

the harmonic constants tabulated, but the following are some conclusions which may be drawn.

On the Pacific coast the diurnal and semi-diurnal tides are both nearly "inverted," and the tide-wave reaches the north-easterly parts of the islands somewhat earlier than the south-westerly coasts. The diurnal inequality is large. The Japanese Sea is almost a lake, and it is natural that the range of tide on the western coast should be much less than on the east; it is, in fact, only about one-seventh as great. But the phases of the tides are puzzling, for it is diurnal high-water almost simultaneously throughout the Japanese Sea at the same time that it is diurnal low-water on the Pacific coast, and the diurnal amplitudes are not very different throughout. On the other hand, the semi-diurnal phases on the west are so diverse that it is not easy to interpret their meanings, and there is some diminution of amplitude to the north. If the Straits of Korea are wide enough to admit the diurnal wave so freely, why is the semi-diurnal tide so much broken up? These questions deserve more attention than I am able to give to them.

It seems a pity that in the tables of harmonic constants the heights should be given to one-tenth of a millimetre, and the phases to the hundredth of a degree, for this degree of accuracy is quite fictitious, as may be seen by a comparison of the values at any port for successive years. It may be well also to direct attention to the values of the phases assigned to the tides M_2 and O for the port of Tonoura for the year 1895. There must be a mistake, because for that year they are entered as being almost 180° different from the values for all the successive years. There is no misprint, because the suspicious numbers have been used in forming the mean values of M_2 and O . It is clear from the values assigned to these tides at other ports that 1895 was not an abnormal year—and indeed such an amount of abnormality would have been nearly incredible. No doubt the source of error will easily be discovered.

The tidal constants round the Japanese coasts have now been accurately determined, and Prof. Hirayama deserves warm acknowledgment for the care which he has bestowed on his laborious and useful task.

G. H. DARWIN.

FISH PHOTOGRAPHY.¹

DR. WARD'S book consists really of a fine series of photographs illustrated by a rather inadequate text. Considerable trouble has been taken by the author to represent British marine and fresh-water fishes as they would be seen by a human observer placed in much the same conditions as the fishes themselves. Many, for instance, were taken from an observation chamber built below the surface of water in a shallow pond, and others have been made from fishes living in tanks, lighted in various ways. The author gives a good account of these methods, which may be of assistance to those engaged in original work. The book also includes a number of micro-

¹ "Marvels of Fish Life as Revealed by the Camera." By Dr. F. Ward. Pp. xiv+196+plates. (London: Cassell and Co., Ltd., 1911.) Price 6s.

photographs of eggs and larvæ of both fresh-water and marine fishes, and some of these are novel.

The author tells us, in his introduction, that he has endeavoured to show how fishes disclose their mental states in their attitudes and colour changes. The psychology of the pike and perch—contemplation, mental agitation, the rigidity of excitement, doubt, disappointment, disgust, alarm, &c.—are revealed (to Dr. Ward, at all events) by these attitudes. The interpretations may well be doubted, but the photographs themselves are interesting and beautiful. The

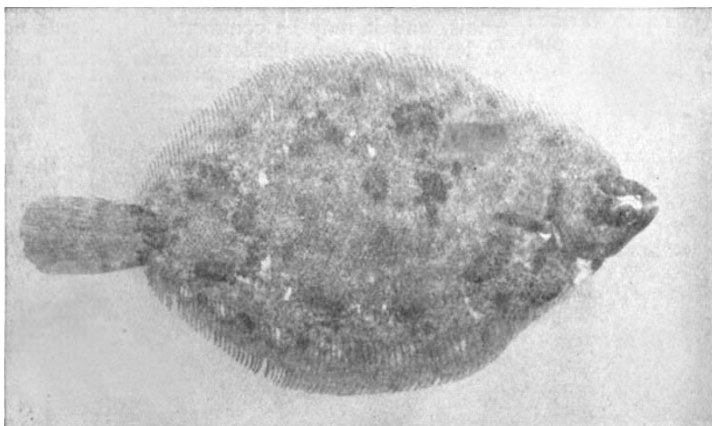


FIG. 1.—Lemon Sole seen against a white background. From "Marvels of Fish Life."



FIG. 2.—The same fish in natural surroundings. From "Marvels of Fish Life."

author is more successful in his illustration of concealment-devices. Thayer's principle of counter or obliterative shading is extended to fishes. The darkening of the dorsal, and the lightening of the ventral surface produce, in a fish lit from above, a flat, ghost-like effect, well shown in the photograph of the dace on p. 26. The fusion of colour patterns with that of the background is illustrated by fine photographs of lemon sole and thornback ray lying on the sea bottom. A further device, imperfectly elaborated by the author, is the concealing effect of the reflection of light from silvery fishes, and the similar effect of the confusion of the iridescence of

such fishes as the mackerel and herring with the shimmering produced by light transmitted through a water surface broken by waves.

Many of the photographs of the eggs and young stages of fishes are very well done; we may direct particular attention to the series representing the hatching of the salmon egg, on p. 50; those illustrating the early stages of the roach on pp. 104-5, and the series taken at Port Erin Hatchery, which represents the larval metamorphosis of the plaice. All these are probably better than any hitherto published.

