

## ENTOMOLOGIA TEORETYCZNA — ENTOMOLOGIE GÉNÉRALE

*Neophemera maxima* (JOLY, 1870) (*Ephemeroptera*,  
*Neophemeridae*) in Poland*Neophemera maxima* (JOLY, 1870) (*Ephemeroptera*, *Neophemeridae*)  
w Polsce

BY

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Among ephemeropterous material collected in the Pilica River near Koniczpol, the author found nymphs of *Neophemera maxima* (JOLY), a species hitherto unrecorded from Poland. This species was first discovered in 1869 in the Garonne River near Toulouse (France) and described by JOLY (1870) as *Caenis maxima* n. sp. Subsequently the systematic position of this species, known only from nymphs, was discussed and changed (VAYSSIÈRE, 1882; EATON, 1883-1888; LESTAGE, 1916; TRAVER, 1931). From the Niemen River system (the Gruda River) KAZLAUSKAS (1959) collected winged forms just after emergence from nymphs that were quite similar to those described by JOLY (1870). From the wing venation KAZLAUSKAS (1959) concludes that these imagines are closely related to winged forms of *Neophemera* MC DUNNOUGH, to which genus he transferred *C. maxima*.

The affinities of the holarctic mayfly family *Neophemeridae* (or subfamily *Neophemerinae*, according to some authors) are not clear, since the particular developmental stages of these mayflies have features common with forms from rather remote groups. ČERNOVA (1962) first proposed the separate superfamily *Neophemeroidea* for the *Neophemeridae*; in her later paper (1964) ČERNOVA placed this family between the *Pota-*

*manthidae* and *Siphonuridae*. EDMUNDS (1962) and EDMUNDS et al. (1963) placed the *Neoephemeridae* in the *Caenoidea*, near the *Caenidae*.

Hitherto, *Neoephemera maxima* was found in two localities: the Garonne River in France (JOLY, 1870) and in the Gruda River in Lithuanian S. S. R. (KAZLAUSKAS, 1959). ILLIES (1967) added one more record — from the Balkans, for he rightly regarded *Oreianthus macedonicus* (ULM.), found by IKONOMOV (1962) in the Vardar River, as *N. maxima*. The descriptions of *N. maxima* by the above mentioned authors compare well with IKONOMOV's drawings of *O. macedonicus* and indicate the close similarity of both species.

*N. maxima* was found by the author in the Pilica River only in the Konicopol (district Włoszczowa, province Kielce), upstream of the sewage outlet from Konicopol Arboreal Works and downstream of the millrace mouth. There, the Pilica River flows among meadows in a meandering natural bed, which is about 10 m in width. From late autumn to spring the sandy and muddy bottom is covered with dead plants; in summer the banks and the river bed in slow-flowing places are overgrown with *Phalaris arundinacea* L., *Fontinalis* sp., and *Veronica beccabunga* L., also *Elodea canadensis* RICH. & MICH., *Lemna trisulca* L. and filamentous algae. The banks are sheltered here and there by *Salix fragilis* L., *S. purpurea* L. and *Alnus* sp.\*

Nymphs of *N. maxima* were collected from September 1971 to April 1972, whilst research in spring 1973 gave negative results. In particular samples only single specimens were encountered, resulting in 11 nymphs. Such paucity makes it difficult to establish the course of development; nevertheless measurements of the body length show that earlier hatched nymphs can reach a comparatively fair length (5.6 mm) by September; in winter their growth is probably arrested, for in spring specimens of the same length or only slightly longer were found, and nymphs only 4 mm long were also collected, pointing to later hatching. It is thus probable that the eggs can hatch over a long period.

The nymphs of *Ephemerella mucronata* BNGTSS., *E. notata* ETN. and other mayfly species were also found. The fauna of small invertebrates in this river section was rich, including *Oligochaeta*, *Hirudinea*, *Mollusca*, *Gammaridae*, nymphs of *Plecoptera*, *Trichoptera* and *Diptera* as well as different developmental stages of *Hemiptera*.

