

New species and new stage descriptions of *Campsurus major* species group (Polymitarcyidae: Campsurinae), with first report of silk-case construction in mayfly nymphs

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Campsurus major, *C. argentinus* and *C. amapaensis* sp. nov. form a monophyletic group supported by the following apomorphies in the male genitalia: robust pedestals with a widely rounded inner-posterior margin and a more acute and thinner outer margin, penes strongly sclerotised and curved ventrally, each lobe twisted outwards, and with a small membranous lobe on ventral margin. The nymphs of *Campsurus major* and *C. argentinus* and the female adult of *C. major* are described for the first time and illustrated here; the male adults of both species are redescribed. A new species, *C. amapaensis*, is described from male imagos. The following new synonymies are proposed: *Campsurus argentinus* Esben-Petersen (= *C. pallidus* Needham & Murphy, junior synonym) and *C. major* Needham & Murphy (= *C. brasiliensis* Traver, junior synonym). The nymphs of both species are reported to use silk to build soft cases and to glue substrate particles. A list of characters useful to distinguish the treated species from others in the genus is given.

Keywords: *Campsurus argentinus*; *C. brasiliensis*; *C. pallidus*; *C. amapaensis*; Ephemeroidea; case-building; silk

Introduction

Polymitarcyidae belongs to a group known as “burrowing mayflies” (Ephemeroidea), characterised by its relatively large nymphs adapted to live in tunnels they excavate in different substrates (soft mud, hard clay, plant tissues, McCafferty 1975). The family is known from three major groups: Polymitarcyinae, Asthenopodinae and Campsurinae (McCafferty 1975; Kluge 2004). Campsurinae, with two genera and about 50 species, shows a Panamerican distribution, with its main diversity in South American tropics (Domínguez, Molineri, Pescador, Hubbard and Nieto 2006). This paper deals with three species: *Campsurus argentinus* Esben-Petersen, 1912; *C. major* Needham & Murphy, 1924; and *C. amapaensis* sp. nov. We are describing the nymphs of *C. argentinus* and *C. major* and interestingly both were found to produce and use silk for their protection. In the case of *C. argentinus* we could confirm the use of the silk for case construction.

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The aim of the present paper is to describe the previously unknown nymphal stages of *C. argentinus* and *C. major* and their particular way of living. Also, adults of both species are redescribed and illustrated, and the female imago of *C. major* is described for the first time. New country records and synonyms are given for both species. Lastly, a new species from northeast Brazil is described from male imagos, *Campsurus amapaensis* sp. nov.

Materials and methods

Morphological terms in descriptions are mainly from Kluge (2004). SEM photographs were obtained with a JEOL 35CF scanning electron microscope at 25 kV. Larval parts were dehydrated in a graded ethanol series, dried by critical point-method, mounted with double-sided tape on SEM stubs and sputter coated with gold. Depositories: CUIC (Cornell University Insect Collection, Ithaca, NY), FAMU (Florida A&M University, Tallahassee, FL), IML (Instituto Miguel Lillo, Tucumán, Argentina), MCR (Museo de Ciencias de la República, Montevideo, Uruguay), and INPA (Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil).

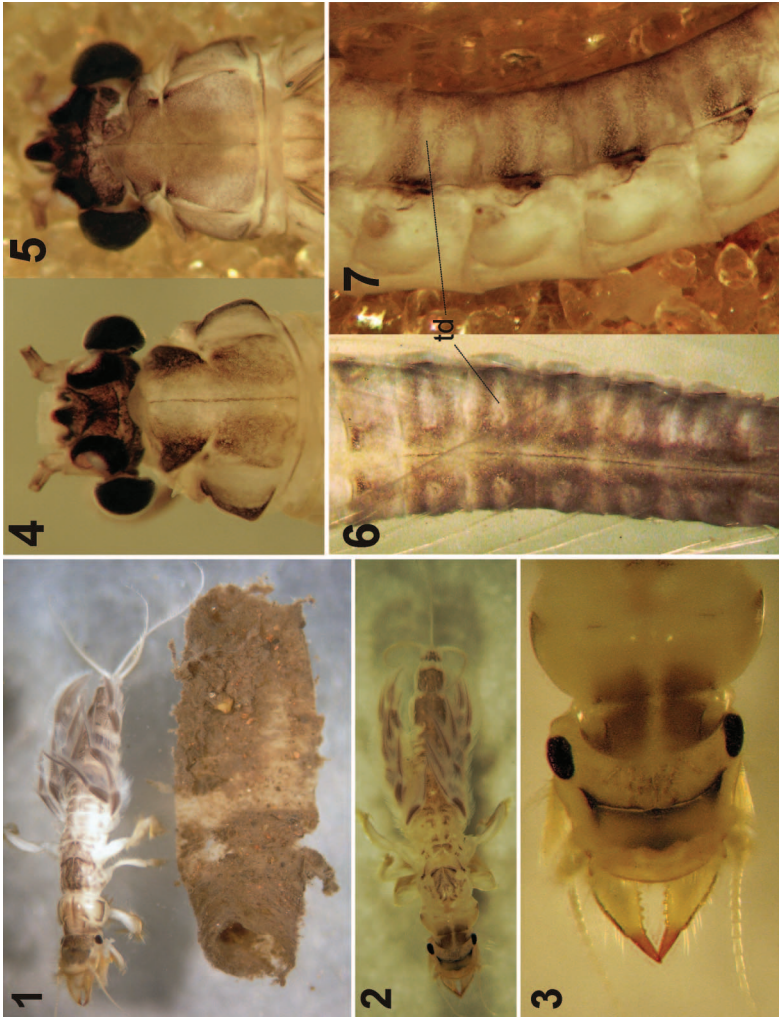
Campsurus argentinus Esben-Petersen, 1912 (Figures 1, 4–18, 35, 36)

Campsurus argentinus Esben-Petersen, 1912: 334 (male); Ulmer, 1920: 106; Lestage, 1923: 120; Needham & Murphy, 1924: 16; Ulmer, 1942: 117 (male); Traver, 1947: 379; Traver, 1950: 593.

