



Redescription of *Chilenoperla puerilis* (Gripopterygidae: Plecoptera) from the eastern Andes of Patagonia

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Abstract

The male and the last instar larva of *Chilenoperla puerilis* Illies (Gripopterygidae) are redescribed from Chubut Province, Argentinean Patagonia. Wing venation previously not described, differs from other described species in the genus. The larva is separable from that of *C. elongata* Vera and *C. puelche* Vera. Comments on the generic and specific position of the material studied and similarities and differences among the genera *Chilenoperla* Illies and *Pelurgoperla* Illies are included. Until new systematic and phylogenetic evidence becomes available no taxonomic changes are proposed.

Key words: Stoneflies, Argentina, taxonomy

Introduction

The genus *Chilenoperla* was established by Illies (1963) to include three new species from the eastern slope of the Andes in southern Chile: *Chilenoperla semitinctoria* (type species), *C. beschi* and *C. puerilis*. The latter species was described based on a pharate male dissected from a late instar larval exuviae. Illies (1963) described the males of the three species, the females of *C. semitinctoria* and *C. beschi*, and the larva of *C. puerilis*.

Nelson (1973) described his new species *C. illiesi*, based on two males and two females from Chile (which were part of the original type series of *C. beschi*) and one male (designated as the Holotype) from Bariloche, Río Negro State, Argentina, in the western slope of the Andes. Nelson (1973) also provided a key for adult males, a phylogenetic analysis of the known species and redescribed Illies's species based on the examination of the type material.

Vera (2008) described *C. elongata*, from male, female, and larval specimens from Chile. The larva of this species is extremely similar to that of *Pelurgoperla personata* Illies, 1963, which cover themselves with soil particles. Vera (2012) described an additional species, *C. puelche* and the larva of this taxon is virtually identical to that of *C. elongata*. The larval morphology is clearly different from that of *C. puerilis* which does not cover itself with detritus and possesses a characteristic dense row of spine-like setae on the thoracic margins.

Illies (1963) distinguished *Chilenoperla* from *Pelurgoperla* mainly based on incomplete transverse veins in fore wing, hind wing margins with spots, fork of CuA in hind wing long and usually with transverse veins (*Chilenoperla*) and few or no incomplete transverse veins in hind wing, hind wings of uniform color, fork of CuA in hind wing short and without transverse veins (*Pelurgoperla*). Vera (2008, 2012) described both short and long CuA in hind wing in *C. elongata* and few incomplete transverse veins in *C. puelche* and suggested, based on larval morphology, that *Chilenoperla* may represent two different genera.

Material and methods

Figures were drawn with the aid of a camera lucida coupled to a Leica MZ6 stereomicroscope. All the specimens are deposited in the “Centro de Investigaciones Esquel de Montaña y Estepa Patagónicas (CIEMEP)” collection,

Esquel, Chubut, Argentina. Larvae and adults were associated based on larvae reared and emerged in laboratory, using a small bucket filled with water and rocks from the collection site and aerated within a refrigerator at approximately 12 °C. Biogeographical areas follow Morrone (2006).

Results

Chilenoperla puerilis

Figs. 1–4

Chilenoperla puerilis, Illies, 1963: 226–227, figs. 39 and 42 (Male description based on a pharate male, larval description (under the name *C. brundini*; lapsus), type locality: Laguna Margarita, Peulla, Province Llanquihue, Chile). Miserendino & Pizzolon 2000, altitudinal zonation in Patagonian macroinvertebrates; Miserendino 2001, macroinvertebrate assemblage in Patagonian streams; Velázquez & Miserendino 2003, macroinvertebrate functional groups in Patagonia.

Chilenoperla semitincta, Pessacq & Miserendino 2008, first species record for Argentina (specimen from Yrigoyen stream, National Park “Los Alerces”); Pessacq 2009, species list.

Material studied. Two male adults, ARGENTINA, Chubut Province, Esquel Stream, 12 km from Esquel, road access to “La Hoya” ski resort, 42°50'28" 71°15'55", 6/XI/2012, P. Pessacq leg. One male, same as previous except for: 1/XI/2007. One male same as previous except for: reared in laboratory, emerged 28/XI/2012. One female, same as previous except for: reared in laboratory, emerged 7/XI/2012. Four final instar larvae and four F–I instar larvae, same as previous, except died during rearing, 14/XI – 17/X /2012. One male, National Park “Los Alerces”, Yrigoyen Stream at junction with National Route 71, 42°30'57" 71°21'43", 11/XI/2009, P. Pessacq leg.