Some nymphs of *N. maxima*, caught in April 1972, were brought into laboratory culture and 3 subimagines (2 ♂♂ and 1 ♀) and one imago

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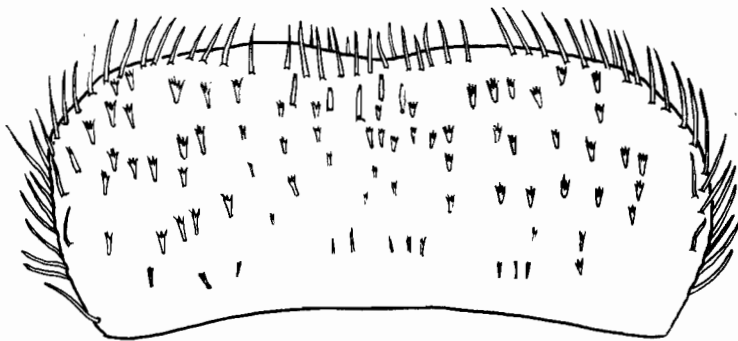
\* Plants determined by Dr D. KRZYWAŃSKI.

(♀) were obtained. The nymphs in the rearing containers were feebly active; most often they were attached to the twigs of *Elodea canadensis* or to the gauze of the ventilators. It was noticed that the nymphs ate this cotton gauze, gnawing holes in it. Such behaviour was never observed in cultures of other mayfly nymphs. In the laboratory the earliest subimaginal moult took place on 23th May (♀), the next followed on 27th May (♀) and 22nd June (♂). These moults occurred about noon (11<sup>00</sup>-13<sup>00</sup>). The only imago obtained (♀) was found in the culture the next day after emergence of the subimago. KAZLAUSKAS (1959) has observed subimagines of *N. maxima* in bushes on river banks on June 7th and on the next day at sunrise — the female imagines depositing eggs into the water. JOLY (1870) has also collected highly advanced nymphs in June.

Characteristic features of *N. maxima* nymphs and winged forms reared in the laboratory are given below. The description of the nymph is based on the last exuviae left by sugimagines.

Male exuvium 8.3 mm long, lateral caudal setae — 6.2 mm; female exuvium — 10.9 mm and 7.7 mm, respectively. The nymphs collected by JOLY (1870) and KAZLAUSKAS (1959) were slightly shorter; however, these authors gave measurements of the nymphs.

The body of the nymph is rather stumpy; head more or less triangular. Mouthparts are illustrated in Figs. 1-5, which compare well with the drawings of EATON (1883-1888) and LESTAGE (1916) and the description of KAZLAUSKAS (1959). Prothorax rectangular or slightly trapezoidal. From the anterior corners of prothorax, posteriorly and to the middle, the V-shaped fold is formed. Thorax rather massive, wing buds



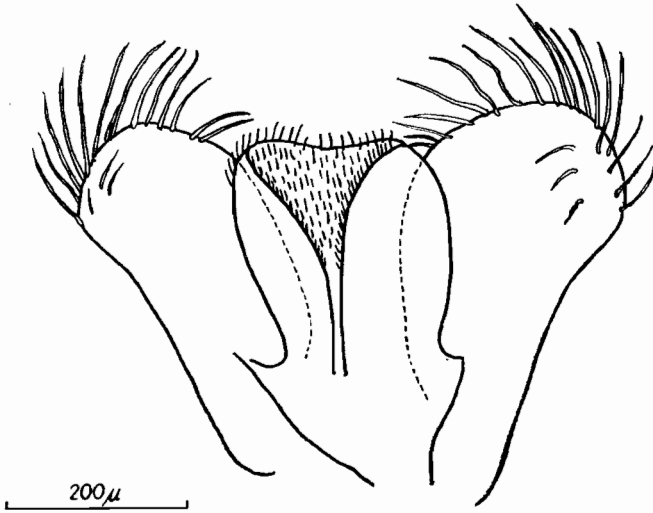
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1. Labrum of *N. maxima* nymph, upper surface  
Labrum larwy *N. maxima*, powierzchnia górna



