The most significant feature of these South African findings is perhaps the documentation of the steady decline in tuna stocks. Exploratory fishing cruises yielded an annual catch of 15·0 tuna per 100 hooks in 1960–61, but only 1·3 tuna in 1963–64. This later period coincided with an expansion of local commercial fishing from 1961 to 1964, when it ceased because of economic difficulties, but exploitation has been continued since then by the Japanese. It seems clear that here, as elsewhere on the high seas, control of the catch of tuna must be effective if world stocks are to be preserved.

COURTSHIP

Turning Off Sexual Behaviour

from our Animal Behaviour Correspondent

ETHOLOGISTS have traditionally been concerned with the stimuli that elicit courtship behaviour in animals. Just as important, however, is why animals stop showing sexual behaviour even though the same external stimuli may be present as previously elicited it. J. van den Assem (*Neth. J. Zool.*, **20**, 329; 1970) has shown an interesting terminator of female sexual behaviour in the wasp *Lariophagus distinguendus*, which is parasitic on animals such as the common granary weevil (*Sitophilus granarius*). Reversing the usual procedure, the male wasp shows much of his courtship behaviour after he has mounted the female, moving his antennae, mouthparts and wings in complicated patterns. The female then signals her willingness to mate by adopting a special posture in which the genitalia are exposed. Copulation follows, after which the female is normally unreceptive to subsequent male courtship and cannot be induced to adopt the copulatory posture a second time.

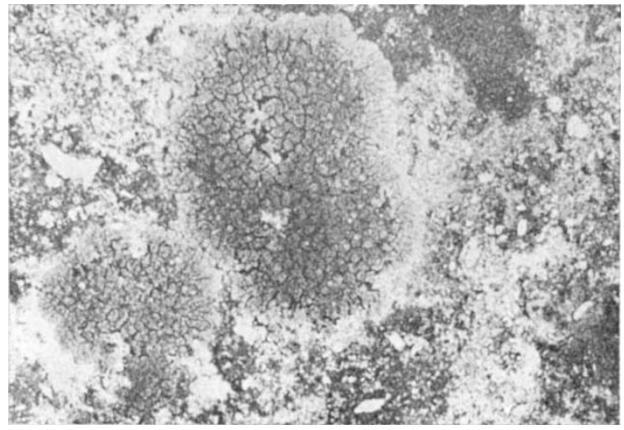
Why is it that the female will now no longer show sexual behaviour even when courted? The most likely explanation seems to be that something about the actual copulation itself causes the change to unreceptiveness, but van den Assem found that actual copulation was unnecessary for the female to become unreceptive. All that was needed to terminate her sexual behaviour was courtship leading to the adoption of the copulatory posture. Van den Assem found that if he removed the male wasp from a female which had been courted and had just taken up the copulatory posture, he created a so-called "pseudo-virgin", that is, a female which was as unreceptive to subsequent male courtship as a female with fertilized eggs, but which had nevertheless not actually mated. Apparently, if a female is courted and induced to adopt the copulatory posture, this switches off subsequent sexual behaviour.

LICHENS

Sanctified Habitats are Best

by our Botany Correspondent

THE centres of London and New York have the poorest lichen flora of any towns on record—only one species, *Lecanora dispersa*, has survived the lethal concentrations of sulphur dioxide in the atmospheres of these urban environments. London's lichens, which are to be found encrusting grave stones, walls, trees and other such substrata, were listed and reviewed recently by J. R. Laundon in the *London Naturalist* (No. 49, 20; 1970), and the reprint which has now appeared will be a *vade mecum* for London lichenologists.



The lichen, *Caloplaca heppiana* growing on the top of an eighteenth century tomb in St Peter and St Paul's churchyard, Mitcham (London Borough of Merton).

Although 165 species of lichen have been recorded in the area of London included in the survey—804 km² within a radius of 16 km from Charing Cross—only seventy-one have been seen since 1950. Forty-five of the species grow within the inner urban ring, which was built over before 1914, but sixty-four survive in the less polluted suburban ring, which was built over between 1918 and 1938 and reaches to a radius of about 19 km from the centre of the city.

The richest variety and growth of lichens in London is to be found in churchyards and cemeteries, where the old limestone memorials provide an ideal substratum. Indeed, churchyards near the perimeter of London often have a flora almost as rich as those in rural areas. Many churchyard lichens belong to the nitrophilous community known as *Caloplacetum heppianae*, which is dominated by the orange and yellow growth of species of *Caloplacetum* and *Candelariella*. Much of the nitrogen which they need seems to be supplied by the birds which perch on the stone statuary. *Caloplacetum heppianae*, however, survives as a relic of earlier times when London was more rural and air pollution less extensive. The community did not spread, for example, from the churchyard of St John, Hampstead, to nearby Highgate cemetery which was opened in 1838. Laundon concludes that this part of London was already too polluted after 1838 for *Caloplacetum heppianae* to spread to new areas, and the same was evidently true in other parts of London.

Old brick walls are the second richest habitat for lichens in London. An early eighteenth century wall in Beddington, in the suburban ring, has twenty-three species, which have never been removed by cleaning. Twenty-nine species grow in London's parks and twenty-four have been recorded in private gardens, where asbestos–cement roofs provide the best substratum, although old walls, cement bird baths and the edges of ponds are of occasional lichenological interest. Sewage farms harbour twenty-one species, chiefly on concrete structures, and heaths and commons support seventeen species. The adverse effects of urban air pollution have been greatest on woodland, which is the richest habitat for lichens when pollution is low, but which in London supports only eight species.

Laundon's prescription for conserving what remains of London's lichen flora includes the preservation of