

## ON THREE SPECIES OF XENOPSYLLA OCCURRING ON RATS IN INDIA.

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As it is now generally admitted that one or more of the species of fleas occurring on the common rats, *Mus rattus* and *Mus norvegicus*, are concerned in the transmission of plague, the study of these fleas has become a matter of the highest importance in connexion with the prevention of the disease. The first point that demands elucidation at the hands of medical entomologists is the identity of the species that is or are responsible. When this point has been satisfactorily determined, attention can be directed to the detailed study of the bionomics of the obnoxious species, as a preliminary to the adoption of appropriate remedial measures. It will be obvious that a *sine qua non* to a successful attack on the problem is the ability of the investigator to discriminate the various species that he is likely to meet in his researches, and it is the object of the author of these notes to supply a key to the identification of the species of *Xenopsylla* that occur on rats in India.

So far as is known, three species of the genus just named are to be found on Indian rats. These species occur in widely varying proportions, according to the part of the country in which the hosts are taken. Not infrequently two—and at times all the three—species are to be found on a single rat. As it happens, the three species are very much alike and can only be distinguished with certainty under a good microscope; a hand-lens is absolutely useless for the purpose. Apart from this, the accurate diagnosis of these species requires practice, and it is within the knowledge of the author that some medical officers find no little difficulty in connexion with this matter. Just as an inflammation of the epidermis does not necessarily denote a case of scarlet fever, so the absence of a comb on a rat flea does not prove the species to be *Xenopsylla cheopis*.

Before proceeding to a description of the chief distinguishing characters of the species under consideration a few remarks as to the technique of the necessary examination may not be amiss. Fleas that have been freshly caught or have been preserved in alcohol are sometimes too opaque when examined with a microscope by transmitted light. Such specimens must therefore first be cleared. This is best effected by boiling them for an hour or more in oil of cloves, after which they should be allowed to remain in the oil for a whole day. This procedure however is usually unnecessary, as a sufficiently clear view can generally be obtained if a moderate pressure is applied to the cover-slip under which the specimen is being examined. If the specimen be a female and there be a difficulty in observing the receptaculum seminis, it is usually possible to carry out the necessary observations by turning the insect over and examining it again. It may be added that, although as a general rule most fleas are more readily determined from the male sex, in the case of these *Xenopsyllas* the shape of the receptaculum seminis is so distinctive a character that the females are probably the easier of the two to identify.

## I. MALES.

1. *Xenopsylla brasiliensis*, Baker. The long dorsal bristle situated on the seventh abdominal segment in front of the pygidium (the *antepygidial bristle*) is placed on a long *pedestal*, which projects beyond the apex of the seventh segment. This is not the case in the female of *brasiliensis*, nor is it so in either sex of *X. cheopis* and