2. Mandibles of *N. maxima* nymph — Żuwaczki larwy *N. maxima*

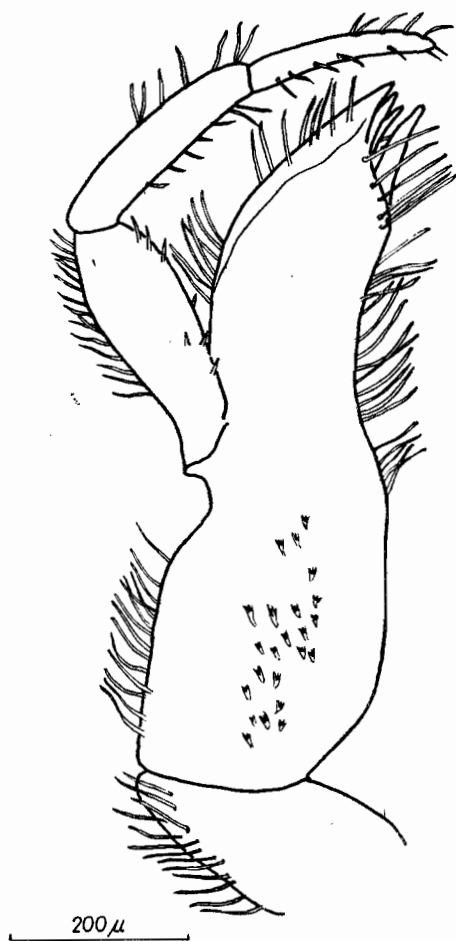
a — right mandible — prawa żuwaczka, b — left mandible — lewa żuwaczka, c — spines on the outer, lateral mandible surface — kolce na bocznej, zewnętrznej powierzchni żuwaczki



3. Hypopharynx of *N. maxima* nymph, hind surface  
Hypopharynx larwy *N. maxima*, powierzchnia tylna

broad and short, in older nymphs reaching only half of the second abdominal segment. Abdomen narrowed gradually from segments III to IX. Posterior corners of each segment protruding backwards and forming spines, whose length gradually increases posteriorly; the spines of the IXth segment are much longer than the length of the Xth tergite. In the middle of metathorax and of the two first abdominal segments there are uncinata processes directed backwards.

The length of the rather massive legs increases posteriorly. There are six pairs of gills. First gills are short, haired processes, inserted on the sides of the first abdominal segment. Second gills form thick chitinous flaps with tufts of gill filaments underneath (Figs. 6a-c). In the middle these flaps are joined with overlapping folds and hairs and they act as one plate, which covers the rest of gills. The remaining gill pairs are similar to each other and consist of two plates fringed with gill filaments (Figs. 7a, b). The size of the gill plates diminishes posteriorly. On the entire body of the nymph and also on some parts of the mouth appendages there are characteristic small scale-like spines of variable shape and length (Figs. 2c, 6b, 8a-c). On the lateral and hind margins of the abdominal segments as well as on the edges of the IIInd gill plate these scale-like spines form a regular stockade. Larger groups of these spines are inserted on the pronotum, anteriorly of the V-shaped fold, at the bases of the second gills,

