if non-X-ray matter is allowed some constraint is still placed upon the X-ray source distribution. Schwartz notes an analogy with the Fano effect, which applies to the number of ion pairs produced by a fast particle in a detector chamber. The distribution of the number of ion pairs is tighter than the Poisson distribution often applied to such problems. He has taken the formulae for this effect over to his work and attempts to show that smoothing is possible and believes that it is not unreasonable that a factor of two smoothing should emerge. No assumptions are made about the distances to sources and it appears that the principle is to be taken quite generally.

What Schwartz has not done is demonstrate that his approach is consistent and that he is justified in using a method from a different branch of physics. Consider a Universe consisting of constant mass elements of some fixed scale size, within which any dispersion of the number of X-ray sources is restricted in some way. Each volume element contains one or more sources but an X-ray detector will observe fluctuations which will be dominated by the distance from the observer where there is about one source per beam. The beam will therefore only observe a small portion of a volume element at one given time, so it matters whereabouts in that element the sources are situated. If they are all in one corner, very large fluctuations will result! The Fano effect does not translate directly to this problem, since the positions of the ion pairs in a detector chamber is irrelevant.

We can conclude therefore that the finite mass constraint does not smooth background radiations to the extent suggested by Schwartz. If the real situation is compared with the artificial one just discussed, it is hard to see that any significant reduction will result at all.

Predators' good housekeeping

from our *Animal Ecology Correspondent*

PREDATORS, in their concern to maintain a supply of food, rarely eat more than a small proportion of the population of their principal prey. Kruuk and Turner (*Mammalia*, **31**, 1; 1967), for example, calculated that lions consumed annually no more than 3% of the wildebeest stocks—their main prey—in the Serengeti. If this did not supply enough food, alternative sources were tapped. Similarly Pearson was able to show that feral domestic cats exerted a powerful pressure on declining rodent populations but switched to alternative

prey when these became too scarce (*J. Anim. Ecol.*, **35**, 217; 1966).

For large predators, such as lions and cats, a switch to alternative prey may be far easier than for small predators which are specifically adapted for feeding on a restricted size range of prey. Brown and Lasiewski have drawn attention to the problems facing weasels in northern tundra regions (*Ecology*, **53**, 939; 1972). Males and females, being of markedly different sizes, exploit different feeding niches and thus function much like two separate species of small predators. Perhaps this size dimorphism makes existence possible in these conditions, or at least permits higher populations. Iverson has pointed out that weasels have a metabolic rate between two and three times higher than that of other mustelids, and a food requirement to match (*J. cell. comp. Physiol.*, **81**, 341; 1972). The ecological implications of an inability to switch to alternative prey coupled with an unusually high food demand are twofold. First, weasels might be expected to be highly territorial with each territory containing sufficient amounts of the correct prey species, and second, they might be expected rapidly to decrease breeding when food becomes too scarce in order to conserve stocks.

Erlinge of Lund has recently published some interesting data on territoriality and population size of the weasel in relation to prey abundance (*Oikos*, **25**, 308; 1974). His study area was 80 ha of spruce plantation, both young and old, deciduous woodland and replanted clearings. Various stone walls and dense cover throughout rendered the whole area a most favourable weasel habitat. Weasels were trapped and marked by ear-clipping during two autumns and one summer. The very high number of recaptures revealed that in the autumn of 1972 the habitat was divided up between three resident territorial males, two females showing evidence of having suckled young, and six young weasels. Three other males visited the area as transients. During the winter of 1972–3 the territorial system was much as it had been the autumn before but a rapid turnover in territory ownership was evidenced by only one of the autumn residents being a territory holder the following summer.

In the autumn of 1972, most weasels had been caught in the spruce plantation. The population of short-tailed voles was then between 30 and 40 per ha. By the following summer the vole density dropped to less than 10 per ha with the result that most of the residents left the plantation and settled in the replanted clearing where the rodent population was some 60% higher. The emigration of all the females from the

study area later in the summer of 1973 meant that there was no breeding.

East and Lockie have made some observations on the food requirements of captive breeding weasels (*Proc. zool. Soc. Lond.*, **143**, 395; 1964). A pregnant female weasel needs 20–30 g of mouse each day for about 35 days, and during the 21 days of lactation she requires about 60 g each day. Once the litter of, say, six young weasels starts eating meat the requirement of food increases over the next 40 days from 69 g to 192 g daily. Translation of these figures into rodent densities requires the acceptance of certain assumptions; namely, that each vole weighs 25 g, that breeding female voles produce 0.125 young each day per adult in the population, that a generation time is 45 days and that the sex ratio is equal. These assumptions accord well with the many published observations on vole productivity. Given them, more than ten reproducing voles are necessary to produce sufficient food for one breeding weasel.

It seems that when the prey density in Erlinge's study sank to less than 10 per ha, breeding was inhibited by the emigration of lone females. Given that the average territory size of females is about 1.5 ha and of males considerably larger, it is hard to see that the reported rodent densities could not support both sexes especially if there is any differentiation in feeding niches. One must conclude that such differentiation is perhaps less clearly defined in rich woodland areas than in the more rigorous northern latitudes. Erlinge's data highlight some of the problems faced by highly specialised, small predators, and some of the difficulties encountered by ecologists in interpreting them.

Noisy meteors

from David W. Hughes

THE sounds associated with bright meteors and fireballs can be divided into two fundamental types—a single or repeated sharp cracking noise and a distinct rumbling, these occurring a few minutes after the passage of the meteoroid—and a second much rarer noise, a hissing sound reported to be heard almost simultaneously with the visual phenomenon.

Theories about the origin, and problems associated with measuring the first type of meteor noise are discussed by ReVelle in the February edition of *Sky and Telescope* (**49**, 87; 1975). He concludes that only fireballs brighter than visual magnitude -8 , with kinetic energies of the order of 10^{15} erg can produce sounds. These penetrate to the lower levels of the atmosphere where