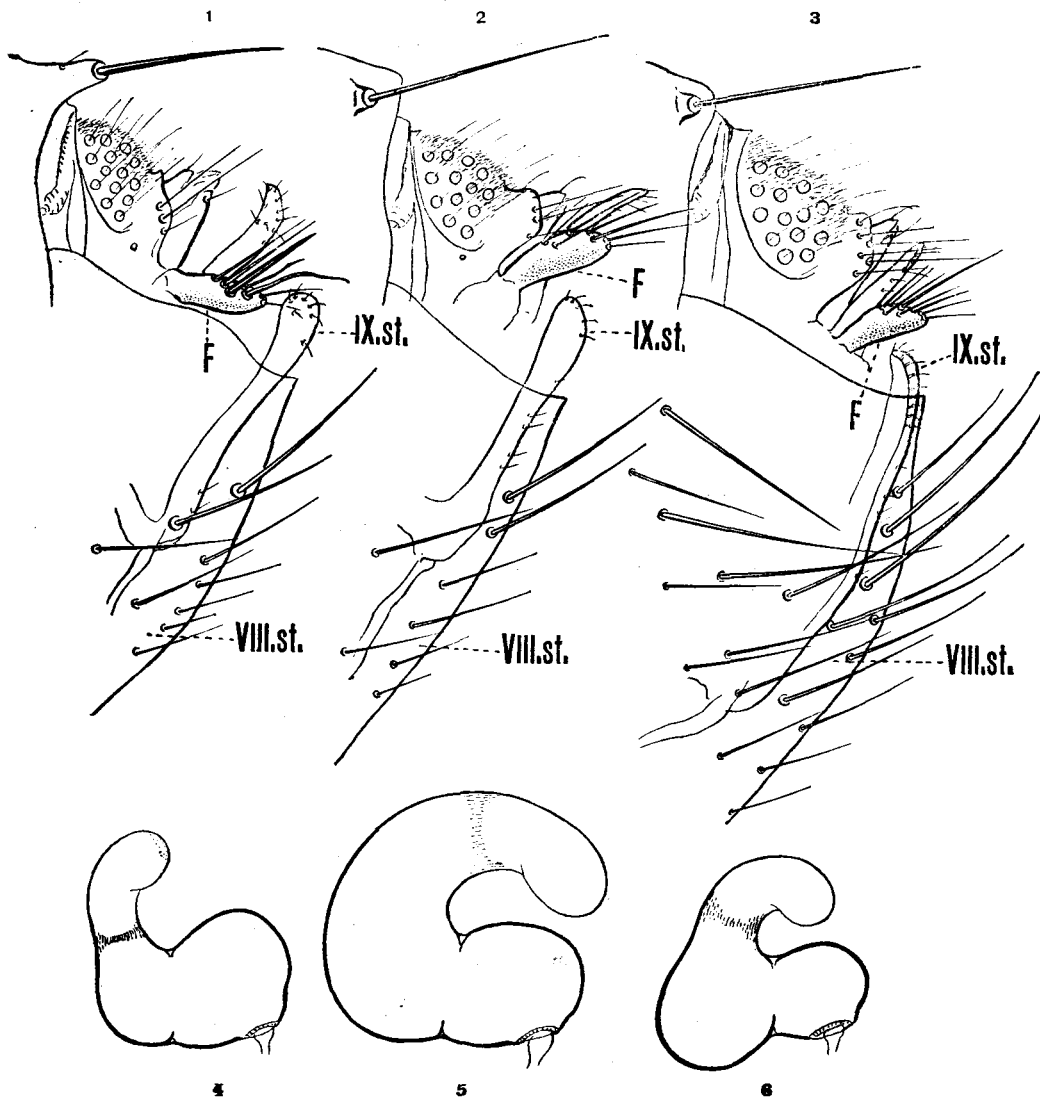


Fig. 1.—Modified abdominal segments of the male of *Xenopsylla brasiliensis*.—  
F, outer flap of clasper; viii st. and ix st. eighth and ninth sternites.

2.—The same of *Xenopsylla cheopis*.

3.—The same of *Xenopsylla astia*.

4.—Receptaculum seminis of *X. brasiliensis*.

5.—The same of *X. cheopis*.

6.—The same of *X. astia*.

*astia*. The outer flap of the organs of copulation is studded with very stout bristles, the longest of which is curved like a boomerang.

2. ***Xenopsylla cheopis***, Roths. The antepygidial bristle is situated on a short *pedestal*, which is placed at some distance from the apical edge of the seventh segment. The outer flap of the copulatory organs is sole-shaped, its upper edge being more curved than the lower edge. This flap bears nine or ten bristles on the outer surface, these bristles being very much thinner than in *brasiliensis* and drawn out into a long thin point. The ninth sternite, which usually projects but slightly from the interior of the eighth segment, is widened towards the apex, having more or less the shape of a club of which the upper side is somewhat flattened. The upper margin of this club is as distinct as the ventral margin when viewed by transmitted light under the microscope.

3. ***Xenopsylla astia***, Roths. The antepygidial bristle is similar to that of *X. cheopis*. This species, however, in the male, is easily differentiated from the other two species by the shape of the ninth sternite. This sternite, instead of being club-shaped, has the appearance of a ribbon viewed from a point on its edge, which is due to the ventral margin being strongly chitinised, whereas the sides and upper margin are very thin and transparent. The outer flap of the organs of copulation is narrower than in *X. cheopis* and bears fewer bristles. The species is replaced in Africa by *X. nubicus*, which differs in minor details only.

## II. FEMALES.

The three species are distinguished at a glance by the shape of the receptaculum seminis. This organ is divided by a deep constriction into a short rounded portion, the "head," and a more or less sausage-shaped portion, the "tail."

1. ***Xenopsylla brasiliensis***. The "head" of the receptaculum seminis is very much wider than the "tail." The abdominal segments III to VI bear ventrally on each side a row of 4 bristles, and the eighth segment has on the outer surface less than 20 bristles.

2. ***Xenopsylla cheopis***. The "tail" of the receptaculum is much longer than in *X. brasiliensis* and, near the constriction, distinctly wider than the "head." The abdominal segments III-VI bear ventrally on each side a row of three or four, rarely five, bristles, and the eighth segment has less than 30 bristles, usually 20 to 25.

3. ***Xenopsylla astia***. The "tail" of the receptaculum is so strongly widened near the constriction that it is here very much wider than the "head"; the "tail," moreover, is shorter than in *X. cheopis*. The abdominal segments III-VI bear ventrally a row of seven or eight bristles on each side, and segment VIII has more than 30 bristles on the outer surface.

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