The defects of the book are in the text, which is sketchy and slight, and is not free from errors. The author evidently confuses the eel and lamprey on p. 126, for he speaks of the former fish as possessing several gill openings behind the pectoral fins. Haddocks (p. 129) are said generally to feed on herring eggs—certainly an exceptional habit. Skates, rays,

State to science, and in the relations between the spheres of government and of knowledge.

France recognises clearly the fact that a nation depends on its science; that its commerce, its industries, its education, all its sources of wealth and of character, are to be found alone in a living and growing material of experimental knowledge. And the nation translates this recognition into will.

In the *Revue Scientifique* of September 23 there is an article by M. A. de Foville, permanent secretary of the French Academy of Moral and Political Sciences, which may well stir envy in an English mind, and prove once more that they manage these things so much better in France. M. de Foville gives a sketch of the Government department known as the "Caisse des recherches scientifiques," which was instituted in 1901, and now celebrates its decennial anniversary merely by modestly directing the attention of capitalists

to its existence. The Caisse owes its institution to M. Audiffred, now a member of the Senate; its object, to quote his words, is "to endow all the sciences with adequate means; to ensure that no serious investigator shall be hindered in his work by lack of the funds necessary for research." It is attached to the Ministry of Public Instruction, but is actually autonomous. It is not, as M. de Foville observes, a charitable institution, but a State Treasury for scientific research. It has a very strong technical committee, which decides upon the applications sent in, and sends its recommendations to the administrative committee. The latest volume of specifications and results of researches financed by the Caisse contains 800 pages. The researches financed or assisted hitherto are

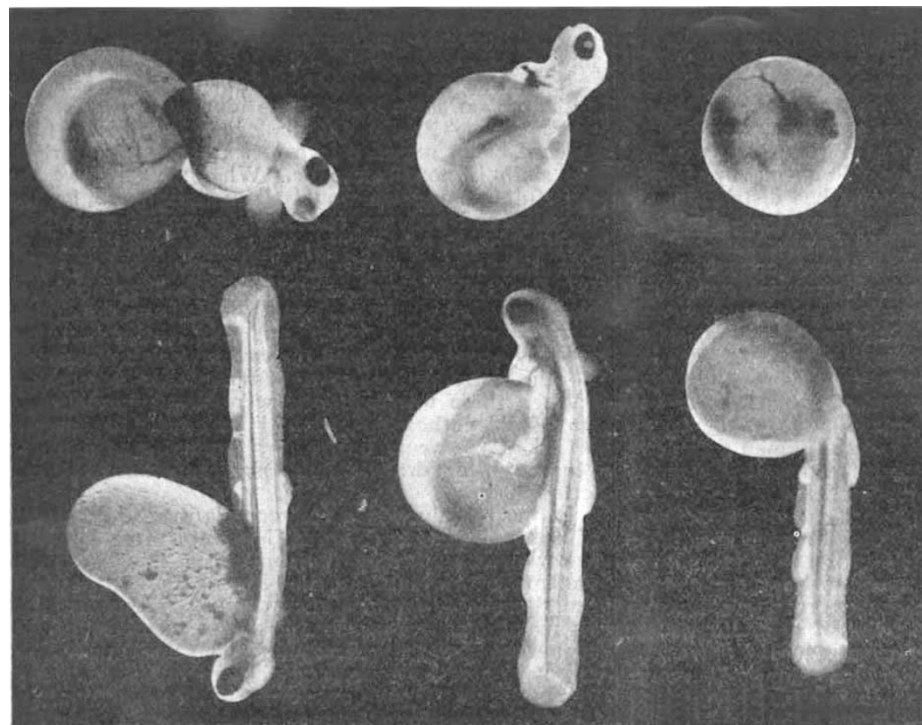


FIG. 3.—Hatching of the Salmon. From "Marvels of Fish Life."

and dogfishes are said to eat oysters (p. 150)—one would like to know where these observations were made. The starfish is also described as protruding its stomach and engulfing an oyster (p. 150)—surely this is impossible! Floating fish eggs are said to occur throughout the year (p. 109). The photograph opposite p. 190 is described as that of a shrimp. Evidently it represents a shank (*Pandalus*).

J. J.

FRANCE AND THE ENDOWMENT OF RESEARCH.

THE French intellect is proverbially clear. The quality implies foresight, no less than insight, and it is revealed in practical politics, no less than in scientific theory. It is also the characteristic of French statesmanship as well as of French thought. Nowhere is this *clairvoyante volonté* of a nation more practically demonstrated than in the attitude of the

distinguished by their eminently social and racial importance, being chiefly concerned with the purification of water supplies, and the methods of combating tuberculosis, syphilis, and other scourges.

The following grants were made in 1910:—1200*l.* to Dr. Calmette; 600*l.* to M. Riolle, for researches into the purification of water supplies; 420*l.* to the late Prof. Arloing, for researches into the prophylaxis of tuberculosis; 400*l.* to Dr. Calmette, for the same purpose; 120*l.* to Prof. Courmont, for studying the prevention of cancer; 120*l.* to M. Gaston, the prophylaxis of syphilis; 120*l.* to Prof. Gley, immunity against toxic serums. Besides these sums, nearly 5000*l.* was allotted to various researches, the total being nearly 8000*l.*, distributed thus:—Biological research, 4692*l.*; water supplies, 2460*l.*; other research, 480*l.*

This Government bureau is not managed by "permanent officials"; its council, consisting of well-known men of science, heads of industrial and commercial firms, and some politicians, is honorary. The