

especially if it is near the middle of the second basal cell is not a conclusive character to separate the two groups.

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Checklist of the Belgian stoneflies (Plecoptera)

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Abstract

In the present study, 52 species of stoneflies are listed for Belgium. However, 14 of these have not been reported for several decades: some have probably been overlooked and will hopefully be rediscovered in the future, while others are probably extinct in Belgium. The latter species are especially potamal species that were restricted to the river Meuse and the downstream part of the river Ourthe. A few other species have been reported from the surrounding countries and may also be encountered in Belgium. An overview of the literature dealing with the Belgian stoneflies is given. In addition, three species are reported here for the first time for Belgium: *Amphinemura borealis* (Morton, 1894), *Nemoura flexuosa* AUBERT, 1949 and *Leuctra major* BRINCK, 1949.

Keywords: aquatic insects; *Amphinemura borealis*; Belgium; *Leuctra major*; macroinvertebrates; *Nemoura flexuosa*.

Samenvatting

In deze studie worden 52 soorten steenvliegen gemeld voor België. Hiervan werden 14 soorten echter niet meer teruggevonden de laatste decennia. Enkele daarvan werden waarschijnlijk over het hoofd gezien en zullen hopelijk herontdekt worden in de toekomst, enkele andere zijn waarschijnlijk uitgestorven in België. Tot deze laatste groep behoren voornamelijk soorten die gebonden zijn aan grote rivieren en die enkel voorkwamen in de Maas en het benedenstrooms gedeelte van de Ourthe. Daarnaast werden nog enkele andere soorten die worden waargenomen in de omliggende landen en die mogelijk ook in België kunnen gevonden worden. Een overzicht van de bestaande literatuur over de steenvliegen in België wordt gepresenteerd. Bovendien worden drie soorten voor het eerst gemeld voor de Belgische fauna: *Amphinemura borealis* (MORTON, 1894), *Nemoura flexuosa* AUBERT, 1949 en *Leuctra major* BRINCK, 1949.

Résumé

Dans cette étude, 52 espèces de plécoptères sont rapportées pour la Belgique. Parmi celles-ci, 14 espèces n'ont plus été rapportées depuis plusieurs décennies. Certaines sont probablement passées inaperçues et pourront être redécouvertes dans le futur, mais d'autres auraient disparu, en particulier celles que l'on trouvait anciennement dans la Meuse ou dans le cours inférieur de l'Ourthe. Quelques espèces ont été rapportées des pays voisins et peuvent aussi être présentes en Belgique. Trois espèces sont rapportées ici pour la première fois de Belgique: *Amphinemura borealis* (MORTON, 1894), *Nemoura flexuosa* AUBERT, 1949 et *Leuctra major* BRINCK, 1949. Un aperçu de la littérature est donné.

Introduction

The first checklist of the Belgian Plecoptera was made by DE SELYS-LONGCHAMPS (1888), who listed 21 species for Belgium, however, these were not all identified correctly as will be discussed below. Later, LAMEERE (1900) only listed 13 species in his 'Manuel de la faune de Belgique', apparently he neglected the previous study. NAVAS (1911) copied the list of DE SELYS-LONGCHAMPS (1888) and added one species: *Brachyptera putata* (Newman, 1838). However, the latter species is restricted to the UK and the Ukraine (FAUNA EUROPAEA, 2004) and no material was preserved, this record was therefore omitted. AUBERT (1956), who studied the collection of the Royal Belgian Institute of Natural Sciences, listed 50 species for Belgium of which four were omitted here as will be discussed below. Since then, only three species have been added to the Belgian fauna: *Diura bicaudata* (Linnaeus, 1758) was reported by AUBERT (1957), *Capnioneura mitis* Despax, 1932 was observed by HOFFMANN (1965) and *Leuctra pseudosignifera* AUBERT, 1954 was recently found by LOCK & GOETHALS (2008).

