

A rather low percentage of "tasters" was observed in Wales (for men, 46.7). Confirming the observations of Fisher and Brandt,³ a sex difference, in most cases definitely significant statistically, was observed in the tasting results. The ratio of the percentage of female to the percentage of male tasters varied from 1.56 to 1.02.

In addition data were collected on about 200 sibs, which will be analyzed for evidence of linkage,⁴ and more than 100 specimens of mummy tissue were obtained, in order to study, if possible, the blood groups of the ancient Egyptians.⁵

Details will be published elsewhere.

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FURTHER OBSERVATIONS ON PARASITISM IN THE STARFISH¹

DURING the summer of 1936 studies were continued at Milford Laboratory of the Bureau of Fisheries on *Orchitophrya stellarum* Cépède, a gonad parasite of *Asterias forbesi*. Although this parasite is found generally in males, it occurs occasionally in females. Of 326 males examined microscopically, 43 (or 13.2 per cent.) contained *Orchitophrya*, whereas only 4 (or 1.1 per cent.) of the 382 females were parasitized. The incidence of parasitism in this species is much lower than that found by Smith² in *A. vulgaris* and much higher than that found by Cépède³ in *A. rubens*. In Long Island Sound the percentage of parasitized males varies according to the locality, being as high as about 20 per cent. in the region of Stratford Point and as low as about 1 per cent. around New Haven.

Parasites within the egg membrane have not been found yet in sectioned ovaries, but in eggs extruded from the living gonad this is common. The parasites can be seen moving around in the yolk and upon complete destruction of the yolk, the ciliates swim freely within the membrane, apparently unable to get out. Both division and conjugation are frequently seen in the living parasites.

The degree of parasitism varies within the individual. Although generally a starfish is completely

parasitized, there are cases in which some gonads of the same individual are infested and others not, or some heavily infested and others only slightly parasitized. A parasitized ovary is usually purplish in color, rather than orange or yellow as in normal ovaries, yet this is not a definite indication of the presence of *Orchitophrya*. A deteriorating ovary, due to unfavorable environmental conditions, such as lowered salinity, may also show a purplish color. An infested testis is generally brownish or dirty white in color, whereas the normal color is whitish or pale yellow.

Piatt⁴ obtained negative results in his attempts to parasitize starfish. In the present studies additional experiments have been carried out for both direct and indirect parasitism. Indirect infection was attempted in the following experiments: young *Mytilus edulis* and *Mya arenaria* were placed in separate finger bowls of parasitized sperm suspension and left until the solution was clear. The animals were later examined at intervals of several days, but in no case could the parasite be found in the mussel or clam and apparently served only as food. For attempts at direct infection some heavily parasitized sperm suspension was added to finger bowls containing: unfertilized eggs, cleavage stages, blastula, gastrula, stomadeum and recently metamorphosed starfishes. Negative results were obtained in all but the gastrula stage.

Nearly all the gastrulae became parasitized by one or several *Orchitophrya*. These move freely within the body cavity of the larvae as development proceeds. After the stomadeum breaks through, the parasites are shut off from the outside. The parasitized larvae, however, appear to lag somewhat behind the normal ones in development. Unfortunately, all larvae, controls as well as parasitized ones, died before reaching the Bipinnaria and metamorphosing stages. *Orchitophrya* that enter the larvae after the stomadeum opens soon die in the stomach and serve as food. Fifty-one young starfish collected near Stratford Point, Conn., where the incidence of parasitism in adult animals is high, failed to show a single *Orchitophrya*.

The fact that no parasites were found in recently metamorphosed starfish taken from a region where parasitism is common and the fact that infected larvae develop more slowly than normal ones may indicate that all parasitized larvae die before metamorphosis and that the parasite does not remain quiescent until maturity. If such is the case, the method of parasitism in the adult starfish is yet to be discovered.

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⁴ J. Piatt, *Fisheries Service Bull.*, No. 247, p. 3, U. S. Dept. of Commerce, 1935.

³ R. A. Fisher and A. E. Brandt, personal communication.

⁴ L. S. Penrose, *Ann. Eugen.*, 6: 133, 1935.

⁵ Wm. C. Boyd and L. G. Boyd, *SCIENCE*, 78: 578, 1933; *Proc. Soc. Exp. Biol. and Med.*, 31: 671, 1934.

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² G. F. M. Smith, *SCIENCE*, n. s., 84: 157, 1936.

³ C. Cépède, *Arch. Zool. Exp. et Gen.*, Ser. 5, 3: 341, 1910.