(curve 2) for a visual pigment with $\lambda_{max.}$ 500 mμ shows that the nomogram curve is not broad enough to match the retinal extract. This suggests a mixture of components, confirming the result obtained in bleaching experiments. The hydroxylamine difference spectra (curves 3, 4) of these pigments are shown in about the proportion that they are present in retinal extracts.

It is clear that these results do not confirm the general statement of Wald[1] that the Labridae possess porphyropsin. In the sheep-head, at least, there are two pigments, one very similar to lamprey visual purple[6], the other to the visual pigments of geckos[7]. Whether the red-sensitive component of *Pimelometopon* is a cone pigment or a secondary rod pigment cannot be decided from the present observations. Unlike chicken iodopsin[8], the red-sensitive pigment of the sheep-head is stable under alkaline conditions and in the presence of hydroxylamine. It would be very desirable to re-examine the Atlantic labrid fishes to determine whether they really do have porphyropsin and whether this marine family is split into two groups, those with retinene$_1$ photopigments, and those with retinene$_2$ pigments.

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Effects of Ultra-Violet Radiation on Oysters

IT seemed of value to examine the influence of ultra-violet light upon the rate of cleavage of artificially fertilized eggs of *Crassostrea angulata* L., the larvæ of *Ostrea edulis* L., as well as their adults. The oysters were collected in the summer of 1956 from their natural beds in south Brittany. The experiments were undertaken partly in the Auray Bacteriological Laboratory, and partly in the Arago Laboratory at Banyuls-sur-Mer. A wavelength of 3600 A. from a quartz mercury arc was used.

The gametes and the fertilized eggs of *C. angulata* were irradiated with graded doses up to 30 min., with the ultra-violet source 50 cm. above the water level. The sperms were found to be more resistant than were the eggs. After doses longer than 5 min., there was a pronounced reduction in the rate of cleavage; when the controls had reached the second cleavage stage, some of the eggs irradiated for 10 min. had not completed the first stage. Later, when 100 per cent of the controls had developed into ciliated trochophores, some of the irradiated eggs were still in the first, second and third cleavage stages and only 5 per cent had developed into free swimming blastulæ. With still stronger doses of 20–30 min., 10 per cent of the eggs developed into balls of motile cells, and 90 per cent remained with the germinal vesicle intact.

Normally, the newly hatched larvæ of *O. edulis* manifest positive phototropism and negative geotropism. When irradiated for 5–7 min. in a container 1 m. deep, with the ultra-violet source 35–125 cm. above the water surface, they showed a tendency to occupy the lower levels in the aquarium and finally to stop swimming freely and to settle down near the bottom with their shells almost closed. Evidently, it was a temporary tropistic response to avoid injury, as many were noticed, later, to regain their activity and to swim freely again. The percentage of larvæ recovered and the time of recovery depend largely upon the strength of the dose.

An exposure of 15 min. from a source at 35 cm. above the surface of water only 20 cm. deep was lethal. The ultra-violet effect was, however, eliminated when, in a new experiment, a glass plate was placed between the larvæ and the ultra-violet source, showing that the larval shell was not adequate protection against strong doses.

The adult *C. angulata* and *O. edulis* were found to resist strong doses of 30–60 min. with the source 35–50 cm. above the surface. All the oysters survived normally for the next two months, and some even showed a slight growth. Many of the parasites which happened to live on their shells were killed by the irradiation.

The radiosensitivity of many planktonic organisms, including some oyster enemies, was found to vary widely in the different forms. While worms like *Polydora*, bacterians and some fungi were highly susceptible, crustacean larvæ and copepods proved to be less sensitive.

In brief, the main conclusions are: 1, the cleavage of artificially fertilized eggs as well as the development of later stages of *C. angulata* is considerably retarded after irradiation; 2, the results of irradiating *O. edulis* larvæ help to explain—in the light of studies on solar radiation and its transmission through air and water—the variations noticed every year in the density of oyster spat setting at different levels on natural and artificial collectors; 3, the resistance of the animal, regardless of its size, depends upon the nature of its outer surface, its thickness, and the strength of the dose; 4, a great progress in artificial propagation of oyster culture would be achieved by discovering some control method involving the use of ultra-violet doses not harmful to the oysters, their larvæ, or feeding organisms, but destructive to the enemies which compete with them for food and space.

Although the practical application of such methods to natural shellfish grounds would be very difficult, I think they might be used on the small isolated bodies of water used for rearing oyster larvæ artificially and for growing their food cultures.

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