavorable conditions, November, December, January and February would have almost none at all; March, 'scarce'; April, 'not scarce'; May, 'plenty'; June, 'scarce'; July 'almost none at all.' In defining the terms here adopted, let them be applied to the product of the labor of two men with their boat and net per day : 'Almost none at all,