

HOLARCTIC DISTRIBUTIONS OF THREE TAXA OF HEPTAGENIIDAE (EPHEMEROPTERA)¹

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ABSTRACT: Two closely related Palearctic-Nearctic species pairs in the Heptageniidae are shown to be conspecific. *Cinygma peterseni* is a synonym of *Cinygma lyriformis* and *Ecdyonurus werestschagini* is synonymized with *Nixe (Akkarion) simplicioides*. *Ecdyonurus joerenis* is placed in *Nixe (Nixe)*.

Although the Palearctic and Nearctic Heptageniidae have several genera in common, taxonomic research has tended to concentrate on one continental fauna or the other with relatively little attention given to possible trans-oceanic relationships. Indeed, for many years workers in Europe and North America even used different family names for the Heptageniidae. The last two decades have been marked by a much more cosmopolitan approach by workers on all groups of Ephemeroptera and, with improved communications between New and Old World researchers, evidence of closer ties between Ephemeroptera of different continents is emerging. Of particular interest to the study of Northern Hemisphere Ephemeroptera are the recent investigations of Central Asian and Siberian mayflies by Soviet and East German workers. Their studies have brought to light a number of new species which more clearly show the affinities to the Nearctic mayfly fauna. In this paper I designate new synonyms involving two previously considered Palearctic-Nearctic heptageniid species pairs and report for the first time the occurrence of both subgenera of *Nixe* Flowers in the Palearctic Region.

Cinygma lyriformis (McDunnough)

Ecdyonurus lyriformis McDunnough 1924: 226; *Ecdyurus hyalinus* Esben-Petersen 1916:6 [nec *Ecdyurus hyalinus* Ulmer 1912: 372]; *Ecdyonurus peterseni* Lestage 1930: 199 NEW SYNONYM; *Heptagenia abnormis* Tshernova 1949: 139 NEW SYNONYM.

Lehmkuhl (1979) noted the similarities between *C. lyriformis* and *C. peterseni*, based on published figures of the latter and McCafferty (1985) suggested that these mayflies are conspecific. I compared a male imago from Alaska to a reared male imago from Siberia furnished by Dr. Nikita Yu. Kluge, University of Leningrad. Color patterns and penes of the two specimens were practically identical; the only difference being a slight one in the shape of the subgenital plate. In the Alaskan specimen the center of

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this plate is weakly produced while in the specimen from Siberia, it is produced more strongly. There seems to be some variability in this character; in our Alaskan specimen, the median hump is larger than in Lehmkuhl's figure of the paratype genitalia (Lehmkuhl 1979). Nymphs of Old World *C. lyriformis* have been described by Tshernova (1949, 1976) but nymphs of the American population are still unknown. In North America, this species is known from Alaska, Alberta and Oregon (Lehmkuhl 1979, McCafferty 1985) while in the Old World it is known from both Siberia and the northern Urals.

As McCafferty (1985) pointed out, the nymph of *Cinygma* is poorly known in the Nearctic. The principal reason is that McDunnough, although he figured mouthparts of two species of *Cinygma* (*integrum* in 1933; *dimicki* in 1934), missed the one character that readily distinguishes *Cinygma* nymphs from the nymphs of other Nearctic heptageniids: the extremely small labrum. *Cinygma* is the only known heptageniid in which the labrum is narrower at the apex than at the base. Tshernova (1976) illustrated this character and discussed differences between *Cinygma lyriformis* and *C. integrum*.

Nixe (Akkarion) simplicioides (McDunnough)

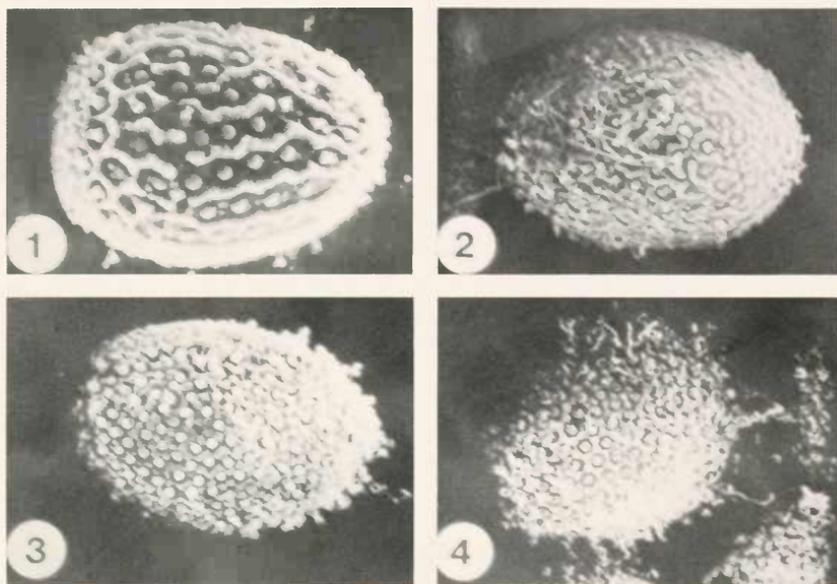
Heptagenia simplicioides McDunnough 1924: 120; *Ecdyonurus werestschagini* Tshernova 1952: 95 NEW SYNONYM; *Rhithrogena imanica* Bajkova 1972: 212.

