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Ephemeroptera and Plecoptera biodiversity in central Patagonia, Chubut province, Argentina

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Abstract

Aquatic insects in Central Patagonia (Andean Region), Argentina, have received poor and fragmentary attention. In this paper we present the first preliminary inventory of Plecoptera and Ephemeroptera taxa for the area and include seasonal records of adult stages. We incorporate a set of environmental features for the sampling sites and biotopes as well as the main characteristics of the phytogeographical and biogeographical areas in which the species were found. Twelve species and eight genera of mayflies and eleven species and five genera of stoneflies are recorded for the first time in Chubut province. The stoneflies *Neofulla* Claassen, *Alfonsoperla flinti* McLellan & Zwick, *Austronemura eudoxiae* Froehlich, *Chilenoperla semitincta* Illies, *Neonemura illiesi* Zwick and *Potamoperla testacea* Vera, and the mayflies *Andesiops ardua* (Lugo-Ortiz & Mc Cafferty), *Chaquihua* Demoulin and Oniscigastridae are new records for Argentina. *Americabaetis* Kluge, *Camelobaetidius* Demoulin and *Traverella* Edmunds are confirmed for first time in the Andean Region (Central Patagonia province) and four Plecoptera and two Ephemeroptera species constitute new records for the Patagonian steppe. We also include two new records for Ephemeroptera and Plecoptera for the Santa Cruz province. We reinforce the idea that Patagonian aquatic environments have a highly specialized and complex insect fauna which can be correlated with biogeographical aspects but also with a great environmental heterogeneity.

Key words: new records, inventory, Patagonia, Ephemeroptera, Plecoptera

Introduction

Knowledge of Ephemeroptera and Plecoptera fauna in Argentina is still poor and fragmentary (Domínguez 1998, Muzón & Bachmann 1998). This is certainly true for the Central and the Subandean Patagonia (Patagonian Subregion) in Chubut province, these areas had received little sampling effort. As a result of different research projects of the Laboratorio de Investigación en Ecología y Sistemática Animal (LIESA) several lotic environments in the area have been the object of intense and systematic collections (Miserendino 1996, 2001, Miserendino & Pizzolón 2000, 2004, Hollmann & Miserendino 2006). Even so, wide areas in the southern region, the Valdivian forest, and most of the steppe remain almost unexplored.

At present, 25 mayfly species within 13 genera have been recorded for the Argentinean Subantarctic and Patagonian Subregions (Andean Region) (Domínguez *et al*. 1994, Muzón & Pessacq 2001, Nieto 2004). Sixteen of those species (in 8 genera) have been recorded in the Chubut province (Domínguez *et al*. 1994, Miserendino & Pizzolón 2000, Miserendino 2001, Nieto 2004).

Stoneflies are represented by 36 species within 27 genera (McLellan *et al*. 1990, 2006, Muzón & Bachmann 1998, Nelson 1973), of which 17 (within 15 genera) have been recorded in the Chubut province (Aubert 1960, Illies 1963, McLellan *et al*. 2006, Miserendino 1996, Miserendino & Pizzolón 2000).

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Material and methods

The present contribution is the result of several surveys carried out in 2005, 2006 and 2007 at 41 sampling sites (Table 1). The study area included the Middle West of Chubut province, the Chubut River basin, and the Santa Cruz River in Santa Cruz province, located within the Patagonian and Subantarctic Subregions of the Andean Region (Morrone 2006) (Fig. 1).

