Since the closing of the Mount Weather research observatory last winter, the Blue Hill Meteorological Observatory is alone in the United States in regularly flying kites in the international days. However, the Weather Bureau is planning to resume aerological work at Omaha.

A MAP of the eastern United States showing the frequency of dry spells during the last twenty years in the months of April to September inclusive was published in the National Weather and Crop Bulletin, May 4, 1915. The greatest frequency is found in the Great Plains district and the least in the southern Appalachians.

DR. W. KÖPPEN, after study of the monthly period in the weather[5] has come to the conclusion that the moon has no noticeable influence on meteorological phenomena.

A KNIGHTHOOD has been conferred on Dr. W. N. Shaw, director of the British Meteorological Service.

MR. AKSEL S. STEEN, who recently succeeded Dr. Mohn as Director of the Norwegian Meteorological Institution, died in Christiania on May 10.

A NEW departure in the distribution of weather forecasts is announced from Illinois where a newspaper man and the Springfield Watch Co. send out the predictions by wireless telegraph.

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SPECIAL ARTICLES

ON THE REPRODUCTIVE AND HOST HABITS OF CUTEREBRA AND DERMATOBIA

IN view of the considerable mystery surrounding the host habits of *Dermatobia hominis,* the man-infesting bot of tropical America, now believed to employ bloodsucking mosquitoes of the genus *Janthinosoma* for the carriage of its eggs to the host, the following recently discovered facts relating to the reproductive habit of *Cuterebra* will be of interest, since *Dermatobia* belongs to the same restricted group of flies.

On June 25, 1915, Mr. Raymond C. Shannon, of the Bureau of Entomology, found a female *Cuterebra cuniculi* on the stem of a plant in a low moist spot near a stream in the vicinity of Beltsville, Maryland. The fly was inactive, and had probably recently emerged from the puparium. It was kept alive until July 2, 1915, when it was seen to be growing weak, whereupon it was killed and dissected.

The uterus was found to be of the double-sac incubating type, much after the style of *Sarcophaga,* probably independently developed in the Cuterebidæ and not indicating any close relationship with the Sarcophagidæ. The uterus was estimated to contain well over five thousand eggs and perhaps nearer ten thousand. It is difficult to make a close estimate, as the eggs are disposed in bunches at various angles to each other and the two large sacs which constitute the uterus are irregularly rounded.

The egg is elongate, about 1.75 mm. in length, about .4 mm. in greatest width, gently tapering toward the caudal end, suddenly tapering at the cephalic end, with tough extra-thick and strong reticulated chorion of a deep salmon color, and is furnished with an operculum or lid on one side at the cephalic end. The lid hinges by its cephalic edge, but is easily completely detached. The chorion appeared to be particularly viscid at and near the caudal end. The embryo was undeveloped. The tubular glands are large and evidently functional, and contained a deep rufous-yellow substance. The ovipositor is simple and without any piercing structure.

The presence of the incubating uterus, enveloped with tracheæ, indicates that the egg is held within the fly until the maggot is well formed. The presence of the thick chorion indicates that the maggot is ejected still ensconced within the shell, or that practical oviposition takes place. The simple structure of the ovipositor shows that the egg is not thrust through any integument or surface. Moreover, the fact that the chorion is tough, extra-strong and deeply colored indicates that

[5] Concluded in *Meteorologische Zeitschrift,* April, 1915. Translated in *Monthly Weather Bureau,* April, 1915, pp. 179–181.

the maggot remains quiescent therein exposed to the conditions of the open for more or less time after the act of oviposition. The high viscosity of the caudal end of the chorion indicates that the egg is firmly attached by that end to some surface, where it remains permanently. The high fecundity indicates a high mortality of the first-stage maggot, a reduced chance of reaching the host, and hence presupposes that the egg is not deposited on the host nor on any object that will be certain to come in contact with the host. The operculum at cephalic end indicates that the maggot, on being awakened from its quiescent state, immediately escapes by that exit. A normal excitement of the maggot to activity can be induced only by the heat resulting from close contact with the body of a warm-blooded host animal.

As far as *Cuterebra* is concerned, we can feel quite confident that its host relation is maintained through stealth, and that, barring accidents, the fly never comes in contact with the host. The eggs are probably deposited in the burrows or runways of the rabbits, rats and other small mammals which it parasitizes. I have found these flies in considerable numbers in the southwestern mountain regions of North America, where they uniformly either perch on dead twigs beside a stream or sit on rocks near the running water or on the earth banks of streams. They evidently take such stations in order to observe the movements of rodents, with a view to locating favorable places for oviposition. Their small antennæ indicate a poor sense of smell, while their large and finely-facetted eye-surface indicates good sight.

Dermatobia parasitizes not only man, but many of the larger mammals. Such animals do not live in burrows or frequent regular runways or places of concealment. Thus *Dermatobia* can not hope to reach its hosts by employing the methods of *Cuterebra*. It has a much smaller fecundity, less than eight hundred according to Neiva of Brazil, which indicates that it adopts some method much more apt than that of *Cuterebra* to connect with the host. Its maggots are very common in cattle, dogs and man in South and Central America, yet among the natives no one seems able to identify the fly that deposits the egg. The indigenes of South America accuse a variety of dipterous insects of mothering these maggots.