During the present study, most available material from collections of Belgian Plecoptera was identified. In addition, field work was carried out in order to get an idea of which species are still present in Belgium. Furthermore,

an overview is given about the literature dealing with Plecoptera in Belgium. Based on these data, a checklist of the Belgian species is presented and three additional species are reported here for the first time for Belgium: *Amphinemura borealis* (MORTON, 1894), *Nemoura flexuosa* AUBERT, 1949 and *Leuctra major* BRINCK, 1949.

Materials and methods

During the present study, all the available material, adults as well as larvae, from the Royal Belgian Institute of Natural Sciences (RBINS), the University Faculty of Agronomic Sciences in Gembloux (FSAG), the Flemish Environmental Agency (VMM), Ghent University (UGent), the University of Antwerp (UA), the University of Mons (UMons), the University of Liège (ULG) and part of the material of the Département de l'Etude du Milieu naturel et agricole, Service Public de Wallonie (D GARNE; VANDEN BOSSCHE, 2007) was identified.

The Belgian stonefly species can be identified with the key of ILLIES (1955), which only misses *Capnioneura mitis* DESPAX, 1932, but is not very good for larvae. AUBERT (1959) is incomplete, but a useful addition, especially for Leuctridae and larvae, while KIS (1974) is in Rumanian but contains good drawings of adults. DESPAX (1951) is only for adults, it is incomplete and the key is not that good, but it contains *C. mitis*. The

keys for the British Isles (HYNES, 1977) and the Netherlands (KOESE, 2008) contain only a fraction of the Belgium fauna and should therefore not be used for Belgium, however, they give useful additional information. With the key of ZWICK (2004), all larvae of West Palearctic species can be identified, but only to genus level.

Results

In total, 52 species of stoneflies (Plecoptera) have been found in Belgium (Table 1). For each family, the occurring species are discussed and an overview is given of the Belgian literature.

Perlodidae

One specimen of *Besdolus imhoffi* (PICTET, 1841) was collected by DE SELYS-LONGCHAMPS, and was reported by KLAPÁLEK (1912, 1923) and AUBERT (1956) from Halloy. However, LESTAGE (unpublished data) indicated that this specimen did not contain a label when he studied it and it should also be noted that DE SELYS-LONGCHAMPS (1888) did not mention this species in his catalogue. For these reasons, *B. imhoffi* was not included in the presented checklist. *Diura bicaudata* (LINNAEUS, 1758) was only reported from Duzo-Moùpas (AUBERT, 1957), but more recently, it was also found at several other locations in the Ardennes region. *Isogenus nubecula* (NEWMAN, 1833) occurred in the river Meuse in the nineteenth century (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; AUBERT, 1956; LOCK & GOETHALS, 2008). *Isoperla goertzi* ILLIES, 1952 has only been reported from the Gaume-Lorraine region and *Isoperla oxylepis* (DESPAX, 1936) only from Xhoffrais (AUBERT, 1956). Because larvae and females of the latter two species can at present not be distinguished from *Isoperla grammatica* (PODA, 1761), their distribution is probably underestimated. *I. grammatica* is a common species in the southern part of Belgium and is the only species of this family occurring in Flanders (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; FREDERICQ, 1904; NAVAS, 1911; AUBERT, 1956; CORS *et al.*, 2004; DETHIER *et al.*, 2008; LOCK & GOETHALS, 2008). *Isoperla rivulorum* (PICTET, 1841) was reported from Houyet by LESTAGE (1935), however, this record could not be confirmed and probably also concerned *I. grammatica*. *Perlodes dispar* (RAMBUR, 1842) was only found in the

river Meuse and the river Ourthe in the nineteenth century (AUBERT, 1956). *Perlodes microcephalus* (PICTET, 1833) is quite common south of the rivers Sambre and Meuse (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; AUBERT, 1956).