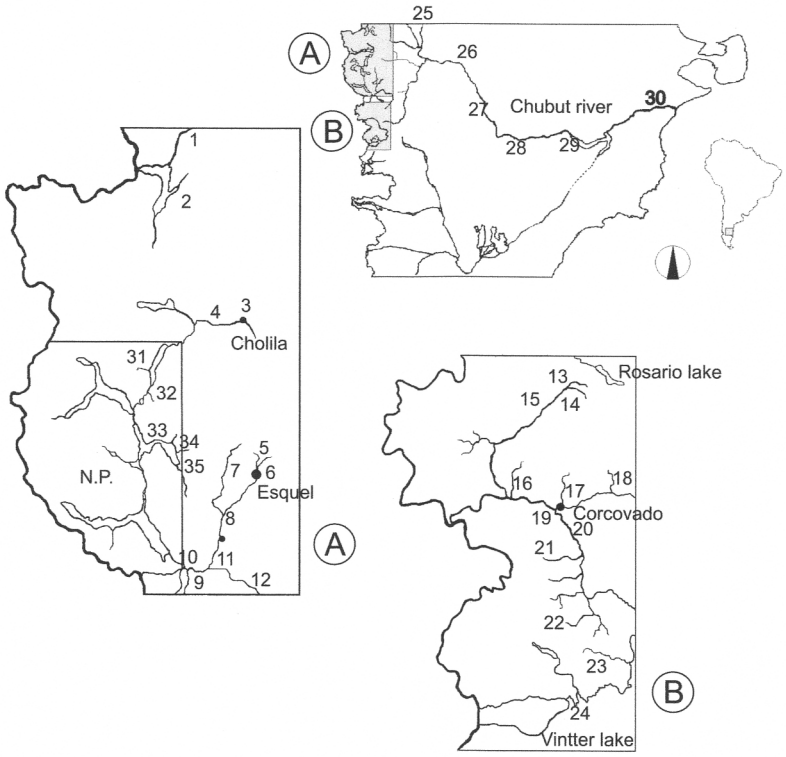

FIGURE 1. Sampling sites in Chubut province. Code of sampling sites in Table 1. P.N.: Los Alerces National Park.

For larval collections Surber, kick-net, and D-frame nets were used, whereas for adults aerial nets, pitfall traps, light traps and Malaise traps were employed (Hauer & Resh 1996).

An environmental characterization for most of the sampling sites was performed. For that purpose, we compiled information previously published (Miserendino 2001, 2006, Miserendino & Pizzolón 2004) and new data. Substrate composition was estimated as percentage of boulder, cobble, gravel, pebble, and sand using a 1-m^2 grid (Gordon *et al.* 1994). Stream order was obtained from Coronato & del Valle (1988). Surface current speed was obtained by timing a bobber (average of 3 times) as it moved over a distance of 10 meters (Gordon *et al*. 1994). At each site we measured wet width and bank full width.

The phytogeographical and biogeographical description was based on León *et al*. (1998) and Morrone (2006) respectively. The species composition of the riparian corridor was analyzed and main native and exotic species recorded.

Results

Environmental Characterization: The main environmental features of the sampling sites are presented in Table 2. This gives a picture of the diversity of watercourses visited during the study. Elevation of sampling sites ranged between 3 and 820 m. Stream order was between 2 and 6. Conductivity values ranged between 9 and 306 uS.cm^{-1}. As expected, mountain streams showed lower conductivity values than those in the steppe. Sub-

strate size was similar across most mountain rivers, being mainly comprised of boulders and cobbles. Substrate size in steppe streams was finer, consisting mostly of cobbles, gravel, and sand.

TABLE 1. Sampling locations for Chubat and Santa Cruz provinces, Argentina. Sites 1®C6, 8®C19 and 26®C30 were sampled on several occasions between May 2005 and March 2006, sites 20®C25 were visited between October 2006 and April 2007. RN: Ruta Nacional, RP: Ruta Provincial.

