Virus transmission was obtained from five out of seventy-five specimens, only one of which had shown definite symptoms. The infected specimens were from three stations, respectively near Achichere in the centre and Dompim and Aiyim in the extreme south of the Province. Cacao is not extensively grown in these localities, and at none of them is swollen shoot disease of cacao known. No infection of *C. chlamydantha* was found at the other twenty-nine survey stations.

From these and the previous results¹, it seems that cacao virus infection is endemic in *C. chlamydantha* around Wiawso. Since a cursory survey in other parts of the Western Province revealed infected trees at about a tenth of the localities visited, it may be assumed that infection is widespread in *C. chlamydantha* throughout its Gold Coast range. The high incidence of infection around Wiawso, and elsewhere, and the occurrence of infected specimens where swollen shoot of cacao is unknown, strongly suggest that virus infection of *C. chlamydantha* antedates that of cacao.

Taking into account the close ecological association of *C. chlamydantha* and cacao which results from farming practice and the exceptional ease with which virus can be transmitted from one to the other, it is postulated that *C. chlamydantha* is the immediate natural reservoir of cacao viruses in the Western Province. Its control is a matter of prime urgency.

I am indebted to A. Attafuah and N. K. Lovi for assistance given in this work.

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Time of Egg-laying in the Planktonic Copepod *Calanus*

In the course of some observations on the cytology of *Calanus* made in Plymouth in June 1950, the eggs in the oviduct of a fairly high proportion of females examined were found to have reached full metaphase of the first reduction division (this is the stage reached when the eggs are laid). On the other hand, in March 1951 at Millport it was difficult to find eggs in the oviduct of *Calanus* in which the chromosomes had reached further than the pachytene stage. This was in spite of the fact that a high proportion of the females brought into the laboratory at this date laid a batch of eggs overnight. It seemed as if few of these *Calanus* would be ready to lay before night. In order to find at what time the actual spawning takes place at Millport, 104 ripe female *Calanus* were put singly into small glass dishes containing about 20 ml. of filtered sea water and examined hourly. The *Calanus* were caught between 50 and 100 metres at 4 p.m. and examination was begun at about 6 p.m. The results are shown in diagram A; 68 per cent spawned between midnight and 3 a.m. and the bulk of the rest by 4 a.m. Only five of the 104 did not lay. The average number of eggs was very constant at about forty per female. There was no difficulty in finding primary oocytes with full metaphase plates in females fixed at 2 a.m.

It seemed possible that this rather surprising result might have been caused by the shock of capture

The continuous line represents the number of eggs laid per hour (A) or in 3 hr. (B). The vertical columns represent the percentage of *Calanus* laying

and examination, or by the sudden reduction of pressure, acting after an interval of about eight hours. A second tow-netting was therefore taken early the following morning (4 a.m.), and fifty ripe females were set up as before but examined only every three hours. Diagram B shows that laying was still concentrated in the early hours of the morning. The peak is not so marked, possibly because of the longer period of starvation. It has been found that the number of eggs laid by *Calanus* is closely dependent on the amount of food available.

It is known that egg-laying in some Crustacea takes place during the night^{1,2}. Dr. C. M. Yonge has told us that he found the same with the shore crab *Carcinus maenas*.

The eggs of *Calanus* are heavier than sea water and sink about 36 m. in 24 hr.³, which is about the minimum time it takes for the eggs to hatch. The young stages of *Calanus* are found continuously in the upper layers, and nauplii almost entirely above 30 m.^{4,5}. It is therefore advantageous for the nauplius that the egg should be laid as near the surface as possible. Nicholls has also shown that female *Calanus* in January show marked diurnal vertical migration. The bulk of the females are, however, at the surface before midnight, and by 3 a.m. the descent is well under way.

It will be interesting to find whether the *Calanus* which are found at the surface both day and night in May and June show the same behaviour in egg-laying.

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