Diagnosis. Adult: Slender, brown, medium size gripopterygid. Posterior sclerite clearly demarcate from central sclerite, subapical, with a short spiniform process directed ventrally; epiproct well developed, with two lateral rows of teeth. Wing with RA-RP fork short, without transverse veins; CuA in hind wing short, without transverse veins. Larva: Slender, brown, medium sized Plecoptera, margins of pro-, meso-, metanotum and abdominal segment margins with a dense row of short, thick, spine-like setae.

Adult redescription. Head. Brown, labrum and clypeus light brown, frons brown with two lateral black spots on its middle line and two smaller spots posterior to these. Two black lateral spots in front of the posterior ocelli. Ventral surface of head light yellow, except for darker palps and sclerotized mandible. Maxillae with a five-segmented palp, fifth and third palpomeres about equal and the longest, followed in length by the fourth and second, first the shortest. Antenna 5 times longer than head width, covered with hair-like setae, scape about two times as long and wide as pedicel; flagellum, with 44–46 annuli. **Thorax.** Dark brown, almost black. Pronotum 1.5 as wide as long, covered with small hair-like setae, more dense and long in the anterior side, margins straight, lateral margins slightly convergent anteriorly, corners rounded. Legs brown, long and slender, covered with small hair-like setae and long needle-like setae in extensor margin, femur II and III basally yellow, tibiae with a wide yellow medial band. Wings (Fig. 2) light brown, transverse veins complete, but some small light areas close to main venation in fore wing may suggest a very few incomplete veins. RA-RP fork short, without transverse veins, CuA short, without transverse veins. **Abdomen.** Brown. sternites II– VIII rectangular. Tergum X (Fig. 1) with an anterior triangular membrane. Anterior sclerite greatly narrowed medio-dorsally, forming two plates that meet in one point (Fig. 1 material from La Hoya Stream) or in a narrow band (Fig. 2a, material from Yrigoyen stream) without dorso-lateral tubercles. Lateral and central sclerites fused, anterior margin slightly convex, in dorsal view wide basally and gently tapering to apex in basal half, strongly tapering to apex in apical half, apex rounded. Posterior sclerite small but clearly demarcated from central sclerite, subapical in the ventral margin of central sclerite, visible in dorsal view, well sclerotized, with a short spiniform process directed ventrally. Epiproct well developed, with two lateral rows of four slightly variably sized teeth (Figs. 1a, 2b). Paraprocts (Fig. 1a) well developed, curved upwards and surpassing segment X distal margin, apex rounded. Cerci composed of seven segments, covered with curved hair-like setae.

Measurements (in mm, n=5): total body length 8.75± 0.8, head max. width 1.68 ± 0.1, antennae 8.24 ± 0.57, maximum pronotal width 1.47 ± 0.02, maximum pronotal length 1.47 ± 0.02, fore wing 10.125 ± 0.43, cerci 0.52 ± 0.08.