Chubut Province						
Site	Water Body	Locality?	Other descriptor	Lat.	Long.	Dates
1	Golondrinas Str.	El Hoyo	Intersection RP 258	41°59’33’’	71°33’25’’	
2	Nameless Str.	Puerto Patriada	trib. Epuyen L.	42°08’17’’	71°31’56’’	
3	Las Minas Str.	Cholila	Pre-urban reach	42°31’03’’	71°25’13’’	
4	Las Minas Str.	Cholila	Urban reach	42°30’32’’	71°25’34’’	
5	Esquel Str.	Nr. Esquel	Road access to “La Hoya’’	42°50’28’’	71°15’55’’	
6	Esquel Str.	Nr. Esquel	Pre-urban reach	42°53’48’’	71°16’03’’	
7	Percey R.	Alto R¨ªo Percey	15 km from Esquel	45°51’17’’	71°25’23’’	4-26/III/07
8	Percey R.	Nr. Trevelin	2 km upstream Trevelin	43°04’22’’	71°28’14’’	
9	Blanco Str.	Nr. Los Cipreses	At RN 259 intersection	43°10’38’’	71°36’30’’	
10	Baggilt Str.	Nr. Los Cipreses	At RN 259 intersection			
11	Nameless Str.	Nr. Trevelin	RP 17, Percey R. trib.	43°12’02’’	71°24’01’’	
12	Nant y Fall Str.	Nr. Trevelin	At RP 17 intersection	41°13’24’’	71°25’17’’	
13	Nameless Str.	Nr. Los ?ires farm	RP 17, R¨ªo Fr¨ªo trib.	43°1’33’’	71°26’36’’	
14	R¨ªo Fr¨ªo R.	Los ?ires farm	Farm on SR 17	43°29’56’’	71°20’22’’	
15	Nameless Str.	Nr. los ?ires farm	RP 17, R¨ªo Fr¨ªo trib.	43°21’43’’	71°30’22’’	
16	Glyn Str.	Nr. Cerro Centinela	Nearby RP 17	43°27’34’’	71°33’25’’	
17	Carb¨®n Str.	Nr. Corcovado	Pre-urban reach	43°32’11’’	71°28’21’’	
18	Cabeza de Vaca Str.	Nr. Corcovado	At RP 17 intersection	43°29’58’’	71°20’51’’	
19	Carb¨®n Str.	Corcovado	Urban reach	43°32’07’’	71°28’11’’	
20	Corcovado R.	Nr. Corcovado	El Palenque farm, RP 44			
21	Poncho Moro Str.	Nr. Poncho Moro farm	RP 44 intersection			
22	El Comisario Str.		RP 44 intersection	43°44’45’’	71°23’32’’	
23	Nameless Str.		RP 44 & Corcovado trib.	43°44’36’’	71°23’35’’	
24	Corcovado R.		Oulet of Vintter L.	43°53’54’’	71°25’28’’	27/IV/07
25	Chubut R.	Fofo Cahuel	At RP 4	42°26’07’’	70°30’35’’	
26	Chubut R.	Piedra Parada	At RP 12	42°40’25’’	70°0,5’1’’	
27	Chubut R.	Paso Berwin	At RN 25	43°37’15’’	68°57’05’’	
28	Chubut R.	Las Plumas	At RN 25 intersection	43°43’12’’	67°17’21’’	
29	Chubut R.	Valle Los Altares	At RN 25	43°53’29’’	68°23’5’’	
30	Chubut R.	28 de Julio	Dwnstr. Ameghino dam	43°22’01’’	65°53’17’’	
31	Coronado Str.	Los Alerces Nat'l Pk.	West side Rivadavia L.	42°37’60’’	71°41’55’’	12/III/07
32	Colegual Str.	Los Alerces Nat'l Pk.	Confluence Rivadavia R.	42°40’27’’	71°41’55’’	26/XI/06
33	Nameless Str.	Los Alerces Nat'l Pk.	N of Centinela str, RN 71	42°29’06’’	71°23’21’’	29/III/07

34	Nameless Str.	Los Alerces Nat'l Pk.	Pucon Pai campgr., RN 71	42°29'44''	71°23'21''	29/III/07
35	Irigoyen Str.	Los Alerces Nat'l Pk.	Irigoyen Fall, RN 71	42°30'57''	71°21'43''	29/III/07
36	Nilson R.	Los tres leones farm	2 km from Pico R.	44°15'06''	71°40'37''	29/I/07
37	Nameless str.	Nr. R¨ªo Pico	Access road to L. 2			28/IV/07
Santa Cruz Province						
38	Santa Cruz R.	Charles Fuhr	At RP 9	50°15'35''	71°53'40''	V/05
39	Santa Cruz R.	C¨®ndor Cliff	At RP 9	50°13'07''	70°55'52''	V/05
40	Santa Cruz R.	Barrancosa	At RP 9	50°30'30''	70°10'41''	V/05
41	Santa Cruz R.	Cte Luis Piedrabuena	At RP 63	50°0'48''	69°0'32''	V/05

