

NOTE ON THE ESTIMATION OF RODENT INFESTATION IN SHIPS WITH A VIEW TO THE ISSUE OF AN INTERNATIONAL CERTIFICATE UNDER ARTICLE 28 OF THE INTERNATIONAL SANITARY CONVENTION 1926

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This note refers to a question which was raised in the Quarantine Commission of the Permanent Committee of the *Office international d'Hygiène publique* at its meeting in October 1946, as to whether it would be possible to establish standard methods of estimating the rat population on board ships, with a view to avoiding unnecessary fumigations carried out on the grounds that there is evidence of infestation sufficient to warrant fumigation, whereas the result of the fumigations reveals the absence of any such infestation.

1. The matter has been the subject of a recent survey in the Port of London and the views have been obtained of the Port Health Authority's Inspectors, whose long experience in the investigation and estimation of rat populations, both in ships and on shore, renders their views worthy of consideration.

2. In the first place, it is necessary to study the evidence which will lead the investigator to determine whether the infestation is pronounced, moderate, slight or absent altogether; these classifications are of greater practical importance than an attempt to enumerate the rodent population.

3. In order to do this it is necessary to set out the signs by which rats reveal their presence on board.

4. These are droppings, smears, cuttings, runs, nests, damage to cargo and the visual presence of rats, adults or young.

(a) *Droppings*. — The shape, size and number of droppings vary according to the type of foodstuffs eaten by rats and, obviously, with the number of rats involved.

The condition and appearance of the droppings are governed, to a large extent, by the humidity and temperature of the compartments and by other factors such as dust.

Much work on this has been done by Dr. E. R. PEIRCE, Assistant Port Medical Officer of Health, Liverpool, and there is little doubt that an expert, with long experience of the habits of rats, can make, at times, a fairly accurate estimation of rat population, but his estimation is often vitiated by a number of superimposing factors, and may take a long time.

Thus, while fresh droppings are easy to recognize, it is not always easy to determine whether the droppings are a few or many weeks old; alternatively they may have been left behind from previous fumigations or not have been swept up at the time the ship was last completely unloaded.

(b) *Smears and Runs*. — Smears and runs are evidence of rat movement, and it can often be determined whether the smears and runs are fresh, though here again the evidence may be vitiated by the unloading of a very dusty cargo which may cover the runs and smears in such manner as partially to obliterate them or make them look as if they were of old standing.

Numerous and extensive fresh smears and runs throughout a ship can be taken as evidence of a considerable rat population.

Runs can be checked by "trace testing"—*i.e.*, by depositing an inert powder on which the foot-marks of rats can be observed—but it may well happen that two or three rats frequently using a run can give the appearance of a higher population using the run than is actually the case.

(c) *Cuttings*. — Cuttings do not in themselves indicate more than evidence of rats, though if a cutting is heavily smeared by fresh oil from the fur, it may be deduced that it is being used frequently by a number of rats.

(d) *Nests*. — Nests obviously show that rats have been on board sufficiently long and without disturbance to enable them to nest and to breed, and the extent of the population may perhaps be revealed by the number of nests found.

This, however, depends on the extent and type of harbourage

that exists, which, if plentiful, would serve to conceal a number of nests and give a false impression.

(e) *Cargo*. — The presence of cargo in the holds and also a quantity of dunnage is sufficient to render the estimation of the rat population difficult, if not impossible, and it may be taken as axiomatic that no accurate estimation of the rat population can be made with the cargo *in situ*.

(f) *Length of Voyage and Nature of Cargo*. — It is obvious that where a rat population is present its numbers will considerably increase, if left undisturbed over a long period, such as on a long voyage and where the cargo affords abundant food.

The fertility of rats depends greatly on the ready accessibility of food and particularly of water.

Practical experience has shown that a vessel may reveal no evidence during the early discharge of cargo but may show pronounced evidence in the lower holds.

(g) *Test Baiting*. — There is a modern method of estimating the population of rats known as "test baiting". Suitable baits are laid in various parts of the ship suspected of infestation, the baits being carefully weighed before deposition. They are weighed again after an interval of 24 hours and the difference divided by 30 grammes will give an estimate of the number of rats taking the baits.