Perlidae

Dinocras cephalotes (CURTIS, 1827), *Perla burmeisteriana* CLAASSEN, 1936 and *Perla marginata* (PANZER, 1799) have been reported frequently south of the rivers Sambre and Meuse (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; LESTAGE, 1920c; KLAPÁLEK, 1923; COOREMAN, 1946, 1949; AUBERT, 1956) and are still quite common. *Perla bipunctata* PICTET, 1833 and *Perla grandis* RAMBUR, 1842 were also reported (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; LESTAGE, 1920c; KLAPÁLEK, 1923, LESTAGE, 1935; AUBERT, 1956), however, verification of the material present at the RBINS indicated that this were all misidentified larvae. *Marthamea selysii* (PICTET, 1841) lived in the river Meuse and the river Semois (MAC LACHLAN, 1877, 1881a; DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; KLAPÁLEK, 1923; AUBERT, 1956), but has not been observed for almost a century.

Chloroperlidae

Chloroperla tripunctata (SCOPOLI, 1763) has been reported by several authors (MAC LACHLAN, 1881b; DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; LESTAGE, 1935; AUBERT, 1956). Despite some of these records probably concern the more abundant *Siphonoperla torrentium* (PICTET, 1841), several records could be confirmed, however, *C. tripunctata* has not been observed recently. *Isoptena serricornis* (PICTET, 1841) was reported from Spa and Longchamps-sur-Geer by DE SELYS-LONGCHAMPS (1888) and cited by NAVAS (1911), however, checking the identification of the material present in the RBINS indicated that this material actually belonged to the species *S. torrentium*. No wonder that AUBERT (1956) could not confirm this species from Belgium. *S. torrentium*, which is the only species of the family Chloroperlidae that has been observed recently, is quite common south of the groove of the rivers Sambre and Meuse (AUBERT, 1956). *Xanthoperla apicalis* (Newman, 1836) has only been observed along the river Amblève in the

Table 1. Checklist of the Belgian Plecoptera. Species still present (•) in Flanders, Brussels and Wallonia; if species were not found since 2000, the last year the species was observed is indicated.