TABLE 2. Environmental features of the sampling sites. Phytogeografical units codes: 1) Subantarctic Province. 2) Patagonic province: Subandean district: a) Herbaceous steppe, occidental district: b) Herbaceus/shrub like steppe, central district c) Barren steppel d) Shrub steppe of Chuquiraga avellanedae e) Shrub steppe of Junellia tridents. Ach: Austrocedrus chilensis, Nd: Nothofagus dombeyi, Na: N. antarctica, Np: N. pumilio, Mb: Maytenus boaria, S: Salix spp., Pn: Populus nigra, Pa: Populus alba, Pm: Pseudotsuga mentziesii, Pc: Pinus contorta. Boul: boulder, Co: cobble, Pe: pebble, Gra: gravel, sand.

Site	Stream order	Bank Width (m)	Substrate	Current m/ sec	Conductivity uS/sec	Elevation m	Phytographic Units	Riparian Veg.
1	2	4.2	Co/Sand	2.6	126	361	1	Pm, Pc
2	1	1.8	Gra/Sand	3	76	495	1	Pm
3	2	3.25	Co/Boul	0.93	164	573	1	S
4	2	9	Pe/Co	3	72	555	1	S
5	3	10.8	Boul/Co	3	105	721	2a	Mb, Na
6	4	9	Co/Pe	0.9	184	610	2a	S, Na
7	5	80	Boul/Co	1	80	600	1	S
8	5	100	Boul/Co	1.11	83	360	2a	S
9	2	35	Boul/Co	0.4	16.8	450	1	Na
10	3	20	Boul/Co	0.6	21.6	460	1	Np, Sal
11	2	0.9	Gra/Sand	0.1	84	730	1	Na
12	3	31.5	Gra/Sand	1.45	113	690	1	Na
13	2	3.5	Co/Pe	3	9	670	1	Na
14	4	22.5	Sand/Gra	0.9	98	670	1	-
15	3	14.2	Boul/Co	1.5	87	700	1	-
16	2	5.66	Co/Pe	0.1	69	615	1	Na
17	3	10.5	Boul/Co	1.73	93	380	1	Pn, Pa
18	2	6.88	Co/Gra	1.06	63	700	1	Na, S
19	3	23.5	Boul/Co	1.35	84	400	1	S
20	4	50	Boul/co	1	-	430	1	S
21	3	12	Boul/Co	1	23.7		1	Na, Ach
22	2	4	Boul/Co	1.03	26	820	1	Na, Np
23	3	9	Boul/Co	0.8	29	770	1	Na, Np
24	4	30	Boul/Co	1.9	-	928	1	Na, Np
25	4	80	Pe/Gra	1.1-2.1	99	500	2a	S
26	5	200	Co/Pe	0.9-1.2	148.7	440	2b	S

27	5	160	Co/Sand	0.5-1.6	185.2	308	2d	S
28	6	200	Pe/Gra/Sand	0.8-1.2	187.2	243	2d	S
29	6	300	Boul/Co	1.7-1.9	189.5	300	2c	S
30	6	70	Co/Pe	0.7-0.9	196	70	2c	S, Pn, Pa
31	3	15	Co/Gra	0.8	-	541	1	Nd, Ach, S
32	3	25	Boul/Co	1.6	26.1	527	1	Nd, Ach
33	3	25	Boul/Co	0.7	41.2	580	1	Nd, Ach
34	3	3	Boul/Co	1.1	22.3	570	1	Nd, Ach, Ch
35	3	7	Boul/Co	1.3	26.1	570	1	Nd, Ach, Ch
36	3	10	Boul/Co	1.4	-	503	1	Nd, S
37	3	7	Gra/Co	0.2	-	-	1	Nd
38	6	150	Co/Pe	0.35	-	170	2e	-
39	6	200	Boul/Co	1.2	-	120	2e	-
40	6	230	Pe/Gra	0.5	-	82	2e	-
41	6	140	Pe/Gra	1.43	-	3	2e	-