Even this is a crude method based on the assumption that 30 grammes is the normal quantity of food consumed by a rat in 24 hours, but obviously the quantity consumed depends on whether the rat makes a full meal off the bait while young rats will consume less than adult rats. It cannot, therefore, be regarded as an accurate estimation and at the best will give only the probable minimum population in the presence of a cargo not attractive to rats.

5. *Degree of Infestation.*

In general it is not necessary to make an accurate estimate of the number of rats on board, and for the purpose of issuing an international certificate a broad degree of infestation falling within three categories is sufficient :

- (a) *Slight* as shown by the absence of nests, cuttings and damage. Evidence of slight and recent excreta or runs.
- (b) *Moderate* as shown by the presence of runs, cuttings, damage to cargo and moderate evidence of old and recent excreta.

- (c) *Pronounced* as shown by nests of young, extensive runs, cuttings or abundant evidence of recent excreta.

6. *Action to be taken.*

It is on these three categories of evidence that a decision can be made as to the action to be taken, thus :

- (i) Evidence slight and localized—trap or poison ;
- (ii) Evidence slight but general—fumigate ;
- (iii) Evidence moderate and localized—trap or poison (if this can be carried out satisfactorily), otherwise fumigate ;
- (iv) Evidence moderate but general—fumigate ;
- (v) Evidence pronounced—fumigate.

When evidence is pronounced it is seldom found in one compartment only.

7. *Ships.*

Certain shipping companies require their masters to pay particular attention to rat infestation.

A good company, proud of its ships, will go a long way to rid their ships of rodent infestation and will carry out the recommendations from Port Health Authorities to prevent reinfestation.

The reputation of a company will often be a determining factor in the mind of an Inspector as to whether he should require a fumigation.

8. *Time Factor.*

This is a factor which often mitigates against a sound decision as to the degree of infestation and the action to be taken.

It frequently happens that a ship remains empty for a very short space of time and, indeed, may never be quite empty, reloading starting in one hold while another is still being unloaded.

If an International Certificate is required, adequate time must be given to the Inspector to make his investigation and assess the degree of infestation.

9. *Evidence based on the Recovery of Rats after Fumigation.*

The number of rats recovered following a fumigation depends largely on the amount of harbourage and of dunnage and the type of space fumigated.

Where harbourage is pronounced, where there is a considerable amount of dunnage or where the space is considerably cut up, the

number of bodies recovered may be few even though considerable numbers may have been destroyed.

Where evidence is pronounced, obviously one expects to recover a number of bodies whatever the type of space fumigated, but if the evidence is only moderate and generalized very few bodies may be recovered.

One thing is certain, however, that the number of bodies recovered from a ship fumigated with the cargo *in situ* is no criterion whatsoever of the rat population involved.

Fumigation with cargo *in situ* should be carried out only in the special circumstances referred to in Articles 25, 26 and 27 of the International Sanitary Convention, 1926.

In such cases a preliminary surface fumigation can be made followed by further fumigations, if necessary, as the cargo is unloaded.

10. *Conclusions.*

The deciding factors in estimating the rat population are made by the accumulative evidence found on board, the length of the voyage, the nature of the cargo and many other features which cannot always be described but are often impressions which have their weight in making a decision.

The fact is that the estimation of a rat population is by no means an easy matter and proficiency can be gained only by long experience.

The object of the estimation should be borne in mind—it is to determine whether fumigation is required (not necessarily immediate) or whether trapping or poisoning will suffice or whether no action at all is necessary.

Unnecessary fumigation not only brings the work of Port Health Authorities into disrepute, but is an added burden on the already high costs of marine transport.

The decision to fumigate is a responsible matter, and should not be taken lightheartedly. Furthermore, unless there is any risk arising from the continued presence of rats, the ship should not be fumigated until under the best conditions—*i.e.*, when the holds are completely empty or when the living quarters can be evacuated for a period of time sufficient to guarantee good results from the fumigation.
