NOTES ON ELEAS COLLECTED ON RAT AND HUMAN HOSTS IN SAN FRANCISCO AND ELSEWHERE.

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In Feb., 1908, Dr. W. B. Wherry, of the Dept. of Public Health of San Francisco, sent to the University for identification a few vials of fleas, most of which had been collected from rats in the plague-stricken districts and from doctors, nurses and others who had been at work in these districts. Those from the rats showed the following species: *Ceratophyllus fasciatus*, Bosc., 1 ♂, 6 ♀'s; *Ctenocephalus canis* (Curtis), Baker, 2 ♀'s; *Loemopsylla (Pulex) cheopis*, Rothschild, 16 ♂'s, 19 ♀'s. Five ♂'s and one ♀ of *Ctenopsyllus musculi* (Duges), Wagner, were taken from a mouse in the plague laboratory, and 220 specimens of *Pulex irritans*, Linn., were taken from human hosts or on their clothing in the plague laboratory and hospital and in the refugee camps where human plague cases were of frequent occurrence. A single specimen of an undetermined species of *Ceratophyllus* was also taken from a human host.

A later sending from Dr. Wherry, April, '08, showed 88 specimens of *Ceratophyllus fasciatus* and 1 *Ctenopsyllus musculi* from rats, 7 *Loemopsylla cheopis* from mice, 25 *Pulex irritans* and 1 specimen of *Ceratophyllus* sp. from human hosts (one *P. irritans* was from the body of a Chinaman who had died of the plague), and 477 specimens of *Ctenocephalus canis* collected from a single Dachshund pup.

From time to time between March 1st and June 1st, Dr. W. C. Rucker, executive officer of the U. S. Public Health and Marine Hospital Service, has sent me many vials of fleas taken from rats and humans. These were mostly collected by the small army of rat catchers in the different sections of the city. A summary of all these sendings shows 619 specimens of *Ceratophyllus fasciatus*, 163 specimens of *Pulex irritans*, 56 *Ctenopsyllus musculi*, 9 *Ctenocephalus canis*, and 139 *Loemopsylla cheopis* from rats, and 668 *Pulex irritans* and 2 *Ceratophyllus fasciatus* from human hosts..

From February to May, Dr. Snow, of Stanford University, had a man catching rats and mice on the campus in order to determine whether any showed symptoms of plague.

From the rats were taken 174 specimens of *Ceratophyllus fasciatus*, 62 *Ctenopsyllus musculi*, and 8 *Hoplopsyllus anomalus*, Baker; from the mice, 26 *Ceratophyllus fasciatus* and 14 *Ctenopsyllus musculi*.

On examining a number of dead rats in San Jose, that had been brought in for the bounty, I found, on March 14, 7 specimens of *Loemopsylla cheopis*. Only this one lot of rats was examined there.

August, 1908

Summarizing all these lots, we have :

On rats (<i>Mus norvegicus</i>)—	On humans—
<i>Ceratophyllus fasciatus</i> 863	<i>Pulex irritans</i> 680
<i>Pulex irritans</i> 163	<i>Ceratophyllus fasciatus</i> 2
<i>Loemopsylla cheopis</i> 139	<i>Ceratophyllus</i> sp 2
<i>Ctenopsyllus musculi</i> 118	On mice (<i>Mus musculus</i>)—
<i>Hoplopsyllus anomalus</i> 8	<i>Ceratophyllus fasciatus</i> 26
<i>Ctenocephalus canis</i> 9	<i>Ctenopsyllus musculi</i> 14
	<i>Loemopsylla cheopis</i> 7
	On mice (<i>Microtus californicus</i>)
	<i>Ceratophyllus fasciatus</i> 1

A study of these records shows that *Loemopsylla cheopis*, which is known as the plague flea in countries where the disease is epidemic, is well established in San Francisco, and is spreading to other near-by cities. Doubtless a search would reveal it in many localities. It is interesting, too, to note that out of the 672 fleas taken from human beings, some of them patients who were sick or had died of the plague, from attendants in the hospitals, and from men engaged in catching the rats, not a single *Loemopsylla cheopis* was found. On the other hand, *Pulex irritans*, which is the most common human flea, has been found quite abundantly on rats. One sending from Dr. Rucker contained 81 specimens of *P. irritans* and no other species. These were collected from 18 rats taken in houses and sewers in one of the infested districts. It will be noted, too, that *C. fasciatus*, the most common rat flea, was in two instances taken from human beings.

The records from Stanford University show that *C. fasciatus* was more common on mice than *Ctenopsyllus musculi*, the latter being quite common on the rats.

The eight specimens which seem to be identical with Baker's *Hoplopsyllus anomalus*, which was originally described from a *Spermophile* in Southern Colorado, are interesting in that they seem to show a possible connection between the rats and the squirrels. Dr. Blue has often stated that should the plague ever become endemic here it would probably spread from the rats to the ground squirrels, thus making it much more difficult to stamp out.

The single specimen of *Ceratophyllus fasciatus* also shows the possibility of the spread of the plague to the native rats and mice.

Mailed August 4th, 1908.