Ephemeroptera and plecoptera analysis: This contribution increases to 24 the number of mayfly species that are known for the Chubut Province (within 15 genera), including the first records for Argentina of *Andesiops ardua* (Lugo-Ortiz & McCafferty 1999), *Chaquihua* Demoulin, 1955b and the family Oniscigastridae. Moreover, *Camelobaetidius* Demoulin, 1966, *Americabaetis* Kluge, 1992 and *Traverella* Edmunds, 1948 are recorded for the first time from the entire Andean Region (Table 3).

TABLE 3. Ephemeroptera and Plecoptera species recorded for Chubut province (including data from Santa Cruz River Santa Cruz province). Site of collection, comments, previous records, and main literature are indicated when the taxa represent a new record. CH: Chubut province NQ: Neuquen province RN: R®™o Negro province SC: Santa Cruz province Records of Chaquihua & Siphlonella are in agreement with Dom®™nguez et al. (2001) who mention the genus for southern Argentina in their generic key without further information.

	Sites	Comments	Previous records	References
EPHEMEROPTERA				
Ameletopsidae				
Chaquihua bullocki (Nav¨¢s 1930)	1, 2, 16	New generic record, Argentina	Subant.Subreg., S Chile	Mercado & Elliot 2004
Chiloporter eatoni Lestage 1931				Domínguez 1998
Baetidae				
Americabaetis alphus Lugo-Ortiz & McCafferty 1996	25, 26, 29	New generic record, Andean reg.	S Am Trans Zone, Neotrop reg., Argentina	Lugo-Ortiz & Mc Cafferty 1996
Andesiops ardua (Lugo-Ortiz & McCafferty 1999)	7, 9, 12	New record, Argentina	Subant. Subreg., S Chile	Lugo-Ortiz & Mc Cafferty 1999, Nieto 2004
A. torrens (Lugo-Ortiz & McCafferty 1999)				Nieto 2004
Camelobaetidius penai (Traver & Edmunds 1968)	25, 26, 29	New generic record, Andean reg.	S Am Trans Zone reg., Neotrop reg., Argentina	Domínguez 1998
Caenidae				
Caenis sp.	3, 4, 5, 7, 25, 26, 28	New family record, Andean reg.	Neotrop reg.	Domínguez et al 1994, Miserendino & Pizzolón 2000
Leptophlebiidae				