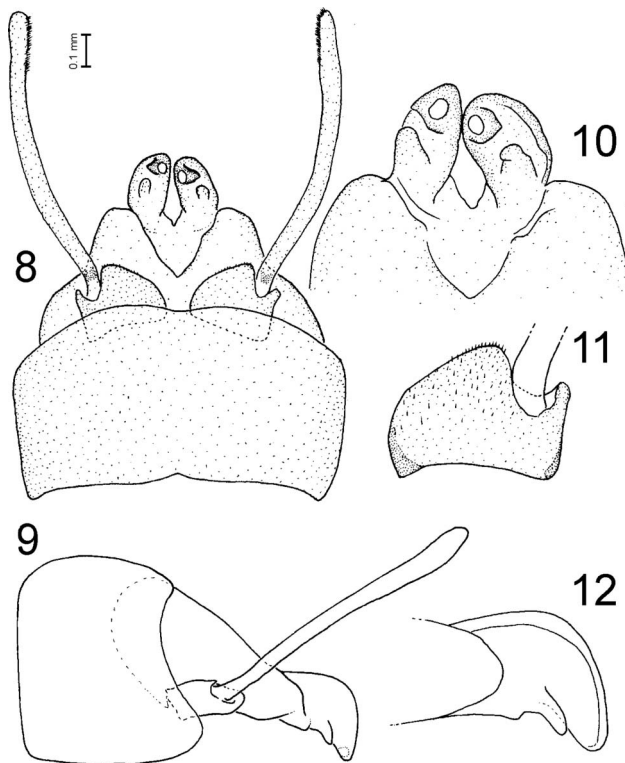
Campsurus pallidus Needham & Murphy, 1924: 20 (male); Traver, 1947: 380 New synonym.

Type material. *Campsurus pallidus* holotype ♂ imago, slide (CUIC N° 623.1) with genitalia, head, forelegs, and 1 pair of wings from Perú [sic], río Alto Paraná, 18-Jan-1920. In the original description type locality data is given as Argentina-Paraguay, above Posadas, 18-I-1920. Types of *C. argentinus* could not be located; identification of the material was done by comparison with original figures and description.

Additional material. Five ♂ and 1 ♀ (IML) from ARGENTINA: Misiones, P.P. Urugua-í, A° Uruzú, S 25° 51' 29" – W 54° 10' 10", 7-11/XII/1999, C. Molineri col. One ♂ imago (IML) from BRASIL: Rio Grande do Sul, Rio Lageado Grande, 29/I/1982, N. Santos & N.F. Netto cols. Four ♂ imagos (IML) from URUGUAY: Rivera, Mina de Corrales, A° Corrales, S 31° 34' 34" – W 55° 27' 58", 135 m, 19/II/2008, D. Emmerich & C. Molineri cols.; 4 ♂ and 2 ♀ imagos (IML) from URUGUAY: Maldonado, R60 km 23, A° El Rodeo, S 34° 40' 20" – W 55° 14' 15", 75 m, 7/XI/2008, D. Emmerich & C. Molineri cols.; 1 ♂ imago (IML slide 380) from URUGUAY: Treinta y Tres, Qda. de los Cuervos, S 32° 55' 27.3" – W 54° 27' 34.4", 125 m, 8/XI/2004, light trap, D. Emmerich col.; 1 ♂ subimago (IML slide 400) from URUGUAY: Cerro Largo, A° Tacuarí, S 32° 31' 51" – W 54° 07' 48", 92 m, light trap, 20/II/2008, D. Emmerich & C. Molineri cols.; 7 ♂ and 8 ♀ (MCR) from URUGUAY, Tacuarembó, Tacuarembó Chico, 24-25/I/1980; 10 ♂ and 10 ♀ imagos (MCR) from URUGUAY, Sepulturas, río Cuareim, 15/I/1952, C. Carbonell & L. de Zolessi cols.; 37 nymphs from (IML, MCR) URUGUAY: Artigas, A° Catalán Chico, S 30° 42' 28.8" – W 56° 19' 17.6", 128 m, 18/II/2008, D. Emmerich & C. Molineri cols.; 8 nymphs from URUGUAY: Artigas, Finca Mataojo Grande, A° Mataojo Grande (IML, used in SEM study), S 31° 17' 29.7" – W 56° 13' 10", 274 m, 18/II/2008, D. Emmerich & C. Molineri cols.; 2 nymphs (MCR) from URUGUAY: Tacuarembó, R5 km 343, A° La Qda. Grande, S 32° 05' 31" – W 56° 06' 07", 135 m, 22/II/2008, D. Emmerich col.; and 3 nymphs (MCR) from URUGUAY: Rivera, Santa Ernestina, R 29, A° sin nombre, S 31° 32' 23.8" – W 55° 33' 42", 146 m, 19/II/2008, D. Emmerich & C. Molineri cols.



