quented by eiders. Laboratory-bred gammarids were also used in these experiments. Gammarids greedily devoured both eggs and worms containing eggs. They did not become infested, though in some cases eggs were seen in the alimentary canal several days later; hatching had not taken place.

Eventually, a single specimen of the common shore crab *Carcinus moenas* was collected and fed with a worm containing a large number of eggs of *P. botulus*. Two days later the crab was dissected and about a dozen acanthors were seen in process of hatching in the alimentary canal. Eventually 10 crabs collected from the same area were fed with eggs and worms containing eggs. Five crabs died in the space of 3–5 weeks after infection and were found to contain large numbers of developing acanthellæ. One crab died 50 days after infection, showing a large number of acanthella stages. Four crabs were killed and examined 62 days after infection and two of these contained fully developed cysts containing acanthellæ (cystacanths) and two others had a large number of acanthellæ.

From these experiments it was clear that the crabs had been hyper-infected, and at the same time it was obvious that full development of *P. botulus* takes place in *C. moenas*.

Since then, 68 shore crabs from the Ythan estuary have been examined, and 29 of them were found to be infested with cysts containing acanthellæ of *P. botulus*, the numbers varying from 1 to 9 in each crab. When these were examined microscopically and the proboscis of the larvæ was compared with the proboscis of adults, it was found that number, arrangement and shape of hooks were identical. The cystocanths were situated in the region immediately under the heart, and either above the hind gut or on both sides of it. The very high rate of infestation in the shore crab in the Ythan estuary explains the common occurrence of this acanthocephalan parasite in eider duck.

This is the first record of the crab *Carcinus moenas* acting as intermediate host in the life-history of acanthocephalan parasites.

Unfortunately, Belopolskaya's paper is not available to us, and we have been unable to find out on what grounds she concluded that the larvæ found in *G. locusta* were really the early stages of *P. botulus*.

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ENTOMOLOGY

Intracellular *Rickettsia*-like Micro-organisms in Certain Ticks

Little attention has been paid to the intracellular *Rickettsia*-like micro-organisms in acarines. Perhaps the first approach to a comprehensive survey on these organisms in ticks was that of Cowdry[1], although a few earlier observations were made[2–4]. Cowdry reported the occurrence of intracellular micro-organisms, of rickettsial nature, in the malpighian tubules and in eggs of several species of ixodid and argasid ticks. He pointed out that, being present in eggs and unfed larvæ, the organisms were transmitted by inheritance, and postulated a symbiotic function. Further work on the morphological appearances of such micro-organisms and their distribution in the malpighian tubules and oocytes of some of these tick species were developed by Buchner[5], Mudrow[6] and Jaschke[7].

Of the several species of *Argas*[8], however, it appears that only *A. persicus* has been shown to possess intracellular *Rickettsia*-like micro-organisms. Recent work[9] describes in detail for this tick the nature and distribution of the organisms in the malpighian tubules and in its oocytes at different stages of development; their recognition and description being based on histochemical methods and electron microscopy.

Suitor and Weiss[10] also recently reported mainly serological and cultural aspects of this organism, isolated from the malpighian tubules, but not, it appeared, from the oocytes, and proposed from their description the name *Wolbachia persica* S. and W.

The present communication reports on intracellular micro-organisms of similar rickettsial appearance in the ticks *Argas vespertilionis*, *A. transgariepinus*, and *A. boueti*, collected from bat-infested places in the Abu-Rawash area near Cairo, Egypt. In these ticks, as in *A. persicus*, the organisms are found in almost all cells of the malpighian tubules and in oocytes. In the malpighian tubule cells, the organisms are mostly present in groups of variable size, though single coccoid and short rod forms have been seen.

In the oocyte cytoplasm, the organisms appeared in smaller groups, and were only demonstrable after combined ribonuclease enzyme treatment and Giemsa staining[9] or after Feulgen–Schiff's technique.

Further work on the nature of the organisms in these species of *Argas*, including examination by electron microscopy is in progress; the work includes a survey also of representatives of other tick genera.

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Biological Species confused under the Name *Culicoides austeni* (Carter, Ingram and McFie)

The age-grading techniques at present widely used in the study of biting Diptera having been found applicable to *Culicoides* in Gambia, they were used systematically with material referred to *C. austeni* (Carter, Ingram and McFie). As a result it