that "it should be emphasized that we do not assume that the regulation of salt balance is the sole function of the adrenal cortex." Furthermore, we have pointed out[6] that the adynamia, hypotension, hypoglycemia, pigmentation, gastro-intestinal symptoms and neurological disturbances of Addison's disease may occur without a decrease in sodium, and finally,[7] that "strength increases strikingly in the adrenalectomized dog following the administration of cortical extract before obvious changes occur in the blood urea or sodium concentration or in the water content of the blood serum."

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"MIGRATION" AND "HOMING" OF SALMON

BY derivation "migration" signifies "wandering." It has come to mean, especially in biology, a definite, purposive movement, preferably "en masse." The salmon is an outstanding example of the fishes that are supposed to show such movements. The Atlantic salmon (*Salmo salar*) spends a number of years as a parr in its natal river before transformation into the smolt stage. The latter is considered to make a feeding migration to the ocean and after several years when an adult a spawning migration back to its natal river. For their return "from the ocean" perhaps to "points far distant from their own rivers" and for their subsequent "travel along the coast" Calderwood[1] states "they find their way by a homing instinct which man can not comprehend."

On inquiry and examination of the literature I have failed to find a single clear case of a salmon returning to its natal river from a distant place in the sea, that is, away from the neighborhood of the river mouth. Admittedly this is a difficult thing to prove, since we must be sure of three things for the individual fish: (1) Which is its natal river? (2) where it has been in the sea, and (3) that it is again in its river. Perhaps some one may be able to produce such evidence. Without it, however, it seems pointless to speak of a "homing instinct."

The movements that have been definitely shown may be placed in three categories: (1) Fish marked as smolts or tagged as kelts in a certain river, being recaptured in that river after having left it, but not necessarily having gone from the neighborhood of the river mouth; (2) fish marked as smolts or tagged as kelts in a certain river being recaptured at a near or distant place in the sea or in another river; and (3) fish tagged in the sea and recaptured at another place in the sea or in a river. There may be mentioned for the Atlantic salmon Alm's[3] experiments in the Baltic, Dahl and Sømme's[4] for the Norwegian coast, those of Calderwood[5] and others for Scottish waters as well as the Canadian ones.[2,6] There have been similar experiments with the Pacific salmons.[7]

In quite a number of instances salmon marked or tagged in one river have been recaptured in another, which constitutes definite evidence against homing. White[2] has shown that this may occur even when the fish is presented at a fork in a common estuary with a choice between another river and its own.

If the traditional conception of salmon migration falls to the ground for lack of definite proof and with clear evidence to the contrary, what is to replace it? The facts show that the salmon wanders to and fro in the sea and this may be considered a migration. Such slight evidence as we have and the analogy of the herring point to these excursions being made when the fish is not feeding. Their range seems to increase with the size of the fish[8] and also, it may be confidently affirmed, with rise in temperature from the winter low, which may be less than 0° C. When the salmon are within the zone of the river's influence at sea these excursions seem to be definitely controlled by a sufficiently steep gradient in the proportion of river water, so that the salmon tend to remain where the proportion is high, as shown by the distribution of the salmon in relation to the outflow of Saint John River water into the Bay of Fundy.[8] The Scottish River Tay similarly has a pronounced zone of influence at sea,[5] and the two rivers agree in that none of the salmon kelts tagged and liberated in them has ever been reported as recaptured in the sea outside the zone of influence or in another river.

It would seem that if a fish happens to get very far from this zone of river influence there is little likelihood that it will in its random wanderings reach the place where the marked gradient occurs. It may then be said to be "lost." Such salmon may reach neighboring rivers or travel very far in the sea. Though they wander to and fro, yet is their course in part determined by the movement of the water. As they tend to keep near the surface, it is not surprising to find that

[6] R. F. Loeb, *Jour. Am. Med. Assn.*, 104: 2177, 1935.
[7] J. Stahl, D. W. Atchley and R. F. Loeb, *Jour. Clin. Invest.*, 15: 41, 1936.
[1] W. L. Calderwood, "A Survey of Salmon Fisheries in Eastern Canada," p. 4, 1930.
[2] H. C. White, *Jour. Biol. Bd. Can.*, 2: 391–400, 1936.
[3] Gunnar Alm, *Ny Svensk Fiskeritidskrift*, 1: 1–6, 1931.
[4] K. Dahl and S. Sømme, *Skr. Norsk. Vid.-Ak. Oslo*, I. *Mat.-Nat.* Kl., 1935, No. 12.
[5] W. L. Calderwood, "The Life of the Salmon," 1908.
[6] A. G. Huntsman, *Bull. Biol. Bd. Can.* 21: 78–92, 1931.
[7] W. H. Rich and H. B. Holmes, *Bull. U. S. Bur. Fisheries*, 44: 215–264, 1928; J. O. Snyder, *Calif. Fish Bull.*, 34: 67–81, 1931; "Pacific Salmon Migration," various articles by H. C. Williamson, C. McC. Mottley and others in *Contr. Canad. Biol. Fish.*: 3 and 4, and in *Bull. Biol. Bd. Can.*, 14, 15, 16, 26, 27, 31, 40, 41.
[8] A. G. Huntsman, *Bull. Biol. Bd. Can.*, 51: 14–15, 1936.
[9] Ann. Rep. Dept. Fisheries Can., 4, 5 and 6: 113, 130 and 130–131, 1934, 1935 and 1936.

