Prosopistoma, or "Binoculus", is a genus of mayflies known from Europe, southern Asia, central and southern Africa, and Madagascar. The genus, as presently constituted, contains 11 named species, although there are an even greater number of species known to be undescribed. For the century following the first description of this insect by GEOFFROY (1762), the adult was unknown and the armored aquatic nymph was believed to be a type of crustacean. It was not until 1871 that it was recognized as a nymph of Ephemeroptera by N. and E. JOLY.

Originally described from Europe in the genus Binoculus, the species of GEOFFROY has gone through an immense series of nomenclatural changes, both generic and specific. It has been referred to by 5 specific names and 4 different generic names. Today, this species is still called by three different specific epithets and the genus is alternately referred to as Binoculus or Prosopistoma.

In this paper I will attempt to unravel this nomenclatural tangle and show that the valid name of the genus is Prosopistoma, the type species is P. variegatum, and the valid family name is Prosopistomatidae.

Nomenclatural History of the Genus

GEOFFROY (1762) established the genus Binoculus which he thought belonged to the Crustacea and placed in it three species; viz. "Le Binocle à queue en filets", "Le Binocle à queue, en plumet" (which he considered to be the same species described by LINNAEUS as Monoculus foliaceus), and "Le Binocle du gasteroste".

The "Binocle à queue en plumet" was the European species now known as Prosopistoma pennigerus as discussed in this paper. The other two species are still considered to be in the Crustacea.

MÜLLER (1776) redescribed many of GEOFFROY's genera and species, bringing them into a binomial system of nomenclature. The "Binocle à queue en filets" became Binoculus palustris (and was synonymized with Monoculus apus LINNAEUS) and the "Binocle du gasteroste" became Binoculus pizcim. In this work MÜLLER made no reference to the "Binocle à queue en plumet". MÜLLER did not designate a type species for Binoculus.

FOURCROY (1785) listed the genus Binoculus and included and briefly described all three of GEOFFROY's species utilizing the binomial system of nomenclature. The "Binocle à queue en plumet" became Binoculus foliaceus because GEOFFROY had listed Monoculus foliaceus LINNAEUS, 1758 as the same species. Again no type species was given.
In that same year, however, MÜLLER (1785) pointed out that the "Binocle à queue en plumet" was not the same species as Monoculus foliaceus of LINNAEUS and placed it in a new genus, Limulus, as Limulus pennigerus MÜLLER with Limulus palustris (the "Binocle à queue en filets").

LATREILLE (1802), also recognizing that the "Binocle à queue en plumet" was not synonymous with Monoculus foliaceus LINNAEUS, removed it from Limulus, called it Binoculus pennigerus, and designated it as the type species of Binoculus. DUMÉRIL (1816), for no apparent reason, in his Dictionnaire des Sciences Naturelles, called this species Binoculus piscinus. LATREILLE (1833) later decided that the "Binocle à queue en plumet" was not congeneric with the other two species of GEOFFROY and placed it in a new genus, Prosopistoma (renaming it Prosopistoma punctifrons), along with a new species from Madagascar, Prosopistoma variegatum. Why LATREILLE placed pennigerus in a new genus when he himself had already designated it as the type species of Binoculus is not known. The renaming of the species as punctifrons is not unexpected, because it was a common practice at that time to rename species whenever names were not thought to be suitable and often upon generic transfer.

In a series of papers beginning in 1871, N. & E. JOLY (e.g., E. JOLY, 1871, E. JOLY, 1876, E. & N. JOLY, 1872, N. & E. JOLY, 1872a, 1872b) reported the discovery in 1868 near Toulouse of the "Binocle à queue en plumet". They recognized for the first time that this was, in fact, a true insect and correctly assigned it to the Ephemeroptera although the adult was still underscribed.

Coincident with the recognition that Prosopistoma was not a Crustacean, E. & N. JOLY (1872) proposed the new name Chelysentomon for the genus, but immediately began using the name Prosopistoma once more.

Prosopistoma still had no designated type species, and EATON (1884) therefore designated Prosopistoma variegatum LATREILLE as the type of the genus. In 1917 LESTAGE established a new family, Prosopistomatidae, for Prosopistoma.

The name Prosopistoma was used almost exclusively for this genus until DEMOULIN (1954) pointed out that, under the rules of zoological nomenclature in effect at that time, the valid name for the genus was Binoculus and proposed the new name Binoculidae as the name of the monotypic family. Both Prosopistoma and Binoculus have been used as the name for the genus since that time. Further, the "Binocle à queue en plumet" of Europe has in recent years been known by the names foliaceus, pennigerus, and punctifrons by various authors.

EDMUNDS ALLEN, and FETERS (1963) pointed out that because Prosopistoma was in almost universal use for the time between the establishment of the genus and the appearance of the paper by DEMOULIN (1954) asserting that Binoculus was the valid name, the "50-year rule" (Article 23, International Code of Zoological Nomenclature) might apply and Prosopistoma would be the valid name.