| | Flanders | Brussels | Wallonia |
|---|----------|----------|----------|
| Order Plecoptera | | | |
| Family Perlodidae | | | |
| 1. <i>Diura bicaudata</i> (Linnaeus 1758) | | | • |
| 2. <i>Isogenus nubecula</i> (Newman 1833) | 1888 | | 1882 |
| 3. <i>Isoperla goertzi</i> Illies 1952 | | | • |
| 4. <i>Isoperla grammatica</i> (Poda 1761) | • | | • |
| 5. <i>Isoperla oxylepis</i> (Despax 1936) | | | • |
| 6. <i>Perlodes dispar</i> (Rambur 1842) | | | 1889 |
| 7. <i>Perlodes microcephalus</i> (Pictet 1833) | | | • |
| Family Perlidae | | | |
| 8. <i>Dinocras cephalotes</i> (Curtis 1827) | | | • |
| 9. <i>Marthamea selysii</i> (Pictet 1841) | | | 1916 |
| 10. <i>Perla burmeisteriana</i> Claassen 1936 | | | • |
| 11. <i>Perla marginata</i> (Panzer 1799) | | | • |
| Family Chloroperlidae | | | |
| 12. <i>Chloroperla tripunctata</i> (Scopoli 1763) | | | 1976 |
| 13. <i>Siphonoperla torrentium</i> (Pictet 1841) | | | • |
| 14. <i>Xanthoperla apicalis</i> (Newman 1836) | | | 1888 |
| Family Taeniopterygidae | | | |
| 15. <i>Brachyptera braueri</i> (Klapálek 1902) | | | 1920 |
| 16. <i>Brachyptera monilicornis</i> (Pictet 1841) | | | • |
| 17. <i>Brachyptera risi</i> (Morton 1896) | | | • |
| 18. <i>Brachyptera seticornis</i> (Klapálek 1902) | | | • |
| 19. <i>Taeniopteryx nebulosa</i> (Linnaeus 1758) | 1982 | | 1949 |
| 20. <i>Taeniopteryx schoenemundi</i> Mertens 1923 | 1921 | | • |
| Family Nemouridae | | | |
| 21. <i>Amphinemura borealis</i> (Morton 1894) | | | • |
| 22. <i>Amphinemura standfussi</i> (Ris 1902) | • | | • |
| 23. <i>Amphinemura sulcicollis</i> (Stephens 1836) | | | • |
| 24. <i>Amphinemura triangularis</i> (Ris 1902) | | | 1954 |
| 25. <i>Nemoura avicularis</i> Morton 1894 | • | | • |
| 26. <i>Nemoura cambrica</i> Stephens 1836 | | | • |
| 27. <i>Nemoura cinerea</i> (Retzius 1783) | • | • | • |
| 28. <i>Nemoura dubitans</i> Morton 1894 | • | • | • |
| 29. <i>Nemoura erratica</i> Claassen 1936 | | | 1895 |
| 30. <i>Nemoura flexuosa</i> Aubert 1949 | | | 1918 |
| 31. <i>Nemoura marginata</i> Pictet 1836 | • | • | • |
| 32. <i>Nemoura sciurus</i> Aubert 1949 | | | 1950 |
| 33. <i>Nemurella pictetii</i> Klapálek 1900 | • | • | • |
| 34. <i>Protonemura intricata</i> (Ris 1902) | • | 1942 | • |
| 35. <i>Protonemura meyeri</i> (Pictet 1841) | • | | • |
| 36. <i>Protonemura nitida</i> (Pictet 1935) | | | • |
| 37. <i>Protonemura praecox</i> (Morton 1894) | | | • |
| 38. <i>Protonemura risi</i> (Jacobson & Bianchi 1905) | | | • |
| Family Capniidae | | | |
| 39. <i>Capnia bifrons</i> (Newman 1839) | | | 1916 |
| 40. <i>Capnia vidua</i> Klapálek 1904 | | | • |
| 41. <i>Capnioneura mitis</i> Despax 1932 | | | 1964 |
| Family Leuctridae | | | |
| 42. <i>Leuctra albida</i> Kempny 1899 | | | • |
| 43. <i>Leuctra aurita</i> Navás 1919 | | | • |
| 44. <i>Leuctra digitata</i> Kempny 1899 | | | • |
| 45. <i>Leuctra fusca</i> (Linnaeus 1758) | • | | • |
| 46. <i>Leuctra geniculata</i> Stephens 1836 | | | • |
| 47. <i>Leuctra hippopus</i> Kempny 1899 | • | | • |
| 48. <i>Leuctra inermis</i> Kempny 1899 | | | • |
| 49. <i>Leuctra major</i> Brinck 1949 | | | 1932 |
| 50. <i>Leuctra nigra</i> (Olivier 1811) | • | | • |
| 51. <i>Leuctra prima</i> Kempny 1899 | | | • |
| 52. <i>Leuctra pseudosignifera</i> Aubert 1954 | • | | • |

nineteenth century (DE SELYS-LONGCHAMPS, 1888; NAVAS, 1911; AUBERT, 1956).