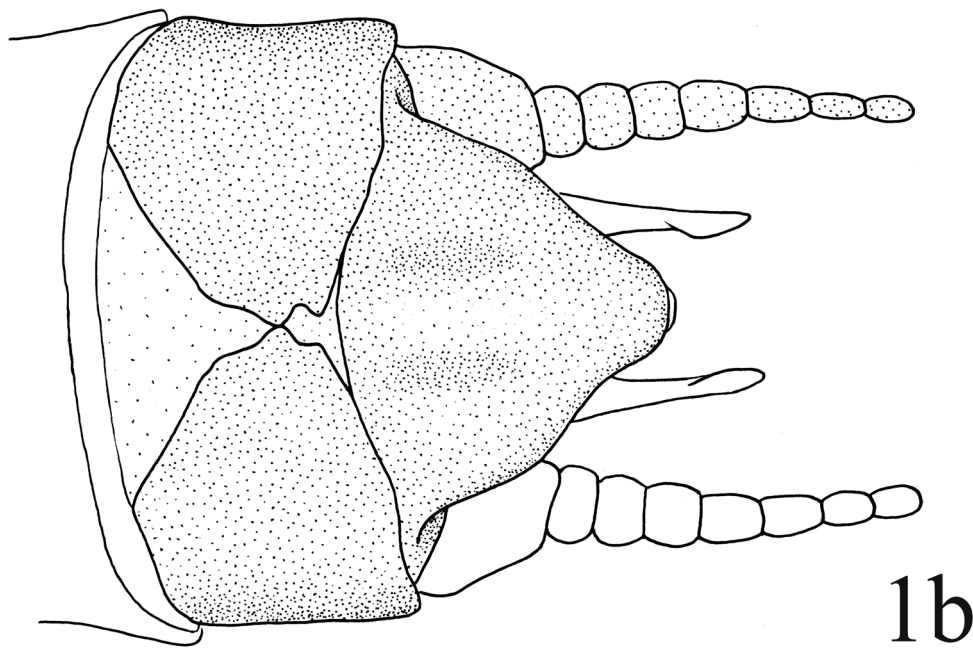
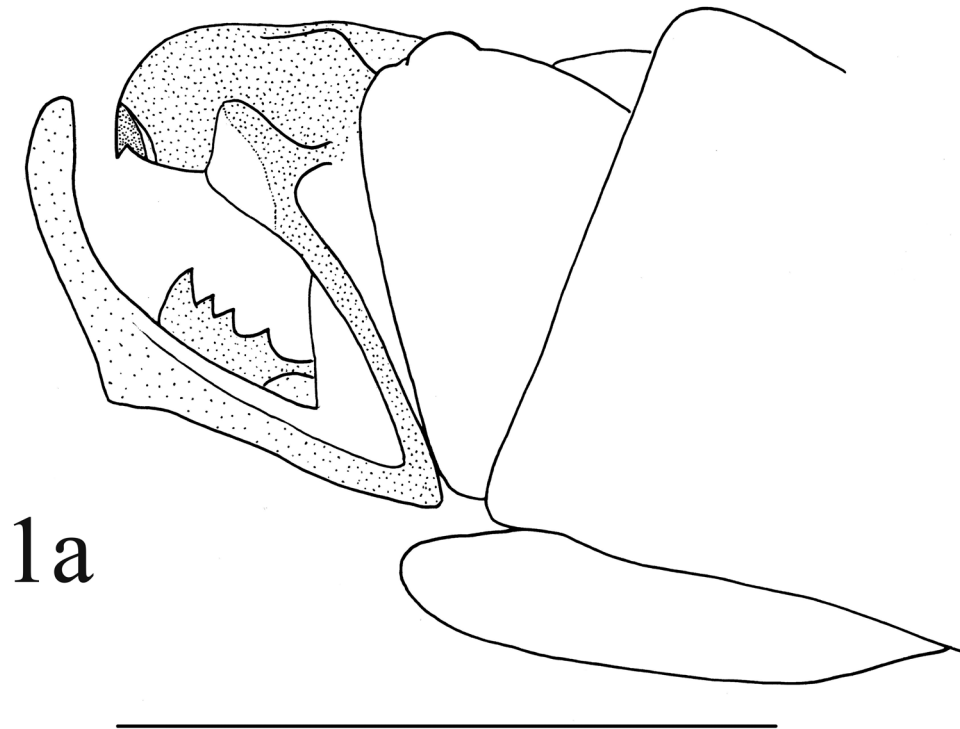


FIGURE 1. Genitalia of *Chilenoperla puerilis*. Adult male (La Hoya Stream). 1a, genitalia, lateral view. 1b, genitalia, dorsal view.

Last instar larva description. The habitus is as illustrated by Illies (1963). **Head.** Brown, densely covered by short spine-like setae. Eyes small, three small ocelli. Cephalic suture poorly visible. Antenna about as long as 3.8 times maximum head width, densely covered with hair-like setae; flagellum with 60–70 annuli. Mandibles as in Fig. 4. Maxilla (Fig. 4f) with palp proportions approximately 1:2:4:3:4. Galea and lacinia as in Fig. 4f. Labium (Fig. 4e) longer than wide, with a three-segmented palp covered with short hair-like setae, distal palpomere longest, basal one shortest. **Thorax.** brown; covered with hair-like setae, all margins, including wing pads with a dense row of short, thick spine-like setae (Figs. 3a–b). Pronotum (Fig. 3a) dark brown, rectangular, angles rounded, about 1.6 times as wide as long, lateral margins straight or