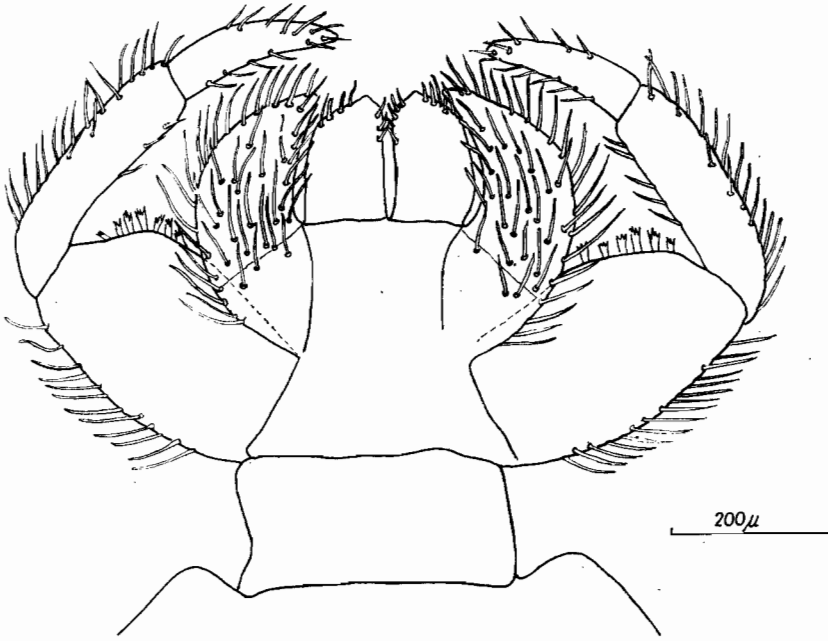


4. Right maxilla of *N. maxima* nymph  
Prawa szczęka larwy *N. maxima*

near the uncinat processes on the two first abdominal tergites and in the posterior, middle parts of abdominal tergites VII and VIII. The middle caudal seta in both sexes is slightly thinner and shorter. Posterior edges of each caudal segment are crowned with hairs, whose length increases laterally.

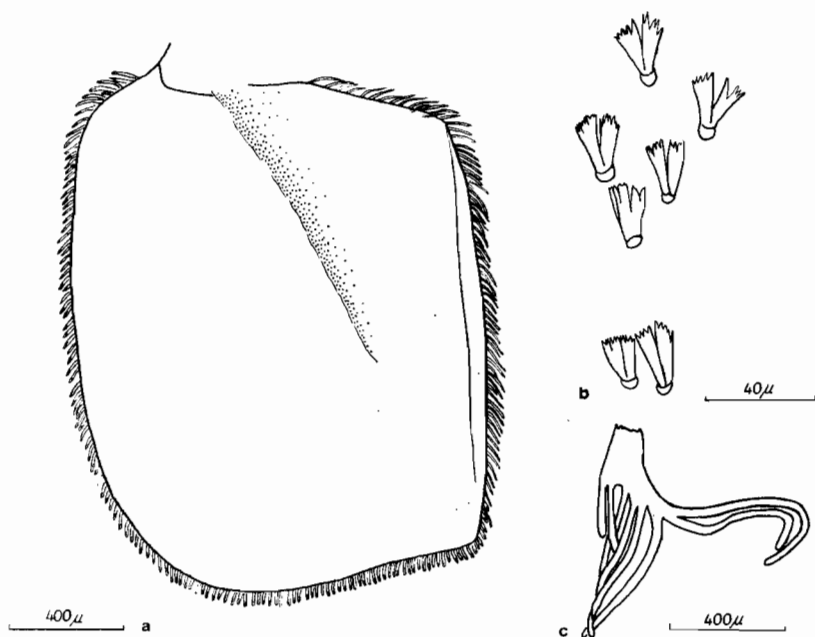
The colour intensity is variable; the nymphs are usually brown or greenish brown with lighter yellow spots, but without any distinct characteristic pattern. The body is usually covered with small particles of debris, indicating a bottom way of life. JOLY (1870) has collected nymphs

of *N. maxima* in muddy places, whereas KAZLAUSKAS (1959) has found them on stones and in *Fontinalis* clumps. However, these last observations concern the period preceding the emergence of the subimagines.



