At a later date, we will report the length of time necessary for these capsules to remain in the brain to cause permanent damage, the type of abnormal waves associated with cortical and subcortical trauma, and the existence of these patterns in meningioma, gumma, tuberculoma and hydrocephalus.

Conclusions. Three clinical cases of subdural hematoma, and 30 rabbits wherein capsules had been inserted, both extradurally and subdurally, demonstrated a consistent wave pattern.

13066 P

A Comparative Study of Rodent and Burrow Flea Populations.*

M. A. STEWART AND F. C. EVANS. (Introduced by K. F. Meyer.)

From the Division of Entomology and Parasitology, University of California, Davis, and the George Williams Hooper Foundation for Medical Research, University of California, San Francisco.

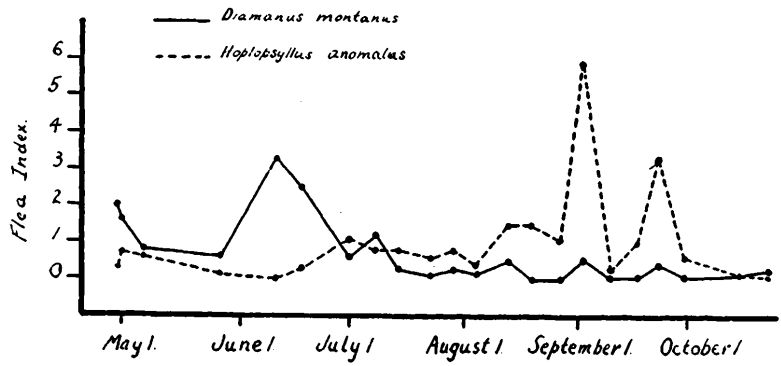
An area located at Calaveras Dam, Alameda County, California, previously determined to be heavily populated with ground squirrels [*Citellus beecheyi* (Richardson)], was selected for field study of (1) the correlation between flea populations existing at squirrel burrow openings and of flea populations on the rodent hosts, and of (2) the seasonal species composition of these populations. One portion of this area was set aside for the study of the fleas at the openings of the burrows, and a contiguous and ecologically similar portion was utilized for the study of fleas taken directly from their hosts.

Fleas at the burrow openings were collected from pieces of cotton batting placed in each burrow mouth. Thirty burrows were set aside for these studies, divided into 3 groups of 10 burrows each and approximately equally distributed as to direction of exposure, amount of exposure, surrounding cover crop and topography. Collections were made at approximately weekly intervals from April 29, 1940, to October 23, 1940, as shown in Graph 1, and they were made

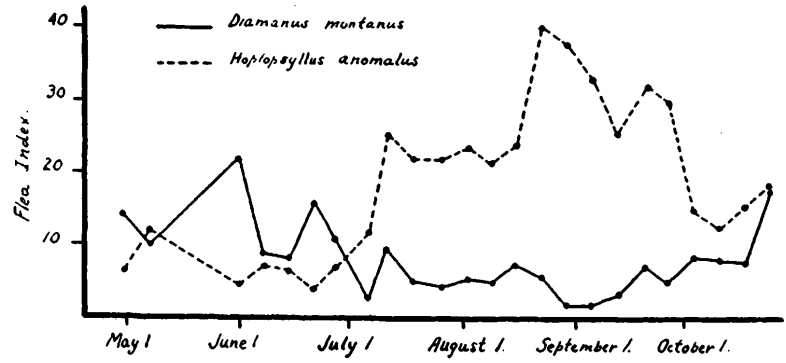
* This study was conducted with the financial assistance of the Rosenberg Foundation. The authors wish to express their appreciation to Dr. K. F. Meyer, Director of the George Williams Hooper Foundation, for his constant advice and suggestions, to Dr. E. B. Roessler, Head of the Division of Mathematics and Physics, University of California, Davis, for valuable assistance in the analysis of data, and to Robert Holdenried for assistance in collecting material in the field.

in regular rotation among the 3 sets of burrows in order not to influence unduly the population densities by repeated collections. In the same period and also at approximately weekly intervals, as shown in Graph 2, ground squirrels were trapped alive, lightly anesthetized with chloroform, and thoroughly combed to remove all fleas. At each burrow collection temperatures were taken at points 1 foot within the mouth of the burrow and 6 feet above the ground. All fleas collected were mounted and identified; of approximately 7500 fleas collected only about a dozen belonged to species other than *Diamanus montanus* (Baker) or *Hoplopsyllus anomalous* (Baker).

As shown in Graphs 1 and 2, *Diamanus montanus* was markedly predominant in the flea population from April 29 to June 28 and *Hoplopsyllus anomalus* was markedly predominant from July 11 to



Graph I. Flea collections from mouths of burrows.



Graph II Flea collections from ground squirrels.

October 14. No correlation could be detected between either atmospheric or burrow temperatures and flea indices other than that *Diamanus montanus* was predominant while the mean temperature was below 75°F and *Hoplopsyllus anomalus* was predominant while the mean temperature was above 75°F.

Comparison of Graphs 1 and 2 shows that the flea population density and species composition at the mouths of burrows reflects with a high degree of accuracy, but on a smaller magnitude, the population density and species composition on the host. Since each collection shown in Graph 1 represents the index of 10 burrow openings, it apparently can be safely assumed that flea collections made from a series of 10 or more mouths of inhabited burrows will portray the flea population density and its species composition on rodents occupying such burrows in a given area. It is, therefore, quite feasible to make flea surveys for the purpose of obtaining information concerning the appropriate time to initiate prophylactic practices against sylvatic plague, the chronological predictions of epizootics, the plague potentialities of an area based upon the species composition of the flea population, and, presumably, the existence or absence of plague infections in the flea population by collecting specimens from burrow openings.

A distinct difference in seasonal incidence exists, at least at Calaveras Dam and probably in all other places as well, between *Diamanus montanus* and *Hoplopsyllus anomalus*. Although *H. anomalus* has been observed to transmit plague under experimental conditions, it seems likely that this species is not as efficient a vector of plague as is *D. montanus*. Because of this and the difference in seasonal distribution of flea species, plague surveys based upon flea collection should be correlated with those times of year when species capable of transmitting the infection are abundant. It is quite possible that many of those areas heretofore recorded as being free from plague infection have been placed in this category because they were surveyed at a time when efficient vectors had been largely replaced by species which are either very poor vectors or incapable of transmitting plague.