Within the past decade, observers in Central and South America have discovered a number of instances of mosquitoes, uniformly of the genus *Janthinosoma*, bearing a cluster of *Dermatobia* eggs attached by their ends to the under surface of the body. Apparently the credit for the first discovery of this kind belongs to Mr. F. W. Urich, government entomologist of Trinidad, who sent one of these egg-laden mosquitoes to Washington in 1905. The importance of the matter was not suspected at the time, and the specimen can not now be found. More recently Gonzales-Rincones observed the same thing in Venezuela, and inferred that the eggs were originally deposited on the leaves of plants frequented by the *Janthinosoma*, which gathered them up while walking about. His observations and conclusions were published and endorsed by Surcouf, of Paris.

In the absence of information to the contrary, we are justified in supposing that *Dermatobia* has a reproductive system and egg much on the same practical order as those of *Cuterebra*. Being unable to maintain its host relation in the same manner as *Cuterebra*, and being similarly unable to approach its hosts without unduly alarming them, since both flies are heavy-bodied and noisy in flight, it must necessarily resort to some extraordinary device for accomplishing its purpose.

Judging from the accounts of both natives and foreigners who have been infested with *Dermatobia* maggots, several distinct species of blood-sucking diptera may be employed by the fly for carrying its eggs. Mr. J. C. Crawford, of the U. S. National Museum, during a stay in Costa Rica, was actually bitten by some fly, and a *Dermatobia* maggot resulted at the point of biting. He also relates a case of an American in that country who stated positively that a *yellow* fly annoyed him in numbers on one occasion, crawling beneath his clothing. Afterward some two dozen *Dermatobia* maggots

developed in the region of his chest, where the flies had gained access. This suggests *Chrysops,* the members of which are commonly called deer-flies, and it is extremely likely that this genus may act as egg-carrier for *Dermatobia* quite as frequently as do mosquitoes. It should be stated that the *Dermatobia* flies are not yellow, but of a dark metallic green.

As to the exact modus operandi in the case of *Dermatobia,* it is quite certain that oviposition on foliage is not practised, but that the fly captures the elected carrier and holds it while gluing the eggs firmly by their caudal end to the underside of its body, leaving the cephalic end of the eggs free and in such position that it will come in immediate contact with the skin of any animal bitten by the carrier. Once the carrier alights on a warm-blooded animal, the heat of the latter's body causes the maggot to spring the lid of the chorion and to work its way immediately and doubtlessly very rapidly into the skin, most probably by way of a hair follicle. As suggested by Mr. Crawford, it is practically certain that the empty chorion remains attached to the carrier after the exit of the maggot.

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U. S. NATIONAL MUSEUM,
July 3, 1915

RAPID METHOD OF COUNTING BACTERIA IN MILK[1]

THE satisfactory control of milk supplies would be facilitated by a rapid method of determining the bacterial content. There can be no question but what the most accurate count is obtained by incubating plate cultures for five days at room temperature, but, in spite of this, two days at 37° C. is the only standard method. This has been adopted because of the urgent demand for a quick answer. Because of the advantage of obtaining results rapidly, the direct microscopical examination of milk is frequently urged. In spite of the obvious weaknesses of this method, such as the errors in measuring the small quantities needed or in centrifuging, and the fact that dead bacteria can not be differentiated from the living, this method has its earnest advocates.

If it were possible to use easily measurable quantities of milk, *i. e.,* from 1/10 to 1 cc., and grow the germs contained therein so that only those capable of forming colonies would be counted, and if this count could be obtained within, say, six hours, the demands in the case would be reasonably met.

If such an accurate count could be obtained in a few hours, it would be possible for the producer or dealer to determine actually the bacterial content of his product before putting it on the market. This would also enable the health official to hold a sample of milk suspected of being beyond the limits permitted until the count could be actually obtained, when the samples in question could be either passed or justly condemned. Under present conditions, when the bacteria are determined by ordinary cultural procedures, such a course is out of the question because it is not possible under any conditions to obtain a count in less than forty-eight hours.

It is possible now to suggest a rapid method, which, I believe, will meet any reasonable demands. The method is a combination of the direct count and the culture methods and is obtained by making small plate cultures on a microscopic slide. These little plates are incubated for several hours (three to six), then the medium is dried down and stained so as to bring out in sharp relief, when examined under the microscope, the minute colonies which have developed.

It is not proposed to go into definite details in this preliminary paper[2] but rather to define the lines along which the investigation is proceeding. In explanation of the methods, however, it may be said that about one tenth of a cubic centimeter of milk is mixed with standard agar and spread over a definite area of a sterile glass slide. When the agar is hard, this little plate culture is put in the incubator for about six hours, under conditions which prevent evaporation. It is then dried, given

[1] Preliminary note. Publication authorized by the Director of the Wisconsin Experiment Station.

[2] An extended account of the method and the results obtained in a series of analyses will soon appear.