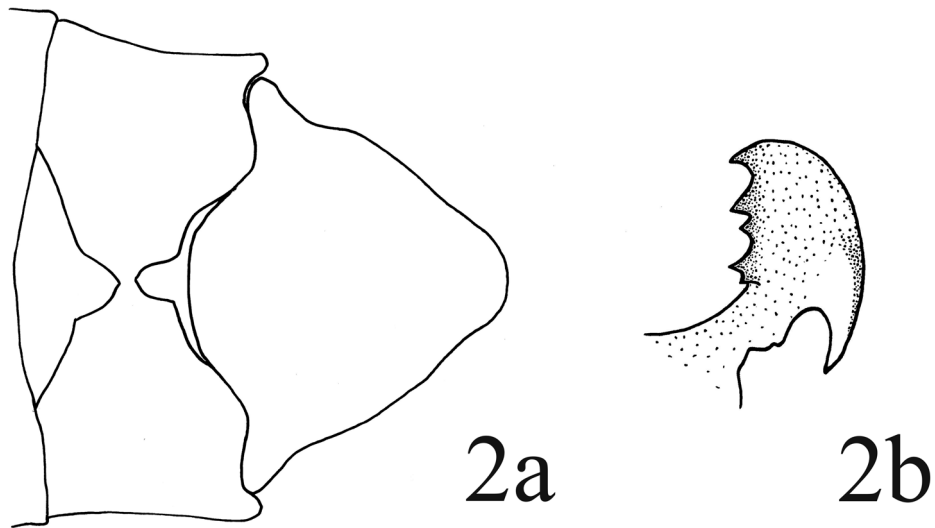


FIGURE 2. Tergum X and epiproct of *Chilenoperla puerilis*. Adult male (Yrigoyen Stream). 2a, tergum X, dorsal view. 2b, epiproct lateral view.