to a considerable extent they go where drift bottles go. In Canadian Atlantic waters drift bottles mostly travel to the northeast in correspondence with the prevailing southwest winds of summer. From 1931 to 1934, 642 salmon kelts were tagged and liberated in the Nictaux River, a branch of the Annapolis River of western Nova Scotia. This river has a very weak influence where it empties through the Annapolis Basin and Digby Gut into the Bay of Fundy. Of the 24 salmon recaptured and reported,[9] five were taken at various points on the east coast of Newfoundland, a minimum distance by sea of about 900 miles and one at Ramah in northern Labrador, more than 1,000 miles farther and northward along the coast. The remainder were all taken in the river, except one at Yarmouth, N. S., which is on the route to Newfoundland. The drift bottles that take this course northeastward from the mouth of the Gulf of Maine have been found only as far as Sable Island on this side of the Atlantic. Most of them enter the North Atlantic drift, which carries them to the Azores and the European coast. The salmon, on the other hand, seem to keep to the waters with river ingredients, which extend little beyond the banks, and thus they ultimately reach some point on the coast.

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A WHALE SHARK IMPALED ON THE BOW OF A STEAMER NEAR THE TUAMOTUS, SOUTH SEAS

THROUGH the courtesy of Rear Admiral W. R. Gherardi, head of the Hydrographic Office of the U. S. Navy, I have learned of the interesting happening indicated in the title of this note. Through his kindness there was published in *Hydrographic Bulletin* No. 2362 a short description and a good figure of the whale shark (*Rhineodon typus*). This was done in the hope that the interest and help of ships' officers might be enlisted for the sending in of observations of the occurrence of this greatest of sharks. This hope has been abundantly realized. Information concerning the particular specimen in question comes from Mr. S. H. Crawford, third officer of R. M. S. *Maunganui* of the Union Steam Ship Company of New Zealand, Ltd.

On September 7, 1934, in Lat. 13° 59′ S. and Long. 147° 46′ W. (about 60 mi. N. N. E. of Tikehau Atoll in the Tuamotus) the *Maunganui* struck a large animal at first thought to be a whale. The vessel was steaming at about 16 knots and the animal was struck so sharply just behind the head that it was impaled on the stem of the ship. Here it was held so securely by the pressure of the water that the engines had to be reversed and the ship backed before the bows could be cleared of the great carcass.

While on the bow of the steamer, the head-to-gills region was estimated at about 15 feet and the remainder of the body at about 40 feet, making the total length about 55 feet. This could well have been, for in the Indian Ocean the fish has been measured to 45 feet, and in the Gulf of Siam estimated by an ichthyological friend of mine at 60 feet.

Recalling the figure of *Rhineodon* seen in the *Hydrographic Bulletin,* when Mr. Crawford noted the square-cut head and the speckled markings plainly visible, he recorded the fish as a whale shark. A photograph was taken of the fish held against the vessel's stem, and a copy of this through the good help of the Hydrographic Office was obtained from Captain Toten. This settled the matter once and for all that a second whale shark must be recorded from the Tuamotu Archipelago, South Seas.

In May, 1928, divers at work in Takeroa lagoon were confronted by a spotted shark about 17 feet long. They killed and skinned it. M. F. Hervé, administrator of the Tuamotus, sent the skin to the little museum at Papeete, Tahiti. M. Rougier, curator of this museum, made record of it in *Bulletin Société Études Océanographique,* Papeete, 1929, Vol. 3, 318–319.

It will interest the reader to know that this is the sixth recorded case of the spearing of a whale shark by a steamer making her way over the ocean. One case has been recorded from the Indian Ocean, two from the Red Sea and two from the Atlantic. I plan later to bring these accounts into an article.

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THE AMERICAN MUSEUM OF NATURAL HISTORY

JELLYFISH FROM GRAND CANYON ALGONKIAN

THE impression of a medusa, commonly known as a jellyfish, was found during the summer of 1934 in a fine-grained sandstone of the Nankoweap group of the Grand Canyon series.[1] The Grand Canyon series lies upon the Archean complex and has been divided into the Unkar, Nankoweap and Chuar groups. The medusa measures 18 cm across and is thought to be a marine type. A paper giving the details of this specimen is now in preparation.

The writer examined the lower portion of the Algonkian rocks during 1933 and 1934 under a program sponsored by the Carnegie Institution of Washington, and was accompanied by R. A. Bramkamp when the medusa was found.

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[1] C. E. Van Gundy, Abs. Program Cordilleran Section Geol. Soc. of America, April, 1936.