Figures 1–7. (1) *Campsurus argentinus*, nymph and silk-case; (2–3) *Campsurus major*, (2) nymph, general view; (3) head and pronotum, dorsal view. *Campsurus argentinus*, imago; (4) male head and pronotum; (5) female head and pronotum; (6) male abdominal terga I–VI, dorsal view; (7) male abdominal segments III–V, lateral view (td = transversal pale dashes).



Figures 8–12. *Campsurus argentinus*; (8–9) male genitalia in (8) ventral view; (9) lateral view; (10) detail of penes, ventral view; (11) detail of pedestal, ventral view; (12) detail of penes, lateral view.

Male imago

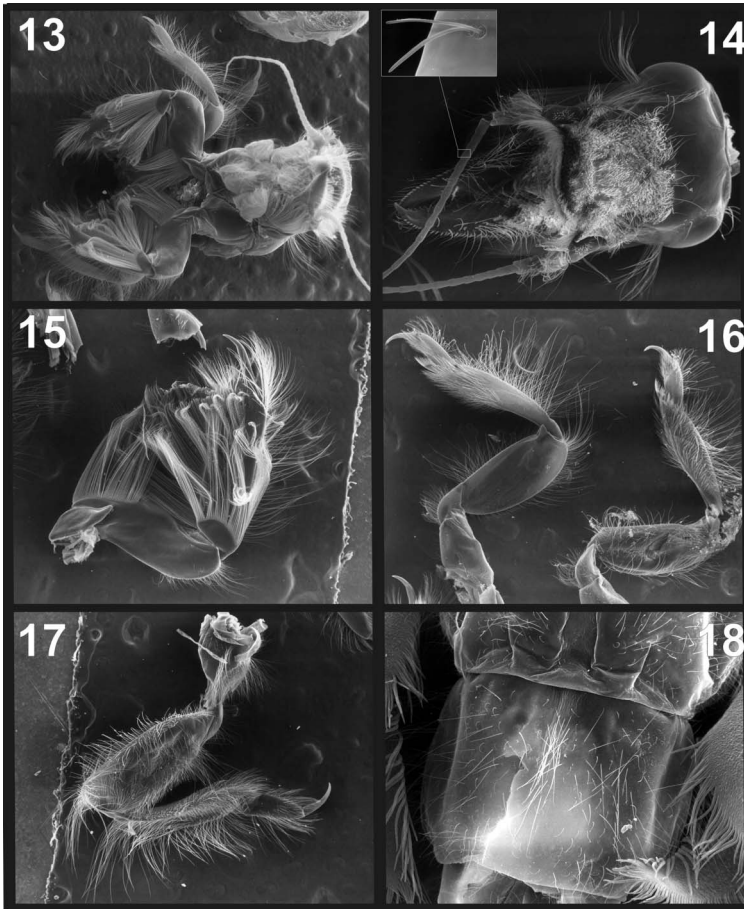
Length (mm): body, 10.8–11.0; forewing, 9.5–10.3; hind wing, 4.2; cerci, 28.0–30.1; fore leg, 5.0–5.2. General colouration yellowish white with brownish markings dorsally.

Head dorsally blackish (Figure 4), scape and pedicel brownish, flagellum hyaline.

Thorax. Pronotum translucent shaded brownish medially and laterally, blackish medial line well marked (Figure 4). Meso- and metanota shaded black on carinae. Pleura and sterna yellowish white except on prothorax shaded purplish grey; mesofurcasternal plates contiguous basally but diverging distally. Forelegs shaded purplish brown except apical 1/3 of each tarsite, pale; vestiges of middle and hind legs yellowish white.

Wings (Figures 35, 36). Membrane hyaline, except C and Sc areas tinged with brown; veins brownish, becoming darker towards fore margin.

Abdomen whitish translucent, shaded with brownish on terga (Figures 6 and 7): a thin medial line on terga IV–X, a paler band around it extending from terga I–VIII, and with shading darker more laterally; terga I–II with a pair of submedian small anterior marks, terga III–VII shaded more widely except on pale lateral transversal band (td in Figures 6, 7); terga VIII–IX widely pigmented and with small dark and pale marks; tergum X paler.



Figures 13–18. *Campsurus argentinus*, nymph; (13) general frontal view; (14) head, dorsal view; (15) foreleg, ventral view; (16) middle legs, ventral view (left), dorsal view (right); (17) hind leg, dorsal view; (18) abdominal sternum IX.

Genitalia (Figures 8 – 12) whitish yellow, forceps shaded grey, sclerotised apex of penes orangeish. Penes (Figures 10, 12) strongly curved ventrally, each penial arm twisted outwards and with its prominent dorsal (posterior) margin very sclerotised; ventral margin of each penial arm membranous and with a small cylindrical projection. Pedestals short and somewhat flattened, inner margin well developed and rounded, outer margin much smaller (Figure 11). Caudal filaments whitish translucent.

Female imago

Length (mm): body, 10.6–12.7; forewing, 12.6–14.7; hind wing, 5.4–6.3; cerci, 4.6; fore leg, 1.5–1.7. As in male, exceptions follow.