The striking morphological similarity between *N. simplicioides* of western North America and *Ecdyonurus werestschagini* of eastern Asia has been previously noted (Flowers 1980, Kluge 1980). We have directly compared these two forms and find them to be conspecific. The only morphological difference between the Asian and North American populations is in the egg: the ridges of the chorion in the central part form longitudinal lines in Asian *simplicioides* (Fig. 1) while in American specimens (Fig. 2) this pattern is not nearly so well defined.

Nixe (Nixe) joernensis (Bengtsson) NEW COMBINATION

Ecdyonurus joernensis Bengtsson 1909: 19; *Ecdyonurus flavomaculatus* Aro 1928: 54; *Heptagenia mongolica* Bajkova and Varychanova 1978: 114-116.

Examination of all life stages indicates that this species is an Old World representative of *Nixe* (subgenus *Nixe*). Especially significant is the egg (Fig. 3) which shows the same reticulated pattern that characterizes all known New World of the subgenus *Nixe* (Fig. 4). The only difference is in the nymph: *N. joernensis* may have a small filamentous tuft on gill 6. This



Figs. 1-4. Eggs: 1. *Nixe (Akkarion) simplicioides* from Siberia (Primorye Territory), 242X; 2. *Nixe (Akkarion) simplicioides* from Wyoming, 240X; 3. *Nixe (Nixe) joernensis*, Siberia (Primorye Territory) 201X; *Nixe (Nixe) rusticalis*, New York, 240X.

character can vary even among specimens from the same locality (Kluge, pers. comm.). New World *Nixe* s.s. lack this tuft although specimens of *N. (N.) rusticalis* from New York have a single filament at the base of the plate on gill 6.

The generic status of *Nixe*, as well as other genera of the *Ecdyonurus* complex, requires further study. While *Nixe* in North America is a distinct entity, easily separated from other genera, this is not the case in northern Eurasia. Recently discovered Asian and Siberian members of the *Ecdyonurus* complex show a large number of apparent links among such genera as *Nixe*, *Leucrocuta*, *Ecdyonurus*, *Afronurus* and *Afghanurus*. As phyletic relationships are finally worked out, extensive revision of generic limits may well be necessary.

The Alaskan distribution of *Cinygma lyriformis* reported by Lehmkuhl (1979) and McCafferty (1985) shows the circumpolar nature of this species' range. Besides *C. lyriformis*, circumpolar mayflies also occur in the Baetidae, Ephemerellidae, Metretopodidae, and Siphonuridae. On the other hand, neither *Nixe* nor any other member of the *Ecdyonurus* complex has been reported from Alaska. Moreover, I have had the opportunity to

examine collections from Alaska (Fairbanks and Mt. McKinley areas) and from the Yukon near the Alaskan border, all of which also lacked *Ecdyonurus* complex species (although other Heptageniidae were well represented). It is worth noting that all these collections are from areas that were glaciated during the Wisconsin glaciation but a large part of Alaska was not glaciated and formed a refugium during this time (Flannagan and Flannagan 1985). McCafferty's records are from this refugium but from an extreme northern part. It is reasonable to assume that *Nixe simplicioides* occurred in Alaska during the Tertiary and possibly into the Pleistocene, although the post-glacial climate may have eliminated it. The United States populations of *N. simplicioides* are today found in the warmer streams of their present range (Bednarik and Edmunds 1980); on the other hand, in Siberia this species occurs in the Kotuy River which reaches higher latitudes than even the north coast of Alaska (Kluge 1980). Collections from the southern part of the Alaska refugium may clarify this question as well as establish whether any other members of the *Ecdyonurus* complex survive in Alaska.

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