Archetraulodes spatulus Pescador & Peters 1982	21	New generic record, Chubut prov	Subant.& Patag. Subreg.s, S Chile & Argentina (NQ)	Domínguez 1998
Dactylophlebia carnulenta Pescador & Peters 1980	18, 20-22, 37	New generic record, Chubut prov	Subant. & Patag. subregs., S Chile & Argentina (NQ)	Domínguezz 1998
Meridialaris chiloeensis (Demoulin 1955a)	38, 40, 41	New record, Patagonia steppe & Santa Cruz prov.	Subant. & Patag. Subreg.s, S Chile & Argentina (CH, NQ, RN)	Domínguez 1998
M. diguillina (Demoulin 1955c)				Domínguez 1998
M. laminata (Ulmer 1920)	5, 6, 7, 8, 11,12,13,14	1st confirmed record, Chubut prov	Subant.& Patag. Subreg.s, S Chile & Argentina (NQ, RN)	Domínguez 1998, Miserendino & Pizzolón 2000
Nousia bella Pescador & Peters 1985	9, 10, 12, 20, 21, 37	1st confirmed record, Chubut prov	Subant. & Patag. subregs., S Chile & Argentina (NQ, RN)	Domínguez 1998, Miserendino 2001
N. crena Pescador & Peters 1985				Domínguez 1998
N. delicata Navás 1918b				Domínguez 1998
N. minor (Demoulin 1955c)				Domínguez 1998
Penaphlebia vinosa (Demoulin 1955c)	1	1st confirmed record, Chubut prov	Patag. Subreg., Argentina (NQ, RN)	Domínguez 1998, Miserendino 2001
P. chilensis (Eaton 1883)	26	New record, Patagonia steppe	Subant. & Patag. subregs., S Chile & Argentina (CH, NQ, RN)	Domínguez et al 1994
P. flavidula Pescador & Peters 1991				Domínguez 1998
P. fulvipes (Needham & Murphy 1924)				Domínguez 1998
Rhigotopus andinensis Pescador & Peters 1982				Domínguez 1998
Traverella sp.	25-30	New generic record, Andean reg.	S Am Trans Zone reg., Neotrop reg., Argentina	Domínguez 1998
Nesameletidae				
Metamonius anceps (Eaton 1885)				Domínguez 1998
Oniscigastridae				
Siphlonella sp.	7, 15, 16, 32	New family record, Argentina	Subant. Subreg., S Chile	Needham & Murphy 1924, Pictet 1894
PLECOPTERA				
Eustheniidae				
Neuroperla schedingi (Navás 1929)				Illies 1960b, Miserendino 1996
Diamphipnoidae				
Diamphipnopsis samali Illies 1960b	1, 2	New generic record, Chubut prov.	Subant. & Patag. subregs., S Chile & Argentina (NQ, RN)	Illies 1960b, Wais et al 1987
Austroperlidae				
Klapopteryx kuscheli Illies 1960a	38-41	New record, Patagonia steppe & Santa Cruz prov.	Subant. & Patag. subregs., S Chile & Argentina (CH, NQ, RN)	Illies 1960a, McLellan 2001

Penturoperla barbata Illies 1960a				Illies 1960a, Miserendino 1996
Griptopterygidae				
Alfonsoperla flinti McLellan & Zwick 2007	15, 22,23	New generic record, Argentina	Subant. Subreg., S Chile	McLellan & Zwick 2007
Antarctoperla michaelseni (Klap¨¢lek 1904)	28, 30, 38-41	New record, Patagonia steppe	Subant. & Patag. subregs., S Chile & Argentina (CH, NQ, RN, SC)	Illies 1963, Miserendino 2001
Aubertoperla illiesi (Froehlich 1960)				Illies 1963
Araucanioperla bullocki (Navás 1933)				Illies 1963
Ceratoperla fazi (Nav¨¢s 1934)	22, 23	New record, Chubut prov	Subant. & Patag. subregs., S Chile & Argentina (RN)	Illies 1963

Table 3. Continued

	Sites	Comments	Previous records	References
Chilenoperla semitincta Illies 1963	5	1st confirmed record, Argentina	Subant. Subreg., S Chile	Illies 1963, Miserendino 2001, Miserendino & Pizzolón 2000
Limnoperla jaffueli (Navás 1928)	29, 38-41	New record, Patagonia steppe	Subant. & Patag. Subregs., S Chile & Argentina (CH, NQ, RN)	Illies 1963, Miserendino 2001
Notoperla archiplatae (Illies 1958)				Illies 1958
N. fasciata McLellan 2006				McLellan 2006
N. magnaspina McLellan 2006				McLellan 2006
Notoperlopsis femina Illies 1963	26	New record, Patagonia steppe	Subant. & Patag. Subregs., S Chile & Argentina (CH)	Illies 1963, McLellan et al 2006
Pelurgoperla personata Illies 1963				Illies 1963
Potamoperla myrmidon (Mabille 1891)				Illies 1963
P. testacea Vera 2006	22, 23	New record, Argentina	Subant. Subreg., S Chile	Vera 2006
Rhitroperla rossi (Froehlich 1960)				Froehlich 1960, Illies 1963
Senzilloides panguipullii (Nav¨¢s 1928)				Illies 1963
Notonemouridae				
Austronemoura chilena Aubert 1960	15, 21 22, 33-35	New generic record, Chubut prov	Subant. Subreg., S Chile & Patag. Subreg., Argentina (RN)	Aubert 1960, Illies 1961
A. eudoxiae Froehlich 1960	15	New record, Argentina	Subant. Subreg., S Chile	Froehlich 1960, Illies 1961
Neofulla biloba (Aubert 1960)	35	New generic record, Argentina	Subant. Subreg., S Chile	Aubert 1960, Illies 1961
Neonemura barrosi Navás 1919	21, 31	New generic record, Chubut prov	Subant. Subreg., S Chile & Patag. Subreg., Argentina (RN, NQ)	Illies 1961, Wais et al 1987
N. illiesi Zwick 1972	10	New record, Argentina	Subant. Subreg., S Chile	Zwick 1972