Head more heavily shaded with black (Figure 5). Foreleg paler, shaded slightly with purplish. Abdominal terga III–VII with a pale transverse band on lateral areas clearly indicated, spiracles surrounded with blackish; terga VIII–X more widely and strongly pigmented. Wing membrane whitish translucent shaded very slightly with

brown, longitudinal veins brownish, crossveins paler. Abdominal sternum VIII with a single bottle-like socket on median zone of fore margin, sternum with a grey dash at the base of this socket.

Mature nymph

Length of male (mm): body, 9.0; terminal filament, 6.0; cerci, 6.5. *Length* of female (mm): body, 9.2–13.0; terminal filament, 5.8–6.0; cerci, 6.0–7.5. General colouration whitish yellow with brownish marks.

Head (Figures 1, 13, 14) shaded brownish dorsally except on whitish genae and yellowish frontal projection. Mouthparts and antennae whitish except sclerotized areas, spines and thick setae yellowish to orangeish; mandibular tusks with variable number of denticles anteriorly to subbasal tubercle (5–10 on left tusk, 6–8 on right tusk).

Thorax. Pronotum shaded brownish almost in the entire dorsum, darker on medial line (pale longitudinal line surrounded by black parallel lines at each side) and other small marks (Figure 1); meso- and metanotum shaded mainly on median band, carinae darker. Wing buds shaded grey along main veins. Thoracic pleura and sterna without marks. Legs whitish except at joinings, yellowish. Forelegs with numerous fringed setae (Figures 13, 15); middle legs (Figure 16) and hind legs (Figure 17) with long and short simple setae.

Abdomen whitish shaded brownish dorsally with a pattern similar to that described for the male adult: tergum I shaded widely except on median band; terga II–VII shaded almost completely except on a long paler transverse band at each side; terga VIII–X widely shaded except on four submedian pale marks (partially fused in tergum 10) and an additional pair of sublateral pale marks in tergum VIII. Abdominal sterna without marks, sterna VIII–X with many long setae, longer on a median row of sternum IX (Figure 18). Gills (Figure 1): vestigial gill I whitish, bilamellate with a small and thin ventral lobe and a larger rounded dorsal lobe; gills II–VII with ventral lobe also smaller than dorsal lobe but increasing in length posteriorly, so on gill VII both lobes are subequal in length; fringes of gills whitish, lamellae widely brownish (somewhat paler on ventral lobe). Caudal filaments whitish covered with thin yellowish setae.

Biology

Mayflies are not widely known as silk producers but some Polymitarciidae nymphs have long been reported to produce silk from modified Malpighian tubules (Hartland-Rowe 1958; Sattler 1967). Nymphs of Asthenopodinae (*Asthenopus* and *Povilla*) use the silk to coat U-tunnels they burrow in different submersed plant tissues (Hartland-Rowe 1958; Sattler 1967). Campsurinae nymphs (the sister group of Asthenopodinae) burrow their tunnels in soft substrates like mud or sand (*Campsurus*) or in hard-clay river banks (*Tortopus*). Nymphs of an unidentified Amazonian species of *Campsurus* were reported to coat their burrows with silk, thus preventing their collapse (Sattler 1967). *Tortopus*, living in more stable substrates, apparently do not coat their tunnels (Scott, Berner and Hirsch 1959; Molineri 2008).

The nymphs of *C. argentinus* were collected in streams with a rocky substrate. Each nymph was found inside a cylindrical silk case (Figure 1) slightly fixed to the

upper surface of rocks, mainly in riffle zones but also in pools near the shore. Cases are made of a thin layer of silk with fine sediment on the outer surface. Both ends of the tube are completely open, and cases are large enough to hold the entire nymph inside. As the cases are very soft and poorly fixed to the rocks, their role seems related more to a camouflage than to a mechanic protection for the nymphs.

It is probable that the silk is produced in modified Malpighian tubules, as reported for other species of the genus (Hartland-Rowe 1958; Sattler 1967). It has been reported that the silk produced in insect Malpighian systems are not delivered through a specialised spinning organ (Craig 1997), and concordantly in the case of *C. argentinus* the silk is apparently liberated from the anus. A mediolongitudinal row of long setae on abdominal sterna IX (Figure 18) may help during case construction, but this behaviour was not observed.

Discussion

All three species treated here form a monophyletic group (below “*C. major*-group”) defined by characters from male genitalia. Domínguez et al. (2006) included the species of the *C. major*-group in a larger assemblage (*C. albifilum*-group). Both groups of species share some synapomorphies in male genitalia (penes with an additional membranous ventral lobe and pedestals relatively flat. The *C. major*-group is defined here by the following apomorphies (characters that can be used to separate the three species of the group from all other species in the genus): (1) pedestals robust, with a widely rounded inner-posterior margin and a smaller and thinner outer margin (Figures 11, 24, 34); (2) penes strongly sclerotised and curved ventrally, each lobe twisted outwards, and with a small membranous lobe on ventral margin (Figures 8–10, 23–26, 30–33); (3) male gonopore large, clearly visible on the apex of penial lobe, and opening towards the medial line (Figures 10, 23, 33).

