

FILE

The Appreciation of Lice

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Most birds and mammals have associated with them one or more species of louse, although this is a fact rarely mentioned by natural history books and broadcasts. This is a pity, for the chosen life-style of lice presents many points of interest. True, any naturalist wishing to study the life of the louse is faced with considerable difficulties, for lice will abandon, or at least behave abnormally on, any dead or injured animal. So it is that the overwhelming majority of lice have never been properly studied while alive. Many, indeed, have never even been seen alive and are known only as Latin names attached to museum specimens.

Now, however, an opportunity unprecedented in recent times has been afforded naturalists for the study of at least one louse alive and in its natural surroundings; on the heads of their own children! The extraordinary increase in the prevalence of head lice which has occurred in all the countries of the Western world has been accompanied by a yet more extraordinary change in their distribution. They are now found somewhat less frequently in their traditional haunts amongst the children of industrial, working class areas but much more frequently on the children of the professional middle class.

Now that all of us with children have improved chances of being able to study living head lice, it is perhaps timely for naturalists to know something more about them. This may not make their appearance any more welcome, but it will make the visitation more interesting, will perhaps reduce the drama of the occasion, and will certainly make for more effective treatment.

It seems that the increase of head lice is being matched by rises in the incidence of the other two human lice, the crab louse and the clothing louse, although their prevalence is much harder to quantify.

What is a louse? Entomologists restrict the use of the word, applying it only to insects which comply with two conditions. Firstly, they must be ectoparasites of warm-blooded animals: birds or mammals. Secondly, they must spend the whole of their life-cycle on the host animal, never voluntarily leaving it save for another in contact. Lice lay their eggs on the host, they hatch on the host and the insects are not only born but live and die on the host as well. How different from a flea!

There are in fact several Orders of insect which fulfil these two criteria and hence are regarded as lice. They were all formerly united in the old Order Phthiraptera, but most workers now recognise that while some degree of relationship is present they cannot all be placed together in a single group. The

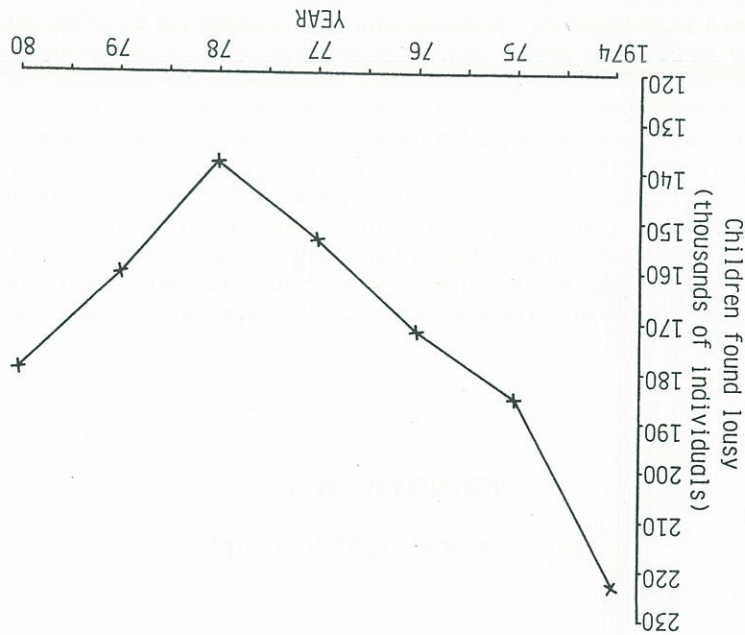


Fig. 1 Incidence of head lice in English state schools. The numbers of individual children found lousy in state schools in England is shown. Lighter cases are frequently missed at school inspections and research shows that the true incidence is approximately double that here recorded. If children under school age are included and if the figures for Scotland, Wales and Northern Ireland are also added, then the total incidence may exceed half a million cases annually: about one child in fifteen. The increases recorded for 1978-1980 are the steepest reported in this century.

classification of lice above the level of Families is the subject of friendly dispute amongst taxonomists, and until a consensus is reached, I adopt a conservative position by recognising three Orders of lice.

However classified, the whole of the lice have much in common. They are all hemimetabolous insects; that is to say that the young, called nymphs, closely resemble the adults and that no pupal stage precedes the adult.

All lice are small, but a few are minute. The louse of the pig is the longest at about 5mm in length; on the other hand, some lice of the squirrel can hardly be seen with the naked eye. All are quite wingless and all have short stumpy legs completely incapable of jumping or even of walking efficiently on a flat surface. These legs are equipped with large, sometimes enormous, claws which facilitate climbing amongst hair or feathers. Regardless of Order, and with almost no exceptions, the lice which live on birds have two claws on each leg while those which live on mammals have but one.

partner. Recrudescence typhus has been termed bereavement fever. Thus it is not possible to be sure that typhus has been eliminated from a community until there is no-one left alive who has ever had it.