5. Labium of *N. maxima* nymph  
Labium larwy *N. maxima*

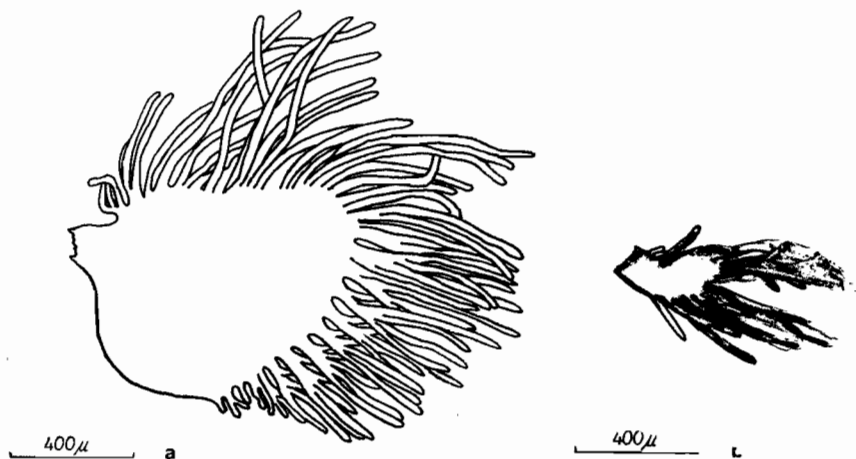
The comparison of exuvia revealed some sexually dimorphic features: smaller size of male exuvium; larger eyes in male, causing the head to lose its triangular shape, which is rather distinct in females, and finally the different shape of the hind margin of the IXth abdominal sternite in both sexes. In male nymphs the semicircular posterior lobe of this sternite has on both its sides a small but distinct tooth, while in female nymphs such teeth are lacking. This is a good discriminating feature, but it was observed only on the last moult skins, so probably it appears only after the penultimate moult. KAZLAUSKAS (1959) mentioned that in the male nymph the pronotum is rectangular, while in female nymph it is trapezoidal. In the present collection only one nymph had a distinctly trapezoidal pronotum. The difference mentioned by KAZLAUSKAS was difficult to observe on the moulted skins owing to the longitudinal split on the pronotum.



6. Right second gill of *N. maxima* nymph

Prawa skrzelotchawka II pary larwy *N. maxima*

a — covering plate — płytką przykrywającą, b — spines on the upper surface of the covering plate — kolce górnej powierzchni płytki przykrywającej, c — lower lamella — blaszka dolna

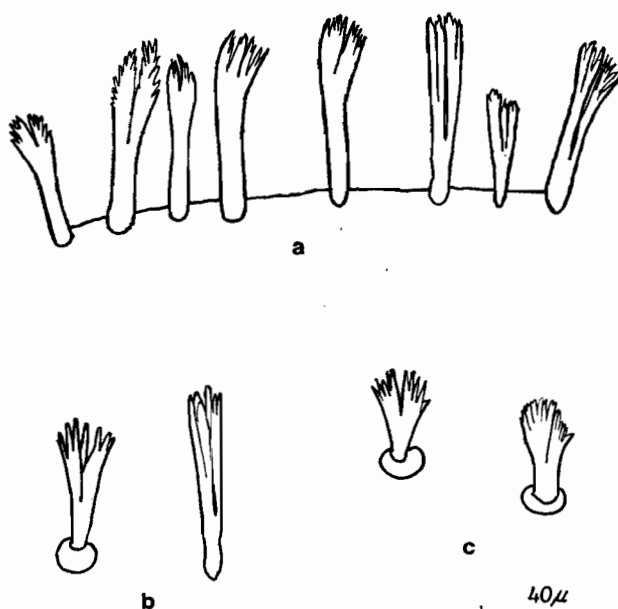


7. Right third gill of *N. maxima* nymph

Prawa skrzelotchawka III pary larwy *N. maxima*

a — upper lamella — blaszka górna, b — lower lamella — blaszka dolna





8. Spines of the body of *N. maxima* nymph — Kolce na ciele larwy *N. maxima*  
 a — stockade spines of the hind and lateral margins of tergites — palisadowe kolce tylnych i bocznych krawędzi tergitów, b — spines scattered on the tergal surface — kolce rozproszone na powierzchni tergitów, c — spines of the sternal surface, similarly found also on the tergites — kolce powierzchni sternitów, obecne również na tergitach

The female imago, reared from the nymph from the Pilica River, is 9.3 mm in length; the fore wing has the same length. The middle tail is vestigial, consisting of several segments only. The length of the lateral tails is 13.8 mm. The specimens collected by KAZLAUSKAS (1959) were slightly longer, but the index

$$\frac{\text{length of tails}}{\text{body length}}$$

in both cases was the same, namely 1.5. The legs of the female imago increase in length from the I to IIIrd pair, but the difference between first and second is very small. Tarsus five-segmented, but the demarcation between the tibia and the first tarsal segment is hardly noticeable. In all legs the last tarsal segment is the longest; in the fore leg the length of the tarsal segments diminishes in the following order: V, II, III, IV, I. This agrees with KAZLAUSKAS' (1959) observations. Two claws in all legs are different in shape.