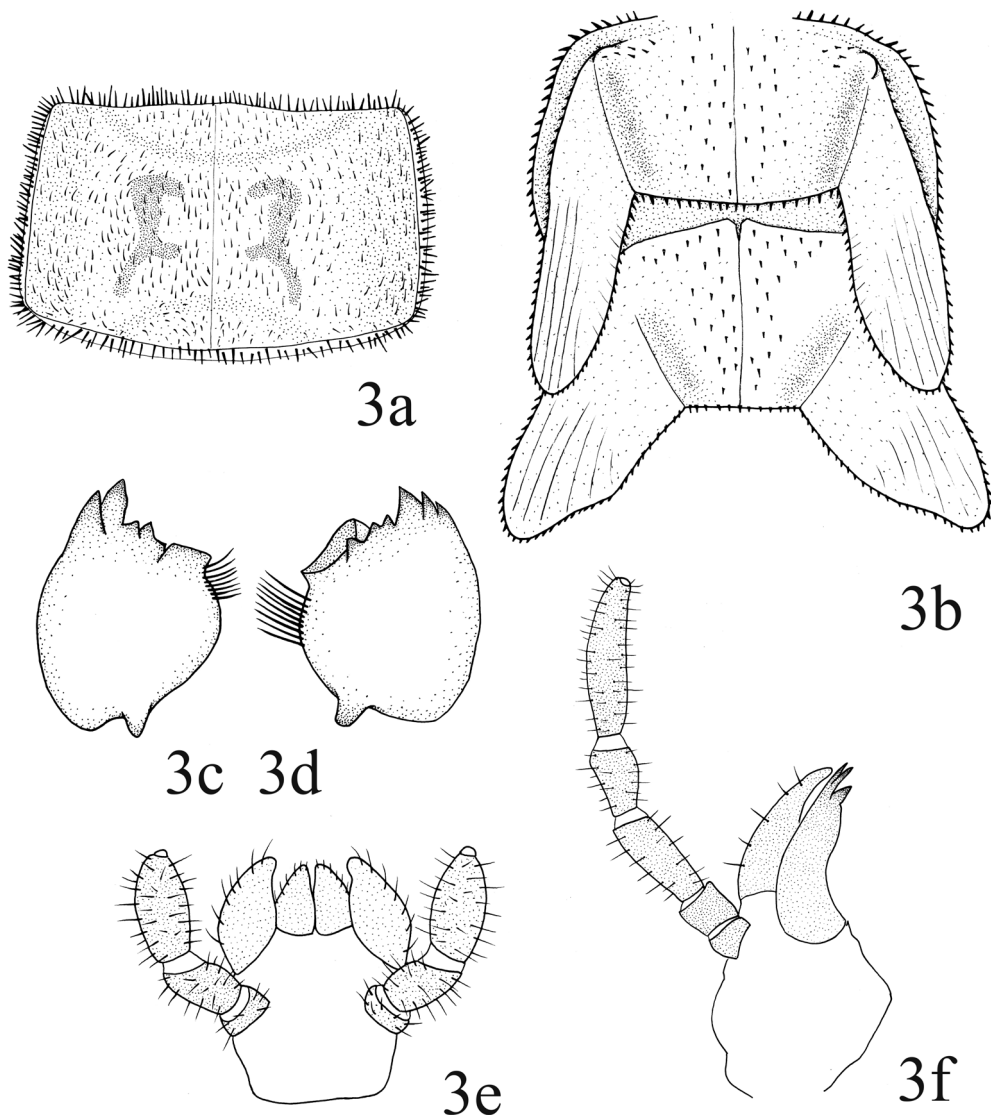


FIGURE 3. Larva of *Chilenoperla puerilis*. Last instar larva (Esquel Stream). 3a, pronotum, dorsal view. 3b, meso and metanotum, dorsal view. 3c, d, mandibles in ventral view. 3e, labium, dorsal view. 3f, right maxilla, dorsal view.