The useful characters to separate *C. argentinus* from the other two species in the group are, in the adults

- (1) medium size (body 10.8–13.0 mm, forewings 9.5–13.0 mm);
- (2) blackish pigments on dorsum of head widely and strongly marked in fresh material (Figures 4 and 5);
- (3) pronotum shaded blackish, including the medial line (Figures 4 and 5);
- (4) abdominal colour pattern with clearly pale transverse dashes on terga II–VII (Figures 6 and 7);
- (5) pedestals with both posterolateral margins (inner and outer) approximately of the same length (Figure 11);
- (6) penes relatively slender and moderately twisted (Figures 10 and 12).

In mature nymphs, the above characters (2)–(4) are also useful to distinguish the species, but character (3) may show variations (pronotum with a thin pale longitudinal line surrounded by black parallel lines at each side); other characters are

- (1) mandibular tusks with variable number of denticles anteriorly to sub-basal tubercle (5–10 on left tusk, 6–8 on right tusk);
- (2) wing buds shaded grey along main veins;
- (3) gills II–VII with lamellae widely shaded with brownish, somewhat paler on ventral lamellae (Figure 1).

Campsurus pallidus Needham & Murphy was described for one male from Alto Parana (above the locality of Posadas in Argentina), with a body length of 9 mm and fore wings of 12 mm (Needham and Murphy 1924, p. 20). *Campsurus argentinus* Esben-Petersen (1912) was also described from one male from Alto Parana (between Posadas and Corrientes), with a length of 13 mm for the body and the fore wing. At the moment both species are not distinguishable since the genitalia, wing venation, size range and general colouration coincide completely. For these reasons *Campsurus pallidus* Needham & Murphy (1924) is proposed here as a junior subjective synonym of *C. argentinus* Esben-Petersen (1912).

Distribution

This species was previously known from Argentina-Paraguay border (Alto Paraná), and is reported here for the first time from Brazil (Rio Grande do Sul) and Uruguay.

Campsurus major Needham & Murphy, 1924 (Figures 2, 3, 19–26, 37, 38)

Campsurus major Needham & Murphy, 1924: 17 (male); Traver, 1947: 378.

Campsurus brasiliensis Traver, 1944: 36 (male), new synonym.

Type material. *Campsurus major* holotype ♂ imago, slides (CUIC N° 618.1) with genitalia and 1 pair of wings from ARGENTINA, Buenos Aires, 16-XII-1898. Five additional slides (also from CUIC, designated as paratypes by Traver 1947), same data as holotype, representing three ♂ imagos (genitalia, wings, forelegs and head).

Additional material. Twenty seven ♂ and 6 ♀ imagos (IML) from ARGENTINA: Misiones, P.N. Iguazú, rio Iguazú, Puerto Canoas, S 25° 41' 39" – W 54° 26' 51", 26/XI/1998, E. Domínguez et al. cols.; 1 ♂ imago (IML) from ARGENTINA: Misiones, P.P. Urugua-i, A° Uruzú, S 25° 51' 29" – W 54° 10' 10", 7–11/XII/1999, C. Molineri col. Eight ♂ imagos (FAMU) from BRASIL: Parana, rio dos Patos, 3 km E of Prudentópolis, 16/III/1969 W.L. & J.G. Peters cols. Eleven ♂ imagos (MCR) from URUGUAY: Paysandu, Santa Rita, XII-1959, Carbonell col.; 1 ♂ imago (MCR) from URUGUAY: Maldonado, R60 km 23, A° El Rodeo, S 34° 40' 20" – W 55° 14' 15", 75 m, 7/XI/2008, D. Emmerich col.; 4 ♂ (IML slide 379) from URUGUAY: Treinta y Tres, Qda. de los Cuervos, S 32° 55' 27.3" – W 54° 27' 34.4", 125 m, light trap, 8/XI/2004, D. Emmerich col.; 6 ♂ adults (IML) from URUGUAY: Cerro Largo, A° Tacuarí, S 32° 31' 51" – W 54° 07' 48", 92 m, light trap, 20/II/2008, D. Emmerich & C. Molineri cols.; 1 ♂ subimago (IML) from URUGUAY: Durazno, Sarandí del Yi, Río Yi, S 33° 20' 41" – W 55° 37' 07", 132 m, 22/II/2008, D. Emmerich & C. Molineri cols.; 4 nymphs (IML, MCR) from URUGUAY, Rivera, Tranqueras, A° Tacuarembó, S 31° 10' 40" – W 55° 45' 44", 147 m, 19/II/2008, D. Emmerich & C. Molineri cols.

Male imago

Length (mm): body, 13.2–16.0; forewing, 12.0–14.2; hind wing, 5.2–6.0; cerci, 32.0–42.0; foreleg, 5.5–7.2. General colouration yellowish white with very few dark markings.

Head shaded purplish gray dorsally, stronger between ocelli, a transverse black line (shallow V-mark) extends between lateral ocelli, posteriorly to this line the shading is much paler (Figure 19). Antennae: pedicel shaded purplish grey, also scape but paler.



Figures 19–22. *Campsurus major*, imago; (19) male head and pronotum; (20) female head and pronotum; (21) male abdomen, dorsal view; (22) male abdomen, lateral view.

Thorax. Prothorax translucent, diffusely shaded with gray dorsally except on mediolongitudinal line (Figure 19). Meso- and metathorax yellowish white without markings. Foreleg shaded rather uniformly with purplish grey; middle and hind legs yellowish white.

