

THE GAMONE OF Fucus vesiculosus

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(Received in UK 19 October 1970; accepted for publication 18 November 1970)

The mature eggs of the common seaweeds Fucus vesiculosus and F. serratus release into seawater small amounts of volatile material which attracts the motile spermatozoa.¹ Since the latter are sensitive only to a concentration gradient of the 'gamone', the mechanism of this striking phenomenon may be primarily physical.^{1,2}

In 1951 Cook et al.² reported that dilute solutions in seawater of a number of simple organic compounds simulate the effect of cell-free preparations from Fucus eggs. The closest correspondence with the natural principle in biological and physical behaviour was observed with n-hexane which was active at a limiting concentration of 1 part in 10⁶ or 10⁷ of seawater. However, mass spectrometric studies on (wet) aspirates from ripe eggs suggested "that the natural chemotactic principle could not after all be n-hexane". A re-examination of the volatile constituents of Fucus seemed worthwhile in view of the introduction of gas-liquid chromatography (g.l.c.), and the advances in mass spectrometry, since the pioneer work of Cook et al. summarised above. Meanwhile Müller³ has reported that the female gametes of the brown alga Ectocarpus siliculosus produce a volatile gamone with a retention time similar to that of n-nonanal.

The ripe female tips (ca. 4 Kg.) from F. vesiculosus (collected at Beaumaris, North Wales, at the end of May) were macerated with seawater (5 l.). The mixture was aspirated with helium, and the gas stream was passed through magnesium perchlorate (to remove water), and then through a trap cooled in liquid nitrogen. The condensate was examined by g.l.c. (Perkin-Elmer F11; flame ionisation detector). The major peak (60%) had the same retention time as n-hexane on both polyethylene glycol (DE208) and squalane (DE121); the four isomers of n-hexane all had shorter retention times. No g.l.c. peaks were obtained with similar aspirates from macerated male tips (3 Kg.), or from blanks with seawater alone (5 l.). A further condensate from female tips gave a mass spectrum (AEI MS902; cold inlet

system) which differed from those of aspirates from the macerated male tips, and from seawater, by the presence of a substantial peak at m/e 86.1093 (M^+ ; Calc. for C_6H_{14} 86.1096). There is therefore no doubt that the female tips contained n-hexane (estimated from g.l.c. of condensate as ca. 1 part in 10^8 of wet tips). A second component (ca. 30%) with a shorter retention time than that of n-hexane has not yet been identified; traces (<1%) of benzene were detected (g.l.c. and m.s.), but these were also present in the seawater (m.s.). Further experiments with other Phaeophyceae, and with the separated oögonia and eggs, are planned.

We are indebted to Professor Maud B.E.Godward (Q.M.C.) and Dr G.Eglinton (University of Bristol) for their advice, Dr Eifion Jones (Marine Biology Station, Menai Bridge) for his help in organising the collection of samples, and the S.R.C. for a research grant.

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