Udamocercia frantzi Illies 1961	5, 21, 22, 24, 37	New generic record, Chubut prov	Subant. Subreg., S Chile & Patag. Subreg., Argentina (NQ, RN)	Illies 1961, Wais et all 1987
Perlidae				
Kempnyella genualis (Nav¨¢s 1918b)				Illies 1964
Pictetoperla gayi (Pictet 1841)				Illies 1964

The number of stonefly species now known from Chubut Province stands at 28 (in 23 genera). Moreover, *Neofulla* Claassen, 1936, *Alfonsoperla flinti* McLellan & Zwick, 2007, *Austronemoura eudoxiae* Froehlich, 1960, *Neonemura illiesi* Zwick, 1972, *Chilenoperla semitincta* Illies, 1963 and *Potamperla testacea* Vera, 2006 are recorded for the first time in Argentina.

Additionally, four species of stoneflies and two species of mayflies are recorded for the first time in Patagonia steppe. For Santa Cruz Province a new Ephemeroptera specific record and a new Plecoptera generic record are included. Table 3 provides a summary of the Ephemeroptera and Plecoptera inventory for Chubut province, including site of collection, comments, previous records and main references for every new record.

Discussion

The emergence periods of Ephemeroptera and Plecoptera species are predictable and well known in the northern hemisphere and in some southern hemisphere regions (Hynes & Hynes 1975, Scrimgeour 1991, Richardson 2001). Unfortunately, literature about emergence periods of mayflies and stoneflies in Patagonia is limited to that of Miserendino & Hollmann (2005) and Hollmann & Miserendino (2008). The emergence data presented in this paper are not the result of a systematic sampling, nevertheless, the capture dates of adults constitute new information for the species in the area (Table 4). Mayflies emerged nearly exclusively in southern hemisphere in spring and summer, with the minor exception of *Nousia delicata* Navás, 1918a, which was also present in early autumn. *Meridialaris chiloeensis* (Demoulin 1955a) was the first mayfly to emerge, beginning in early October, which is consistent with reports by Hollmann & Miserendino (2006) who observed a bivoltine pattern with spring and summer generations for this species.

Some stoneflies began emergence in late winter, but the majority waited until spring, with several emerging throughout the summer months. Adults of the three Notonemouridae genera *Austronemura* Aubert, 1960, *Neofulla* and *Udamocercia* Enderlein, 1909 were found mainly by the end of summer and beginning of autumn. Most Gripopterygidae emerged during spring and summer months. *Notoperlopsis femina* Illies, 1963 appeared only in October, while *Ceratoperla fazi* (Navás 1934) and *Pelurgoperla personata* Illies, 1963 appeared to be early autumnal species.

The most abundant and ubiquitous Ephemeroptera species were *Meridialaris chiloeensis*, *M. diguillina* (Demoulin 1955c) and *Andesiops torrens* (Lugo-Ortiz & McCafferty 1999), whereas *Antarctoperla michaelseni* (Klapalek 1904), *Aubertoperla illiesi* (Froehlich 1960), *Limnoperla jaffueli* (Navás 1928) and *Klapopteryx kuscheli* were the most frequently collected Plecoptera species. These qualitative abundances and generalized distributions for both mayflies and stoneflies are in agreement with previous reports in the area (Miserendino & Pizzolón 2000).