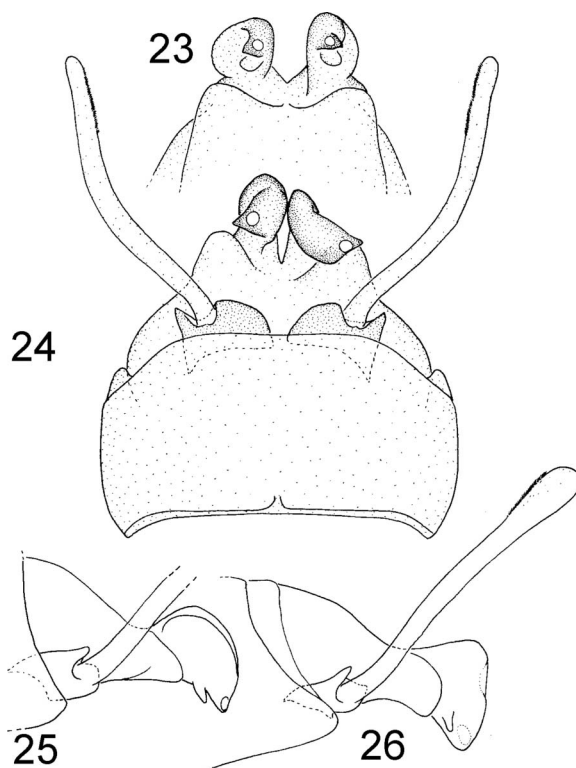
Wings (Figures 37 and 38). Wing membrane hyaline; veins C, Sc & R (and crossveins therein) shaded brown on basal 2/3, remaining veins yellowish to whitish translucent.

Abdomen. Pattern similar to that described for the males of *C. argentinus* but the pale lateral (or transversal dashes) marks are less distinguishable and blurred (Figures 21 and 22).

Genitalia (Figures 23 – 26) whitish except pedestals yellowish white, and sclerotised portions of penes orangeish. Pedestals with rounded inner margin, outer margin short and acute (Figure 24); penes (Figures 23, 25, 26) very similar to *C. argentinus* but larger, each lobe very wide and strongly twisted, the dorsal (posterior margin) strongly developed; a small membranous projection is also present on ventral margin of each penes. Caudal filaments whitish translucent.

Female imago

Length (mm): body, 13.8–15.7; forewing, 15.5–17.0; hind wing, 8.0; cerci, 5.3; foreleg, 1.8–2.5. Head colour pattern as in Figure 20. Rest as male except purplish grey



Figures 23–26. *Campsurus major*; (23) detail of penes, ventral view; (24) male genitalia, ventral view; (25–26), male genitalia, lateral view.

marks present on mesonotal carinae; wing membrane whitish translucent; abdomen shaded very slightly with purplish grey. Abdominal sternum VIII as described for the previous species.

Nymphs (immature) (Figures 2 and 3)

Head colour pattern similar to male imago (with a black transverse line between ocelli) (Figure 3); frons and genae not shaded, paler than the rest; with a pair of occipital submedian star-like greyish marks. Mouthparts and antennae whitish except sclerotised areas, spines and thick setae yellow to orangeish; all the nymphs studied ($n = 4$) show six denticles anteriorly to sub-basal tubercle on left mandibular tusk and seven denticles on the right tusk.

Thorax. Pronotum shaded diffusely with grey on anterior $2/3$ of their length, mediolongitudinal line paler. Meso- and metanotum with small irregular grey marks medially and costal veins of wingbuds. Legs whitish with yellowish setae and articulations.

Abdomen yellowish white shaded brownish submedially on terga I–II, terga III–VII shaded more widely except on thin transversal pale dashes (broken by dark pigments at middle); terga VIII–X widely shaded except on four submedian pale marks (partially fused in tergum X) and an additional pair of sublateral pale marks in tergum VIII. Abdominal sterna without marks, sternum IX with long

medial setae. Gills II–VII widely shaded with brownish, restricted to trachea in ventral lamellae (Figure 2). Caudal filaments whitish covered with thin yellowish setae.

Biology

We only collected four immature nymphs attributable to this species, one of the nymphs was found inside a hollow stick with some parts glued together by thin silk filaments. No silk case was observed in this species.

Discussion

The characters useful to separate *C. major* from the other species of the *C. major*-group are, in the adults

- (1) larger size (body 13.2–16.0 mm, forewings 12.0–16.0 mm);
- (2) blackish pigments on dorsum of head mainly restricted to a transversal shallow V-mark between ocelli (Figures 19 and 20);
- (3) pronotum shaded greyish to blackish, except on paler medial line (Figures 19 and 20);
- (4) abdominal colour pattern weak and not forming completely distinguishable pale transverse dashes on terga II–VII (Figures 21 and 22);
- (5) pedestals with outer posterolateral margin somewhat longer than the inner one (Figure 24);
- (6) penes large, wide, strongly twisted (Figures 23 – 26).

In mature nymphs, the above characters (2) to (4) are also useful to distinguish the species, and also:

- (1) mandibular tusks with six denticles anteriorly to sub-basal tubercle on left tusk and seven on the right tusk;
- (2) wing buds shaded grey on costal margin;
- (3) gills II–VII with dorsal lamellae widely shaded with brownish, restricted to trachea in ventral lamellae (Figure 2).