Taeniopterygidae

Brachyptera braueri (KLAPÁLEK, 1902) was found in the river Meuse and the river Ourthe (AUBERT, 1956), but this potamal species has not been reported for almost a century. Also *Brachyptera monilicornis* (PICTET, 1841) is a potamal species, which was found in the river Meuse, the river Ourthe, the river Vesdre and the river Sûre (AUBERT, 1956), however, at least in the river Ourthe, this species is still present. As indicated previously, the record of *B. putata* by NAVAS (1911) was discarded because this species only occurs in the British Isles and the Ukraine (FAUNA EUROPAEA, 2004) and no material was preserved. *Brachyptera risi* (Morton, 1896) is the most common species of the family Taeniopterygidae (AUBERT, 1956; CORS *et al.*, 2004), while *Brachyptera seticornis* (KLAPÁLEK, 1902) is less common (AUBERT, 1956). The records of *Brachyptera trifasciata* (PICTET, 1832) (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911) actually belonged to *B. braueri* and *B. monilicornis*. *Rhabdiopteryx neglecta* (Albarda, 1889) was reported by PICTET (DE SELYS-LONGCHAMPS, 1888; NAVAS, 1911), but could not be confirmed, while the specimen reported by AUBERT (1956) turned out to be *B. risi*. *R. neglecta* was therefore removed from the checklist. Both *Taeniopteryx nebulosa* (LINNAEUS, 1758) and *Taeniopteryx schoenemundi* MERTENS, 1923 have been reported on several occasions (DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; LESTAGE, 1919, 1921, 1938a,b; AUBERT, 1950, 1956; LOCK & GOETHALS, 2008), however, they were often misidentified, which was also indicated by AUBERT (1950). Recently, *T. schoenemundi* has been observed in the river Ourthe and the river Lesse, while *T. nebulosa* has not been observed since 1982.

Nemouridae

Amphinemura borealis (MORTON, 1894) is reported here for the first time for Belgium. The species was found along the river Hermeton in Soulme on 26/4/2010 and in Hermeton-sur-Meuse on 7/7/2010. *Amphinemura standfussi* (RIS, 1902) and *Amphinemura sulcicollis* (STEPHENS, 1836) have been found quite

frequently (MAC LACHLAN, 1881b; DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; FREDERICQ, 1904; NAVAS, 1911; MARLIER, 1951; DEMOULIN, 1953; AUBERT, 1956; CORS *et al.*, 2004; LOCK & GOETHALS, 2008). *Amphinemura triangularis* (RIS, 1902), on the contrary, has only been observed on a few occasions (AUBERT, 1956) and has not been reported since 1954. *Nemoura avicularis* MORTON, 1894, *Nemoura dubitans* Morton, 1894, *Nemoura cambrica* Stephens, 1836, *Nemoura marginata* PICTET, 1836 and especially *Nemoura cinerea* (RETZIUS, 1783) are common species (MAC LACHLAN, 1881b; DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; FREDERICQ, 1904; NAVAS, 1911; LE ROI, 1912; MARLIER, 1951; DEMOULIN, 1953; GROOTAERT & VERBEKE, 1983; BARVAUX, 1988; DOPAGNE & DETHIER, 2000; AUBERT, 1956, 1957; DETHIER & HUBART, 2003; CORS *et al.*, 2004; DETHIER *et al.*, 2008; LOCK & GOETHALS, 2008; MENTEN, 2008). *Nemoura flexuosa* AUBERT 1949 is reported here for the first time for the Belgian fauna. Thirteen specimens of the latter species were found in Ombret on 19/4/1918, however, they were wrongly identified as *Nemoura erratica* CLAASSEN 1936. *Nemoura erratica* CLAASSEN, 1936 has only been found once near the river Semois in the nineteenth century and *Nemoura sciurus* AUBERT, 1949 only in Cerfontaine and Gomzée-Andoumont (AUBERT, 1956). *Nemurella pictetii* Klapálek, 1900 has been frequently encountered in Belgium (DE SELYS-LONGCHAMPS, 1888; NAVAS, 1911; LESTAGE, 1922; MARLIER, 1946, 1951; AUBERT, 1956; DETHIER *et al.*, 2008, LOCK & GOETHALS, 2008; MENTEN, 2008). *Protonemura intricata* (RIS, 1902), *Protonemura meyeri* (PICTET, 1841), *Protonemura nitida* (PICTET, 1935), *Protonemura risi* (JACOBSON & BIANCHI, 1905) and to a lesser extent also *Protonemura praecox* (MORTON, 1894) have all been encountered quite frequently (DE SELYS-LONGCHAMPS, 1888; NAVAS, 1911, 1913, 1914; AUBERT, 1956, 1957; CORS *et al.*, 2004; DETHIER *et al.*, 2008; LOCK & GOETHALS, 2008).