The records of *Camelobaetidius*, *Americabaetis* and *Traverella* were unexpected. Their southern distributional limit was the South American Transition Zone and the Neotropical Region, in the Argentinean provinces of Córdoba and Tucumán, about 1000 km north of our records. These records, together with that of *Leptohyphes* Eaton, 1882 (Ephemeroptera), in Somuncurá Plateau, Río Negro province (Muzón & Pessacq 2001) suggest a disjunct distributional pattern with interesting biogeographical patterns. However, these patterns must be corroborated with extensive sampling in intermediate areas.

TABLE 4. Months and seasons of collection for those species where adults were observed. *Indicates a low quantity of specimens collected at only one sampling site and date. (x) Indicates only one or two specimens collected.

Season	Winter			Spring			Summer			Autumn		
Month	Jul.	Ag.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Ephemeroptera												
Penaphlebia chilensis				x								
Meridialaris chiloeensis				x	x			x	x			
Nousia delicata				x	x		x	x		x		
Andesiops ardua								x				
Archethraulodes sp. *****								x				
Meridialaris laminata					x							
Meridialaris diguillina								x	x			
Metamonius anceps *									x			
Siphlonella sp.									x			
Plecoptera												
Austronemoura chilena									x			
Antarctoperla michaelseni			x	x	x	x	x	x	x			
Aubertoperla illiesi			(x)	x	x	x	x	x	x			x
Neonemura barrosi			(x)					(x)	x			
Notoperlopsis femina				x								
Klapopteryx kuscheli				x	x	x			x			
Limnoperla jaffueli				x	x	x	x	x	x			
Senzilloides panguipulli				x					x			
Potamoperla testacea					x	x						
Neofulla biloba *									x			
Pelurgoperla personata									x			
Penturoperla barbata *									x			
Rhithroperla rossi *									x			
Udamocercia frantzi									x	x		
Austronemoura eudoxiae *									x			
Ceratoperla fazi									x	x		

Some taxa were rare or occasionally recorded, as was the case for *Austronemoura eudoxiae*, *Neofulla biloba* (Aubert 1960), *Neonemura illiesi*, *Potamoperla testacea*, *Alfonsoperla flinti* (Plecoptera) and *Archetraulodes spatulus* Pescador & Peters, 1982 (Ephemeroptera). These taxa were represented by only a few specimens at one sampling site. The gripopterygid *Potamoperla myrmidon* (Mabille 1891) was the only species that appeared through all sampling sites in Chubut River (Miserendino 2006). Similarly, the austroperlid *Klapopteryx kuscheli* was found in all the sampling sites in Santa Cruz River (province of Santa Cruz) reaching the estuarine area on the east of the province (Table 1). This is a curious record, given that this species was always found in the Subantarctic and west limit of the Patagonian Subregions, very close to the Andes (Illies 1960a, McLellan 2001).

In Patagonia, as well as in many other regions of Argentina and the world over, mayflies and stoneflies are used as indicators of water quality and in biotic indices (Miserendino & Pizzolón 1999, Pizzolón & Miserendino 2000). An adequate knowledge of the species distribution and information on their biotopes improves the

performance of biotic indexes. However, information about systematics, biology and ecology of these taxa in most of Patagonia is scarce. In this sense, collaboration between ecologists and systematists improves the knowledge of these taxa for use in water quality assessment and conservation of these species in Argentina.

Even though the present contribution is the result of a limited sampling effort, it increases by 100% the number of Ephemeroptera genera and by 65% the number of Plecoptera species recorded for Chubut province. In addition, it provides nine new country records for Argentina. These results further demonstrate the poor knowledge of the aquatic insect fauna in Patagonia and Chubut provinces. They also demonstrate the necessity of new and systematic entomological surveys in the area. Patagonian aquatic environments are endangered by the construction of hydroelectric dams, seeding of exotic fished and by poor forestry practices. Long-term poor land use practices have resulted in severe desertification problems in broad areas in the steppe. All these activities threaten the biodiversity of these once pristine and fragile aquatic ecosystems (Pascual *et al*. 1998).

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