Campsurus major Needham & Murphy (1924) was described for a single male from Buenos Aires (16-XII-1898, M. Baer col.), with a body length of 13 mm and a forewing of 20 mm. Traver (1947) corrected the length of the wing to 16 mm, and designated three additional male imagos as paratypes. *Campsurus brasiliensis* Traver (1944) was described from 42 male imagos from Brazil (Rio Grande do Sul, Lagoa dos Quadros, XI-1941, H. Kleerekoper col.). The author separated this species from *C. major* because this last species presents (1) general colouration yellowish, (2) in the hind wings the cross veins of C area are better visible, and (3) there is a network of cross veins in the anal margin of hind wings. All these characters are variable among the material studied and thus are not reliable to separate both species. The general colouration is always very pale but varies from whitish to yellowish even between individuals of the same population. The hind wings present cross veins in costal area normal to weak, and the cross veins in anal area may be strongly to not anastomosed at all (even between the

two wings of the same specimen). For these reasons we here propose *Campsurus brasiliensis* Traver as a junior subjective synonym of *Campsurus major* Needham & Murphy.

Distribution

Originally described from Buenos Aires (Argentina) and Rio Grande do Sul (Brazil), we here firstly record this species from Parana (Brazil), NE Argentina (Misiones) and Uruguay.

Campsurus amapaensis sp. nov. (Figures 27–34, 39–40)

Type material. Holotype (INPA) and paratype (IML) ♂ imagos from BRAZIL: Amapá, Município de Amapá, Cachoeira Grande, 21/XII/2008, light trap, I. Santos Andrade col.

Male imago

Length (mm): body, 8.5–11.0; forewing, 9.0–9.8; hind wing, 4.3–5.0; cerci broken off and lost; foreleg, 4.0–4.3. General colouration yellowish white, dark shading on dorsum of abdomen.

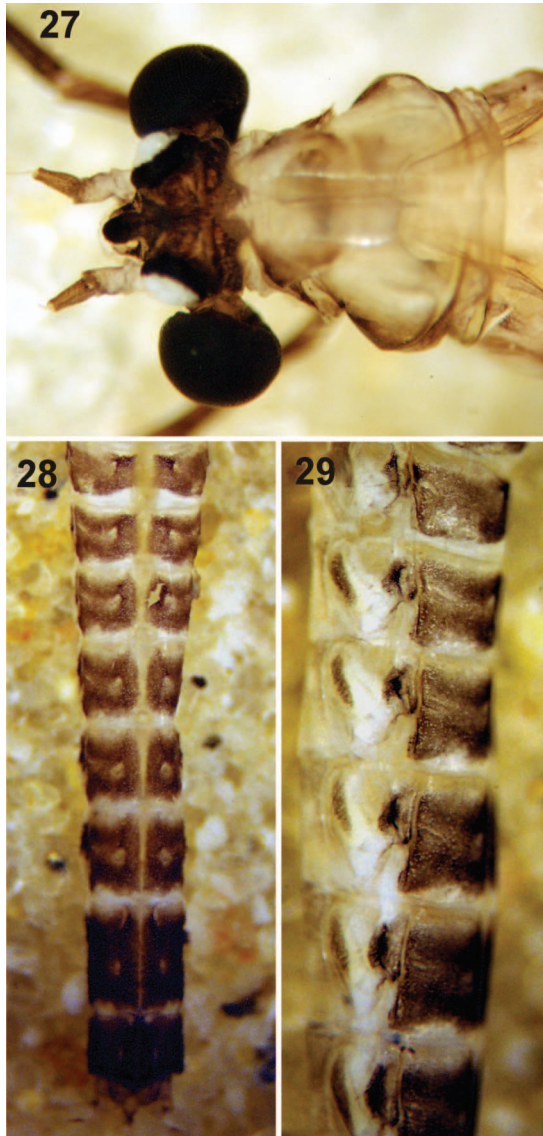
Head shaded purplish grey on the entire dorsum (Figure 27). Antennae with scape whitish shaded with hyaline.

Thorax. Pronotum yellowish translucent shaded diffusely with grey, darker on carinae and mediolongitudinal line (Figure 27); propleura and sternum yellowish white shaded grey more strongly, a blackish mark is present posterolaterally to coxae I. Mesonotum whitish yellow with a light grey medial mark between posteroscutal protuberances (PSP), carinae and medial line shaded grey; mesopleura and sterna whitish yellow with some grey shading on carinae, wing base and furcasternum. Metathorax whitish yellow with few grey stripes. Foreleg shaded rather uniformly with dark purplish grey, except at bases of tarsomeres and claws, slightly paler; middle legs shaded grey almost completely, hind legs shaded grey more slightly.

Wings (Figures 39 and 40). Wing membrane hyaline except C and Sc spaces slightly tinged with purplish grey; longitudinal and cross veins light purplish grey; hind wing with paler veins.

Abdomen (Figures 28 and 29) translucent whitish shaded with grey dorsally, except on medial line whitish, terga shaded more strongly posteriorly; pattern similar to the other two species, pale lateral marks on terga II–VII “broken” at the middle, the medial portion of these marks tending to form well defined submedian pale circles on terga V–VII; terga VIII–IX with two pairs of small submedian pale marks; tergum X pale yellow almost without shading.

Genitalia (Figures 30 – 34) whitish except pedestals and apex of penes yellowish; forceps strongly shaded with black. Pedestals narrow, longer than wide, with rounded inner margin ending in a somewhat acute point, outer margin completely reduced (Figure 34); penes (Figures 32 and 33) wide at base becoming thinner apically, twisted moderately, apex of penes acutely projected; small membranous projection present on ventral margin of each penes. [Caudal filaments broken off and lost.]