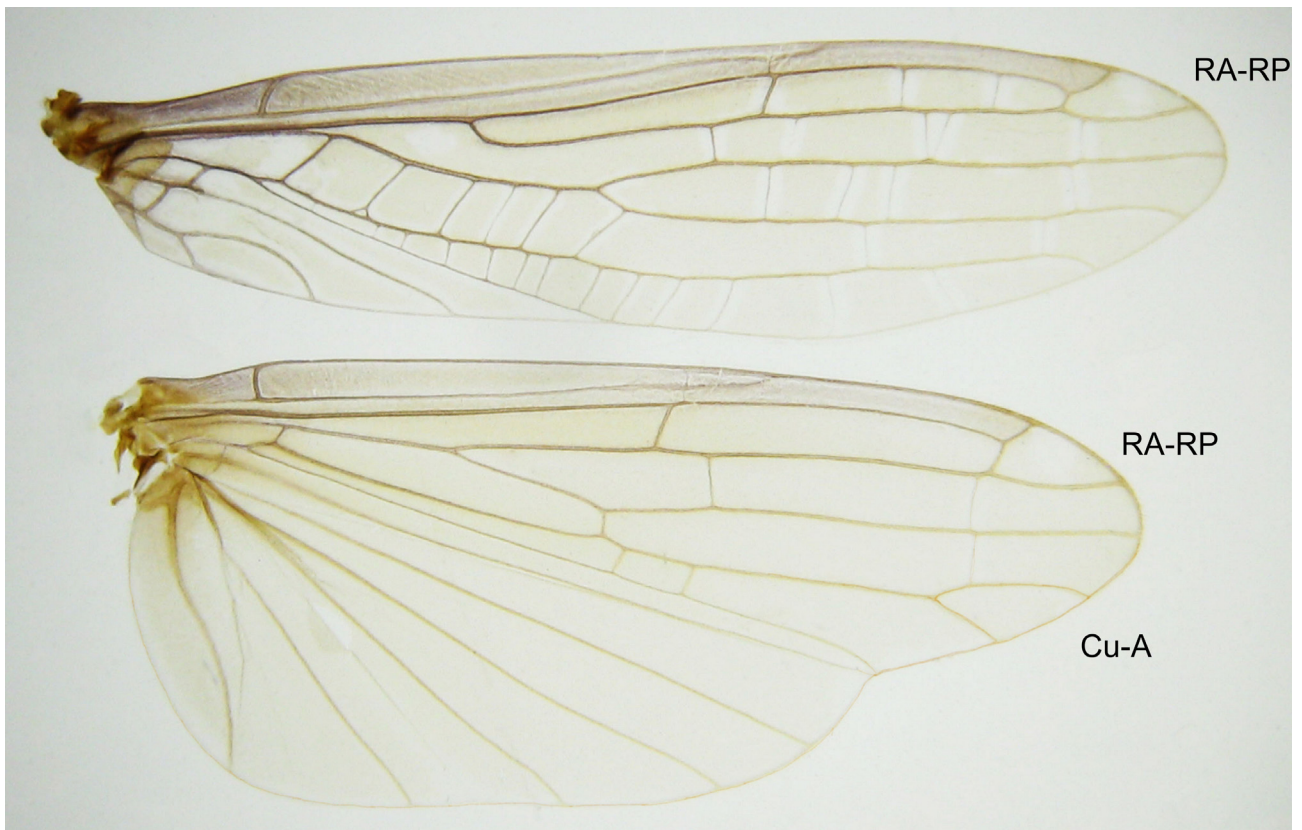


FIGURE 4. Wings of *Chilenoperla puerilis*. Adult male (Yrigoyen Stream). 2a, fore wing. 2b, hind wing.

slightly convex, anterior margin slightly concave, elevated on its middle section, posterior margin convex. Mesothoracic wingpads slightly divergent; metathoracic wingpads strongly divergent (Fig. 3b). Legs brown, tibiae with a wide middle yellow band; legs covered with thin short hair-like setae and sparse, straight and long needle-like setae on extensor margin. Tarsi brown, proportions of segments about 2:1:3. **Abdomen.** Brown, its dorsal surface covered with hair-like setae, more dense in the surface of segment X. Margin of all segments with a dense row of short spine-like setae. Tergites and sternites of segments I and II divided by a membranous area, those of segment III incompletely divided, remaining segments forming a complete ring; segment X large, with posterior margin rounded. Cercus composed of 20–25 annuli, each of them progressively thinner and longer to apex. Anal gill with many filaments.

Distribution. Valdivian Forest Province (Andean region, Subantarctic subregion, Chile, type locality: Laguna Margarita, Peulla, Province Llanquihue, Chile). Subandean Patagonia province (Andean region, Patagonian subregion, Chubut Province, Argentina) in the ecotone between *Nothofagus* forest and Patagonian steppe (La Hoya Stream) and in the *Nothofagus* forest (Yrigoyen Stream).

Discussion

Chilenoperla puerilis was described from a single paratype male with “adult anatomical features not completely developed” (Nelson 1973). Illies' (1963) description and Nelson's (1973) redescription clearly indicate differences in the genitalia of the material here described, suggesting specific differences, but these differences may also be due to the paratype condition of the Holotype male. These differences in specimens examined include the smaller and apical posterior sclerite directed apically and the central sclerite narrower in lateral view, and with a wider apex in dorsal view as described for *C. puerilis* by Nelson (1973). Dr. P. Zwick kindly sent me images of the segment X of *C. puerilis* that agree with Nelson's (1973) illustrations. Unfortunately, the type specimen of *C. puerilis* is in poor condition, faded, and the paraprocts cannot be observed.

The material herein described does not possess all the wing characters as mentioned by Illies (1963) for

Chilenoperla, but the genitalia show the typical structure for the genus. The wings of *C. puerilis* are apparently lost (P. Zwick, pers. comm.). The genitalia of *C. puerilis* are very close to those of *C. puelche* and *C. semitincta*. From the first species, *C. puerilis* can be distinguished by the completely different larval morphology (*C. puelche* has a stout larva covered with soil particles, very similar to that of *Pelurgoperla*; larva of *C. semitincta* are unknown). Adults can be distinguished by wing characters given in Table 1 and minor genitalic differences.

TABLE 1. Larva, wing, and genitalia characters of *Pelurgoperla personata* and *Chilenoperla* species.