Capniidae

Capnia nigra (PICTET, 1833) was reported from the river Ourthe by LESTAGE (1919), however, this record belonged to the species *Capnia bifrons* (Newman, 1839), which was also

indicated by AUBERT (1956). No further records are known for this species. *Capnia vidua* Klapálek, 1904, which is known from two locations in the hautes fagnes (AUBERT, 1950, 1956), is the only species of the family Capniidae which has still been observed recently. *Capnioneura mitis* DESPAX 1932 was only found in 1964 by HOFFMANN (1965), who found the species during one day on four different locations in Belgium close to the border of the Grand-Duchy of Luxembourg.

Leuctridae

Leuctra albida KEMPNY, 1899, *Leuctra fusca* (LINNAEUS, 1758), *Leuctra geniculata* STEPHENS, 1836, *Leuctra hippopus* KEMPNY, 1899, *Leuctra inermis* KEMPNY, 1899, *Leuctra nigra* (OLIVIER, 1811) and *Leuctra prima* KEMPNY, 1899 were all observed quite frequently (MAC LACHLAN, 1881b; DE SELYS-LONGCHAMPS, 1888; LAMEERE, 1900; NAVAS, 1911; LESTAGE, 1920a,b, 1935; AUBERT, 1956, 1957; LOCK & GOETHALS, 2008; MENTEN, 2008), while *Leuctra aurita* Navás, 1919 and *Leuctra digitata* KEMPNY, 1899 were only found on a few occasions (AUBERT, 1956). *Leuctra major* Brinck 1949 is reported here for the first time for Belgium. One female of the latter species was found in Borgoumont in September 1932, however, it was not recognised as such. Recently, LOCK & GOETHALS (2008) reported *Leuctra pseudosignifera* AUBERT, 1954, however, this species was captured in 1918 by LESTAGE and the species has now already been captured in at least five locations.

Discussion

During the present study, all the 52 species reported for Belgium (Table 1) could be confirmed except *Capnioneura mitis*. However, the latter species has also been found in the Grand-Duchy of Luxembourg as well as in Rheinland-Pfalz in Germany (HOFFMANN, 1960; REUSCH & WEINZIERL, 2001; ENTING, 2006) and therefore, there is no reason to doubt the records of this species. During the last couple of years, 38 species have been collected, however, 14 other species were not encountered. Some of the latter species are most probably extinct, especially potamal species such as *I. nubecula*, *P. dispar*, *M. selysii*, *B. braueri* and *X. apicalis*. However, *C. tripunctata*, *T. nebulosa*, *A.*

triangularis, *N. flexuosa*, *N. sciurus*, *C. mitis*, *C. bifrons* and *L. major* have still been reported recently in Luxembourg or the German federal states bordering Belgium (REUSCH & WEINZIERL, 2001; ENTING, 2006; DOHET *et al.*, 2008) and were possibly overlooked.

Of the 28 species that have been reported for The Netherlands, only 11 species have been found recently, while the other 17 are probably extinct (KOESE, 2008; KOESE, personal communication). All the species still present in The Netherlands were also encountered in Belgium. In northern France, stoneflies have hardly been studied (LE DOARÉ & VINÇON, 2009). Based on its distribution in Germany (REUSCH & WEINZIERL, 2001; ENTING, 2006), *Leuctra braueri* KEMPNY, 1898 can still be expected in Belgium. There is also a small chance that *Isoptena serricornis* (Pictet, 1841) and *Leuctra leptogaster* AUBERT, 1949, which are very rare in Nordrhein-Westfalen and/or Rheinland-Pfalz (REUSCH & WEINZIERL, 2001; ENTING, 2006), could be encountered in Belgium.

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