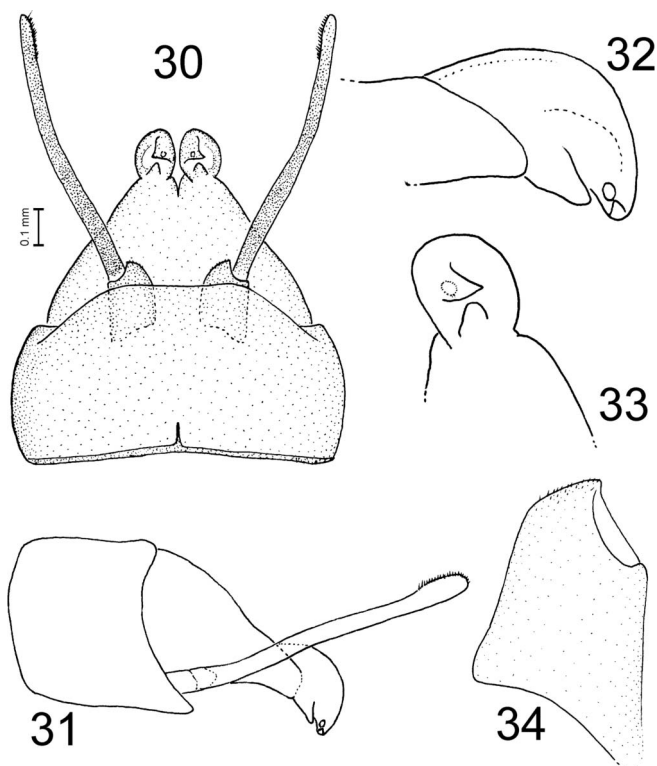
Figures 27–29. *Campsurus amapaensis* sp. nov., male imago; (27) head and pronotum; (28) abdominal segments II–X, dorsal view; (29) abdominal segments II–VII, lateral view.

Female imago and nymph unknown.

Discussion

The characters useful to separate *C. amapaensis* sp. nov. from the other two species of the *C. major*-group are, in the adults

- (1) small size (body 8.5–11.0 mm, forewings 9.0–9.8 mm);
- (2) blackish pigments on the entire dorsum of head (Figure 27);



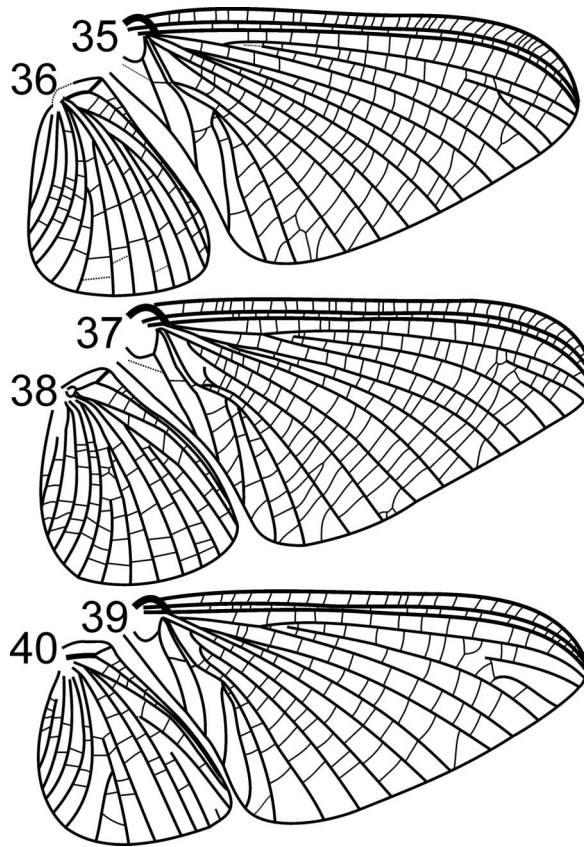
Figures 30–34. *Campsurus amapaensis* sp. nov.; (30) ventral view; (31) lateral view; (32) tip of penis lobe, lateral view; (33) tip of left penis lobe, ventral view; (34) detail of pedestal, ventral view.

- (3) pronotum shaded greyish, blackish medial line present (Figure 27);
- (4) abdominal colour pattern strongly marked (Figures 28 and 29), pale transverse dashes on terga II–VII broken at middle and forming pale submedian circles (mainly on V–VII);
- (5) pedestals narrow, outer posterolateral margin reduced, inner margin rounded but with acute apex (Figure 34);
- (6) penes moderately twisted, similar to *C. argentinus* but with a more acute apex (Figures 32 and 33).

Campsurus amapaensis sp. nov. is very similar to *C. argentinus*, sharing some features of colour pattern (head and thorax) and form of penes, but the new species can easily be distinguished because of their narrow pedestals (Figure 34) and abdominal colour pattern (Figures 28 and 29).

Distribution

Known only from the type locality, in northeast Brazil (Amapá).



Figures 35–40. Male wings; (35–36) *C. argentinus*, (35) forewing; (36) hind wing; (37–38) *C. major*, (37) forewing; (38) hind wing; (39–40) *C. amapaensis* sp. nov.; (39) forewing; (40) hind wing.

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