The history of the nomenclature of this genus is further complicated by the fact that carcinologists have used the name Binoculus for species of Crustacea and ignored its use by entomologists, who in turn paid no regard to its continued use in the Crustacea. FOWLER (1912) proposed the name Binoculidae for a family in the Crustacea containing GEOFFROY'S Binoculus (sensu carcinological), apparently unnoticed by entomologists. The use of Binoculus in the Crustacea was so unnoticed by entomologists, in fact, that a ruling on Binoculus by the International Commission on Zoological Nomenclature requested by carcinologists apparently received no comment whatsoever from ephemeropterists.

Further accounts of the nomenclatural history of this genus may be found in papers by VAYSSEIRE (1890), DEMOULIN (1954), and GILLIES (1954). These accounts discuss certain points in more detail than the present paper.

Discussion

Ordinarily, there would be little problem in discerning the proper nomenclature involved in this genus, if it were not for a few problems which have occurred. The rulings of the International Commission on Zoological Nomenclature, however, when taken into consideration with the nomenclatural history, show quite clearly the correct nomenclature.
Fig. 1. Dorsal view of nymph of *Prosopistoma* sp. from Sri Lanka (1 div. = 1 mm)
Binoculus is the oldest name for the genus, first being used by Geoffroy in 1762. The International Commission on Zoological Nomenclature in Opinion 228 (1954) has declared this work by Geoffroy to be invalid for nomenclatural purposes, because Geoffroy did not use the binomial system of nomenclature. The next use of Binoculus was by Müller (1776). However, Binoculus Müller was suppressed by the International Commission on Zoological Nomenclature in Opinion 502 (1958) for the purposes of the law of priority but not for the law of homonymy and is therefore also unavailable. Binoculus Fourcroy (1785) is thus either a second use of Binoculus Müller or a junior homonym of it and in either case it is not available for use. The next available synonym is then Prosopistoma Latreille (1833) which becomes the valid name of the genus with either case it is not available for use. The next available synonym is thenProsopistoma Latreille (1833), Prosopistoma borneus clature.

Commission on type species of to which the name was wrongly which is indeed a crustacean. Article 49 of the International Code of Zoological Nomenclature states respectively.

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EDMUNDS, ALLEN, and PETERS (1963). The type species of Prosopistoma is P. variegatum Latreille, 1833, from Madagascar, as subsequently designated by Eaton (1884). As I pointed out previously, the type species of Binoculus is Limulus pennigerus Müller, 1785.

The European species, the “Binocle à queue en plume” of Geoffroy, was given a binomial name by both Müller and Fourcroy in 1785, being called Limulus pennigerus and Binoculus foliaceus, respectively. However, as pointed out by both Müller (1785) and Latreille (1833), Geoffroy (and so Fourcroy in following him) was in error in thinking this species to be Monoculus foliaceus Linnaeus which is indeed a crustacean. Article 49 of the International Code of Zoological Nomenclature states that a specific name used in an erroneous specific identification cannot be retained for the species to which the name was wrongly applied. The epithet foliaceus therefore becomes invalid and the next available name is pennigerus Müller, 1785, which becomes the valid name for this species (c.f. h Demoulin, 1954).

Lestage (1917) created the family Prosopistomatidae for Prosopistoma. Thus, Prosopistomatidae has priority over Binoculidae Demoulin, 1954, and is the valid name of the family (c.f. Edmunds, 1955).

The formal synonymy is as follows:

Prosopistoma Latreille, 1833


Binoculus Müller [partim], 1776, Zoologiæ danicæ ...... p:200 (not available).

Binoculus Fourcroy [partim], 1785, Entomol. Paris. 2:539 (not available).

Limulus Müller [partim], 1785, Entomostraca seu Testacea ...... p. 127.


Catalog of the Genus Prosopistoma

Prosopistoma africanum Gillies


Prosopistoma boreus Peters


Prosopistoma crassi Gillies


Prosopistoma deguernei Vayssière


Prosopistoma indicum Peters
For the century after the description of the first species of the mayfly Prosopistoma by Geoffroy in 1762 (as “Binocle à queue en plumet”), it was thought to be a crustacean. Geoffroy did not use a binomial system of nomenclature, and Müller (1776, 1785) and Fourcroy (1785) redescribed many of his species using a binomial system. The “Binocle” of Geoffroy became the nominal genus Binoculus. In 1833, Latreille removed “Binocle à queue en plumet” from Binoculus and placed it in his new genus Prosopistoma along with a new species. The generic name Prosopistoma has generally been accepted as correct since its proposal by Latreille. Recently, however, some authors have again begun to use Binoculus as the name for this genus. I show that the valid name is Prosopistoma, the type species is P. variegatum, and the valid family name is Prosopistomatidae.

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