

fish will not take a hook in the ordinary way. It is difficult to imagine that even the smaller Pacific species make but one return journey to their native rivers, after making their first descent to the sea.

In ascending there are no obstacles which will deter the salmon, and their extraordinary leaps, 10 to 12 feet being a usual limit, are known to every one. Dr. A. Landmarks thinks that a 10-foot jump is possible if there be a deep pool immediately under the fall to be ascended. A recent observer, Dr. R. T. Morris, asserts that salmon can leap falls 18 feet high, and supports his declaration by published photographs. Salmon will certainly attempt to mount the most precipitous and forbidding falls and cascades. In ascending, the schools have been known to accomplish a distance of 40 miles in a day. Livingstone Stone estimates the rate in the Sacramento at two miles, and in the Columbia at three miles a day; but salmon, above tide-head, have been found with sea-fish undigested in their stomachs, and their rate of ascent must be vastly greater. The earlier runs appear to be most leisurely, and the fish appear, indeed, to regulate their rate of progress by the condition of the eggs in the ovaries. In their ascent, they practically eat nothing. Dr. Noel Paton's researches on Scottish salmon have shown that a peculiar degeneration of the walls of the stomach takes place, a "catarrh" it may be called, filling its chamber with a dense mucous mass, in which degenerate cells largely occur, and rendering the organ incapable of digestive functions. The same feature has been noticed in some of the fresh-water salmonoids (*Coregonus*), the rigid condition of the stomach precluding the possibility of normal digestion. In the Pacific rivers it would, of course, be impossible for the migrating schools, on account of the vast numbers of fish composing them, to obtain any food in the ordinary sense, and the same physiological law applies to the schools of salmon in all rivers.

Some doubt has been thrown upon the generally accepted theory that salmon return to their own rivers. Certainly, on the two famous Canadian rivers, the Iteigouche and the Miramichi, anglers and practical fishermen have always held that, though the rivers are practically adjacent, the schools belonging to one river never enter the other; indeed, the difference in size and general appearance is such that the men on the river distinguish them at once. This may be said to apply to rivers generally, the salmon of St. John River are unlike those of the Saguenay or Godbout, and none of them are identical in general appearance and build with those native to the rivers around the Bay of Chaleurs. Some accurate experiments in Scotland proved that salmon do, for the most part, return to their own rivers, and of 56 marked fish set free, 34 were afterwards caught ascending the same river, and the other 22 were taken in fixed tidal nets at distances of from half a mile to 500 miles from their native river. The Pacific salmon may not be so strictly true to this supposed instinct, and Professor Jordan lays little stress on it, but regards as somewhat accidental this supposed fidelity to its native stream. He says:

"It is the prevailing impression that the salmon have some special instinct which leads them to return to spawn in the same spawning grounds where they were originally hatched. We fail to find any evidence of this in the case of the Pacific coast salmon, and we do not believe it to be true. It seems more probable that the young salmon hatched in any river mostly remain in the ocean, within a radius of twenty, thirty, or forty miles of its mouth. These, in their movements about in the ocean, may come into contact with the cold waters of their parent rivers, or, perhaps, of any other river, at a considerable distance from the shore. In the case of the quinnat and the blue-back, their 'instinct' seems to lead them to ascend these fresh waters, and, in a majority of cases, these waters will be those in which the fishes in question were originally spawned. Later in the season, the growth of the reproductive organs leads them to approach the shore and search for fresh waters, and still the chances are that they may find the original stream."

Of the respective numbers of male and female fish which pass up during the season, some interesting facts have been observed. Thus, in the Penobscot River, Maine, U.S., out of 100 salmon examined, 34 were male and 66 were female, a proportion of the sexes which showed even greater disparity in the land-locked variety or Schoodic salmon, in which over 1,000 out of 1,604 specimens proved to be female, and the balance of 604