

## *Caenis lactea* (Burmeister) in the Netherlands (Ephemeroptera: Caenidae)

by

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**ABSTRACT.** — The presence of *Caenis lactea* in the Netherlands has been established and some ecological data are given. In the distributional area of the species, the new records are the westernmost, as known so far. Furthermore, the life cycle of *Caenis luctuosa* is constructed. This species is abundant in the same lake where *C. lactea* was found. Comparisons between the life cycles of the two species were made as far as the limited number of observations of developmental stages of *C. lactea* allowed such.

Although *Caenis lactea* (Burmeister) has been recorded from many European countries (Illies, 1967), no proper description or figure was ever published. Thus the identity of the species was uncertain until 1974, when Jacob (1974) examined the type-series. It turned out that *C. lactea* had to be the correct name for the species known until then as *C. undosa* Tiensuu or *C. nocturna* Bengtsson. Because of its dubious status before 1974, earlier accounts on the presence of *C. lactea* in the Netherlands by Snellen van Vollenhoven (1854), Harting (1867) and Dresscher (1954) are doubtful. The former two authors probably refer to *C. horaria* (Linnaeus) or *C. robusta* Eaton, both very common in the western parts of the Netherlands, whereas the animals mentioned by the latter, which were all larvae, were identified with the use of the confusing key of Schoenemund (1930). Up till now no *Caenis* material from these authors was found in the museum collections studied.

In 1978 the species was discovered in Lake Maarsseveen, about 2 km north of the city of Utrecht. A total amount of 25 larvae was found on 9.VIII (4 specimens), 21.VIII (1), 22.VIII (1), 28.VIII (3), 4.IX (3), 7.IX (7), 18.IX (2), 12.X (1) and 28.X (3), together with 24 adults on 22.VIII (16 ♂, 5 ♀), 15.IX (1 ♂) and 19.IX (2 ♂). Later some ephemeropteran material was received from L. W. G. Higler (RIN, Leersum), collected on 28.IX.1977 and containing one larva of *C. lactea*, whereas five further larvae were found by R. Geerlings, A. van der Lee and T. Schouten on 15.VIII.1979, all from Lake Maarsseveen too. Finally some larvae were discovered in the collection of the Zoological Museum in Amsterdam. This material contained five specimens from the harbour of Vollenhove, found on 12.VII.1939, and six from the littoral zone of the IJsselmeer at Kampernieuwstad, found on 11.VII.1939 (2) and 4.VII.1948 (4), all collected by A. C. P. de Vos. The material from Lake Maarsseveen is kept in the collection of the Research Institute for Nature Management at Leersum and in the author's collection. Some will be placed in the collection of the National Museum of Natural History in Leiden.

Both larvae and adults of *C. lactea* are easy to recognize. Larvae can be separated from other West-European species of *Caenis* by the shape of the terminal sternite. The side borders in the distal half are straight or slightly convex and meet at a sharp angle (fig. 3a), while in other species the sternite is shaped differently (figs. 3b-d). In half-grown and older larvae the anterior part of the pronotum of *C. lactea* is narrower than the posterior part (fig. 1), whereas in other species front and hind margin have the same width, or, even more commonly, the anterior margin is the wider. In very young animals the shape of the pronotum cannot be used as a characteristic, except for *C. robusta*, where the front edges are very sharply pronounced. The general appearance of the larvae of *C. lactea* is rather spotted. The dorsal side of the head shows two characteristic pale spots between the eyes and often a pale median stripe occurs. There is a dark spot on each side of the pale median stripe on the pronotum and pale spots are often present on the second pair of gills. The fila caudalia are banded. The legs are banded too (fig. 2), in some specimens only clearly visible in the fore legs, whereas the coxae of middle