Typhus is very much an epidemic disease, disappearing from any area at some times, only to return later. The highest risk of an epidemic occurs in winter and spring, when clothing louse populations are highest. The biggest recent European epidemic was in 1917-23, largely in the East of the continent, with thirty million cases and three million deaths. A wave of typhus swept Europe in 1933-34, particularly severe in Spain and Portugal, and there were outbreaks in 1943-46. An outbreak in Naples in 1943 was halted by the use of DDT, the first time this substance was used on a large scale. At the present time the major foci of active typhus are in the mountainous areas of North-East Africa, following political unrest, wars and famine in this area, and also in the high mountain villages of the Andes.

Murine typhus, also called endemic or flea-borne typhus, is also caused by a rickettsia, this time *R. mooseri*. The course of the disease is similar to that of classical typhus, but much milder and there are fewer deaths. The disease differs from typhus in that it is a zoonosis, an infection primarily of rats, especially of the brown rat, *Rattus norvegicus*. The transmission from rat to rat may be effected either by the Anopluran louse *Polyplax spinulosa*, a parasite of the rats, or by the house mouse flea *Leptopsylla segnis*, which readily bites rats. Transmission to man is by any of the rodent fleas which also visit man, the plague flea *Xenopsylla cheopis* being most often involved, but transmission is not via the bite of the fleas but is again by the contamination of broken skin by flea faeces. Transfer from man to man occurs through the activities of human lice in a similar manner to classical typhus. Murine typhus tends to be an urban disease, and is at present most common in North America (especially along the Atlantic seaboard), in Mexico, in the Indian sub-continent and also in South-East Asia.

The third rickettsial disease associated with human lice is trench fever. Caused by *Rickettsia quintana*, the condition is painful and debilitating, but fatalities are almost unknown. The epidemiology and course of the disease are reminiscent of typhus itself, but shorter in duration. *R. quintana* does not multiply in the epithelial cells of the louse gut, but in the lumen, almost the only rickettsia known which does not enter an arthropod cell at some stage in its life history. Because many lice are infected with a non-pathogenic rickettsia, *R. pediculi*, which also does not enter the insects' cells, it has been suggested that trench fever might be a recurring mutation of this. Consequently there is an absence of red lice, a point of distinction from early typhus. Trench fever caused major problems in the first world war, and minor difficulties in the second, but has hardly been seen since. Once again, the faeces are the route of transmission, not the bite, and as with all the rickettsial diseases carried by lice it is not necessary to be lousy oneself to catch the disease.

All three louse-borne rickettsial diseases are transmitted equally well by all three types of human lice in the laboratory, but in the field it is the clothing louse which is of overwhelming importance. Partly this is because in epidemic

situations, clothing lice are generally present in much larger numbers than are the other two, but also because their faeces are more likely to be trapped by clothing and bedding, allowing a build-up of dangerous material.

Our last louse-associated disease of man, and a very major one, is louse-borne relapsing fever. This name is preferable to its alternative, European relapsing fever, because the disease is of cosmopolitan occurrence. It differs in several important ways from the other diseases carried by lice. The causative agent is not a rickettsia but a *spirochaete*, *Borrelia recurrentis*, an elongate spiral micro-organism which swims actively in the blood, its length being approximately that of the circumference of a red blood cell.

The designation "louse-borne" distinguishes this relapsing fever from a clinically similar condition caused by another spirochaete, *Borrelia duttoni*. However, that disease is tick-borne and strikingly different in its epidemiology. Henceforth the term "relapsing fever" refers only to the louse-borne form.

The micro-organism invades man through the skin. It may enter through a minor wound, but can also penetrate intact skin. A short incubation period follows, usually less than one week, during which the spirochaetes multiply in the blood by longitudinal binary fission. Their metabolites are toxic, causing damage to liver functions in particular. The onset of symptoms is sudden. A high fever is present but the patient usually becomes apathetic rather than delirious. A rash develops by bleeding into the skin and jaundice is common. In about six days the fever subsides and a degree of recovery appears to occur, but in about six days more the patient usually relapses into a second attack. Some people later suffer a third or even a fourth episode, but these are milder than the first. In fatal cases, death usually occurs at the end of the first attack by failure of the liver or of the heart, or by gross vascular damage. Without medical care about one in fifteen of those infected with the disease will die.

Lice become infected by the ingestion of the blood of persons who are in the active phase of the disease. The spirochaetes then pass through the mid-gut wall of the insects, carefully threading their way between the cells, and enter the blood of the lice. Here they multiply slowly, but seem to do the insects no harm. They cannot again leave the living louse and transmission depends on the louse being crushed, a frequent fate, whereupon the micro-organisms will penetrate the skin from the shed blood of the insect. Naturally the disease cannot be passed to a second person unless the louse has first also passed to him, so that, in contrast to acquire relapsing fever. Neither the bites nor the faeces of lice transmit the diseases; only their blood is infective.

Head lice, clothing lice and crab lice all spread relapsing fever equally effectively, the comparative importance of clothing lice lying only in their relative abundance in the impoverished communities most at risk. Louse-borne relapsing fever is a cosmopolitan disease but is at present causing most concern in the Ethiopian region. In the world in general, and in Africa in particular, it is said to be increasing in incidence.

The third louse of man, *Pthirus pubis*, is unimportant in disease transmission,