In the middle of the II<sup>nd</sup> abdominal tergite there is a small spine-like process. Postero-lateral corners of the IX<sup>th</sup> tergite protrude in long spines, reaching beyond the end of the X<sup>th</sup> segment. Similar but much shorter spines are also present on the VIII<sup>th</sup> segment.

Dorsal side of female imago brown. Abdominal segments I, IX and X are the darkest. Between the tergites there are light transverse bands that widen slightly backwards in the median line. On the sides of this line there are also lighter patches on some tergites. Sternites are whitish; those of segments II–VIII have on their sides paired, triangular, dark spots, subsequently increasing in size so that on segments VII and VIII the spots communicate with each other. The fore femora are brownish, tibiae and tarsi dark brownish; a light ring is present at the end of tibia and at the beginning of tarsus. Femora and distal parts of tibiae in other legs greyish white, praetarsi black.

Wings transparent; fore wing slightly yellowish, hind wing whitish, slightly opalescent. In the fore wing vein  $A_1$  (or  $CuA$ ) curved at the base, sharply running away from  $Cu_1$  ( $MP_1$ ). Vein  $A_3$  ( $1A$ ) is connected with the hind wing margin by two veins, but the second is indistinct. In three remaining winged specimens there is only one such vein but in one case there was also one free vein here. Fore margin of hind wing with a distinct costal process. Vein  $M$  in hind wing forked, the arms of this fork being longer than the shank. Vein  $Cu$  is simple.

Head of male subimago dark, thorax and abdomen brownish with somewhat transparent segments II–VI; subsequent abdominal segments have a large brown spot with a light longitudinal stripe in its centre. Lateral, dark yellow tails covered with small brown spines. Two or three basal segments of the caudal setae dark. Median tail vestigial, consisting of only several segments. Fore femora greyish white, tibiae and tarsi chestnut coloured; in other legs femora whitish, tibiae and tarsi yellowish. Wing venation as in the female imago.

#### STRESZCZENIE

W rzece Pilicy powyżej Koniecpola znalezione zostały larwy *Neopphemera maxima* (JOLY), gatunku nie podanego dotychczas z Polski. Larwy tego gatunku, mimo że znacznie większe niż larwy jętek z rodzaju *Caenis* STEPH., z powodu dużego podobieństwa początkowo zaliczone były do tego rodzaju (JOLY, 1870). Po poznaniu stadiów uskrzydłonych (KAZLAUSKAS, 1959) gatunek ten włączono do rodziny *Neophemeridae* i nadrodziny *Caenoidea* (EDMUNDS, 1962; EDMUNDS, ALLEN, PETERS, 1963).

Larwy *N. maxima* zbierano w Pilicy tylko tuż powyżej Konieczpolskich Zakładów Płyt Pilśniowych. Rzeka ma tu około 10 m szerokości. Latem rozwija się dość bujnie roślinność przybrzeżna, w zimnych porach roku, na piaszczysto-mulistym dnie pozostaje nieco butwiejących roślin i patyków. Nieliczne larwy łowiono w strefie przybrzeżnej jesienią, zimą i wiosną.

W hodowlach prowadzonych w laboratorium przeobrażenie larw w postaci uskrzydłone obserwowano między 23 V a 22 VI 1972 r. Obserwacje w terenie wskazują na to, że gatunek ten zimuje w postaci larw i wylatuje wiosną.

W pracy zamieszczono rysunki wybranych części ciała oraz krótką charakterystykę morfologii larw i postaci uskrzydłonych *N. maxima* zebranych z Pilicy.

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