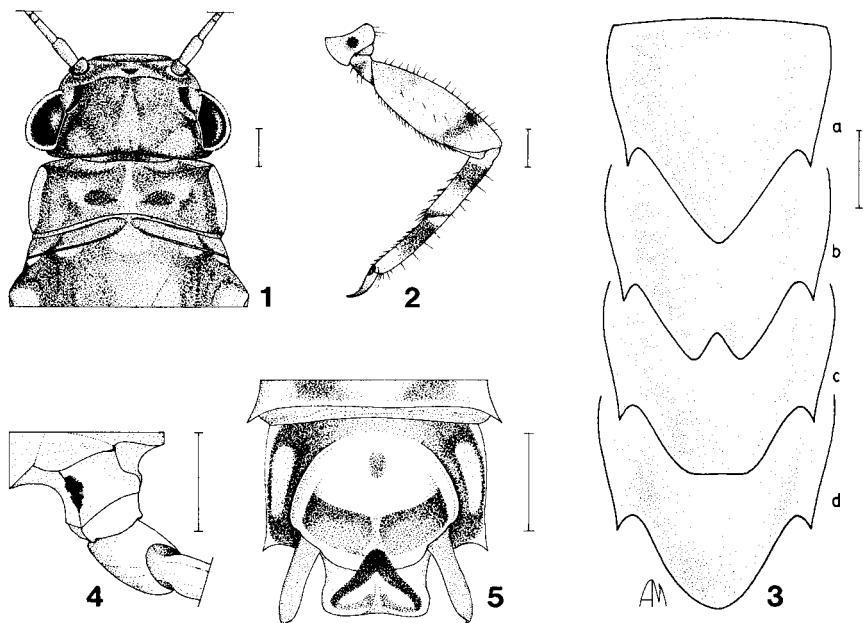


Fig. 1. *Caenis lactea*, head and prothorax of mature larva, dorsal view. Fig. 2. *C. lactea*, second left leg of larva. Fig. 3. *Caenis*, terminal larval sternite (lateral hairs and spines omitted): a. *C. lactea*; b. *C. luctuosa*; c. *C. horaria*; d. *C. robusta*. Fig. 4. *C. lactea*, coxa of third left leg adult. Fig. 5. *C. lactea*, male genitalia, ventral view. — All scale-lines are 0.2 mm.

and hind legs bear a small, but rather sharply bordered, characteristic dark spot. The length of full grown male larvae is 4.2-4.7 mm, of female larvae 5.8-6.4 mm, the fila caudalia not included.

At the adult stage, both sexes of *C. lactea* can be recognized by a dark spot on the outside of the hind coxae (fig. 4). A similar spot is often present on the middle coxae too, but less pronounced. Males are further characterized by the dark V-shaped figure on the ventral side of the penis (fig. 5). The pigmentation of the abdomen is variable; in some specimens all tergites and sternites are grey, in others the pigmentation is reduced, sometimes leaving only tergites 4-6 and 10 grey with the other tergites and all sternites white. The body length of the males is 3.8-4.2 mm, of females 5.1-5.4 mm.

Lake Maarsseveen, where *C. lactea* was discovered, is an artificial lake, about 1750 m long and 400 m wide. It has a maximum depth of 32 m. The lake was dug between 1960 and 1966. It has a sandy bottom and the water is clear and unpolluted. Biological and chemical information is given by Ringelberg (1980).

In this lake, larvae of *C. lactea* were found on submerged vegetation and a few on artificial substrates. No larvae were found on open bottom, although frequently samples have been taken by means of a Petersen grab. Neither were larvae found on stones in the area, exposed to wave action. Although the species occurred as deep as 6 m, the larger number of animals was found between 0.5 and 3 m. The number of *C. lactea* larvae found was very low. Only 25 specimens out of a total number of 2300 *Caenis* larvae, collected from March to December, belonged to this species. The most abundant species was *C. luctuosa* (Burmeister) (about 75%), followed by *C. horaria* (25%). A fourth species, *C. robusta*, was represented by only 3 speci-