	Larva	RA-RP bifurcation in FW	RA-RP bifurcation in HW	CuA bifurcation in HW	Crossveins in FW
<i>Chilenoperla semitincta</i>	?	Long, crossed	Long, crossed	Long	Most of them incomplete
<i>C. beschi</i>	?	Long, crossed	Long, crossed	Long	Most of them incomplete
<i>C. puerilis</i>	Clean, slender	Short, not crossed	Short, not crossed	Short	Most of them complete
<i>C. illiesi</i>	?	Long, crossed	Long, crossed	Long	Most of them complete
<i>C. elongata</i>	Covered by particles, stout	Long, crossed	Long, crossed	Long or short	Most of them incomplete
<i>C. puelche</i>	Covered by particles, stout	Long, crossed	Long, crossed	Long	Most of them complete
<i>Pelurgoperla personata</i>	Covered by particles, stout	Long, crossed	Long, not crossed	Short	Most of them complete

continued.

	Lateral and central sclerites	Central sclerite apex	Posterior and central sclerites	Paraproct
<i>Chilenoperla semitincta</i>	Fused	Short and wide	Clearly demarcated	Almost straight, apex pointed
<i>C. beschi</i>	Not fused	Moderately long, narrow	Not clearly demarcated	Almost straight, apex pointed
<i>C. puerilis</i>	Fused	Short and wide	Clearly demarcated	Slightly curved, apex rounded
<i>C. illiesi</i>	Not fused	Long and narrow	Not clearly demarcated	Almost straight, apex pointed
<i>C. elongata</i>	Not fused?	Long and narrow	Clearly demarcated	Slightly curved, apex slightly pointed
<i>C. puelche</i>	Fused	Short and wide	Clearly demarcated	Slightly curved, apex pointed
<i>Pelurgoperla personata</i>	Fused	Short and narrow	Clearly demarcated	Slightly curved, apex pointed

The larva described here and by Illies (1963) are strikingly different from those of *C. elongata* and *C. puelche* which both are very similar to *P. personata*. P. Zwick sent me one larva, part of Illies's original type material of *C. puerilis*. This specimen shows minor differences with other specimens available, including larger spine-like setae and paraprocts with rounded tips (slightly angulated in *C. puerilis*). Unfortunately, the specimen from the Illies's collection lacks mouthparts. P. Zwick also sent me images of slides prepared by Illies of the mouthparts of *C. puerilis* larvae. These slides were originally labeled as *Ceratoperla* Illies, but subsequently crossed out and relabeled as *Chilenoperla*. In these slides, there are mouthparts of two different species, one of them seems to be conspecific with present material, and the other one belongs to an unidentified species that does not seem to belong to *Ceratoperla*. These slides have a second label with the inscription Br. which refers to L. Brundin, the well-known Chironomidae (Diptera) worker. The only *Chilenoperla* specimens collected by Brundin that Illies studied were those of *C. puerilis* (P. Zwick, pers. comm.).

Most of the characters used by Illies (1963) to separate *Chilenoperla* from *Pelurgoperla* such as incomplete transverse veins in forewing, hindwing margins with spots and fork of CuA in hindwing long and usually with

transverse veins, are within the intra- and interspecific variation of *Chilenoperla* (Vera 2008, 2012). Additionally, there are no substantial differences between *Pelurgoperla* and *Chilenoperla* in genitalic morphology; in fact, they have similar overall structure. Some larval, wing, and genitalia characters of probable taxonomic significance and variable in the species studied are summarized in Table 1. Currently, larval characters are of great importance in separating Patagonian Gripopterygidae genera. Differences among both types of *Chilenoperla* larvae are consistent and should provide definitive information to elucidate the generic position of the included species and the conflict with *Pelurgoperla*. Since the larva of *C. semitincta*, the type species of the genus remains unknown, the larval morphology of the genus and the generic position of *Chilenoperla* species and *P. personata* will remain unsolved. As suggested by Vera (2008, 2012) two different genera may be currently included in *Chilenoperla*, but the possibility of only one monophyletic clade with two different larval morphologies also is possible. The genitalia of the involved species are strikingly similar and may provide synapomorphies that unite these taxa. Additionally, the only stable adult character different in *C. semitincta* as compared with the remaining species of the genus and *P. personata*, is the short and not crossed RA-RP bifurcation in forewing (see Table 1).

This taxonomic problem agrees with the currently weak generic limits recognized for most Gripopterygidae genera. The genera are usually defined by character combinations without explicitly given synapomorphies. I fully agree with McLellan & Zwick (2007) in that "...the parameters of some of the present genera of need re-adjusting". Until a comprehensive phylogenetic study of the genera of the Gripopterygidae is completed including a molecular study, no new genera or a species are being proposed.

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