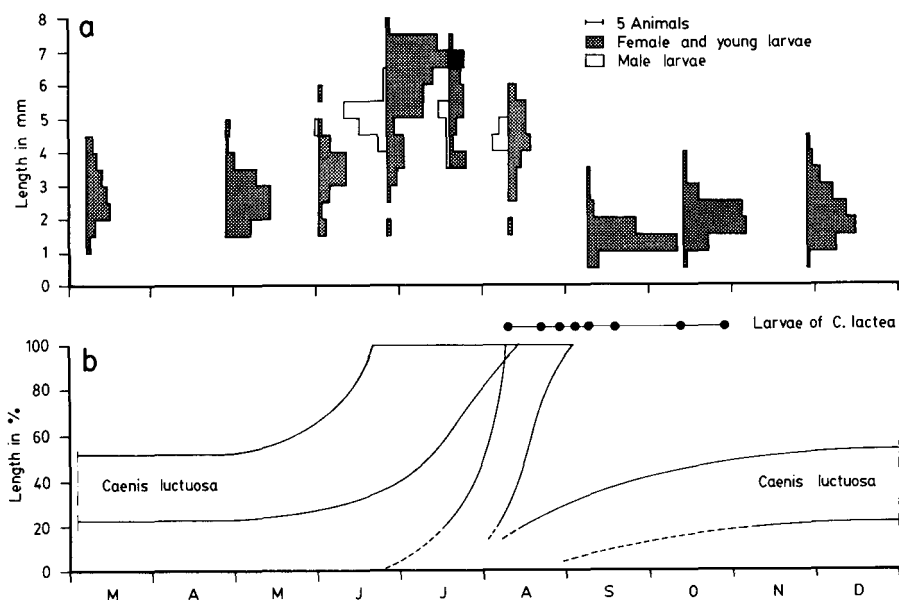


Fig. 6. *Caenis luctuosa* and *C. lactea*, life cycle: a. Numbers and length of larval *C. luctuosa* from Lake Maarsseveen during 1978; b. Proposed schematic cycle of *C. luctuosa*, based on 6a, together with the data on which larvae of *C. lactea* were found.

mens. Despite of its low abundance, there are no indications that *C. lactea* might occur in larger numbers elsewhere, as is the case with *C. robusta*. The latter was found to be very abundant in the Maarsseveense Zodden, a peat area being contiguous to Lake Maarsseveen, where it was accompanied by *C. horaria*, a few *C. luctuosa*, but no *C. lactea*. Although large numbers of *Caenis* are known from various parts of the Netherlands, *C. lactea* has thus far only been found in two of the larger and deeper lakes, viz. in Lake Maarsseveen and, in 1939 and 1948, in the IJsselmeer. The assumption that the species may be typical for larger bodies of water is supported by the fact that in other European countries it was also discovered in lakes.

*C. lactea* sensu Jacob (1974), mainly reported as *C. undosa* or *C. nocturna*, is widespread in northern and central Europe. It is known from Norway (Dahlby, 1973), Sweden (Bengtsson, 1917), Finland (Tiensuu, 1939; Saaristo, 1966), Denmark (Jensen, 1961), West Germany and Switzerland (Malzacher, 1973), D.D.R. (Jacob, 1974), Poland (Keffermüller, 1960), Czechoslovakia (Landa, 1969), while the southernmost location is Lago di Mergozzo in northern Italy (Grandi, 1966). As *C. lactea* is not known for Great Britain or Ireland, Lake Maarsseveen in the Netherlands represents the most western point of its distribution, known at the moment.

Some remarks can be made on the life cycle of *C. lactea*, although the number of larvae found is too small to make a proper reconstruction. The species was not found earlier than August 9th, although sampling was carried out from March onwards. After the first finding, the species was present on nearly every sampling date, until October 28th. In August there were some half grown animals, but from the last week of August onwards, almost all specimens were mature or nearly mature. Because of the method used, in which the samples were put in a sieve with mesh width 0.5 mm, before picking out the animals, the number of earliest larval stages is probably underestimated. Very small larvae could have been present on June 25 or July 17, when rather large samples have been taken without finding *C. lactea*. But, if present on these dates, they must have been smaller than one millimeter, for animals of that length could rather

easily be detected, as was proven for *C. luctuosa*. Therefore, there must have been a vast increase in length of the larvae at the various stages, between mid July and mid August.

*C. luctuosa* (= *C. moesta*) is by far the most abundant *Caenis* in Lake Maarsseveen. Its life cycle for 1978 is presented in fig. 6a. Half-grown larvae were found during winter and they reached maturity in the second half of June and in July. Large numbers of adults were observed during this period, swarming along the borders of the lake in the early morning. In August there was a second generation, but, as the number of both larvae and adults was much lower than in the previous period, it may be expected that only a small part of the offspring of the first generation did reach maturity then. The larger part of this second generation probably formed a second cohort, that overwintered about half grown (fig. 6b). Considering *C. lactea*, it is clear that this species started to develop after the first generation of *C. luctuosa*, and together with, or even later than, the partial second generation of this species (fig. 6b). Landa (1968) discovered that in southern Bohemia *C. lactea* used the period between the two generations of *C. horaria* and *C. robusta* to develop. Larvae of *C. lactea* were mainly found there from June till August. This is slightly different from the situation in Lake Maarsseveen, where *C. horaria* in 1978 only had a poor second generation, in every respect comparable to *C. luctuosa*. *C. robusta* did hardly occur, but according to the data from the already mentioned contiguous Zodden, this species probably had only one generation. These differences may be due to the warmer summers in central Europe, causing a more rapid development by which the entire cycle, including the occurrence of *C. lactea*, shifts forward and two generations of other species of *Caenis* can fully develop. Nevertheless it is clear that, both in central Europe and in the Netherlands, there is a separation in time between *C. lactea* and related species occurring in the same habitat.

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