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Arthropod assemblages of the Quebrada del Morel private protected area (Atacama Region, Chile)

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Abstract. The objective of this baseline study was to use pitfall traps to examine the taxonomic composition and abundance of arthropods in the Quebrada del Morel private protected area located in the Atacama Region (Chile). The study area was divided into 10 vegetationally and pedologically contrasting sites: coastal steppe (CS), ravine bottom (RB), dunes with *Prosopis flexuosa* (PF), sandy-bottomed ravine (SBR), dunes with *Skytanthus acutus* (SA), coastal range (CR), piedmont with *Nolana* sp. (PN), inland dunes (ID), steppe with *Nolana* sp. (EN), and steppe with *Atriplex* sp. (EA). A total of 2187 specimens were captured, belonging to 73 species in 31 families. Of these 73 species, 26 belonged to Arachnida, and 47 to Insecta. The two dominant orders of the Arachnida assemblage were Solifugae (22.8% of total capture) and Araneae (5.7%). Insecta accounted for 69.1% of the total capture and was dominated by two orders: Coleoptera (33.8%) and Orthoptera (21.9%). The most abundant arthropod families were the solifuge Mummucidae (22.5%), the coleopteran Tenebrionidae (19.4%), and the orthopteran Gryllidae (18.8%). Particularly important among these families was Tenebrionidae which was represented by 18 species and 11 genera. The sites with the highest abundance of tenebrionids were PF (61.9%) and SBR (11.8%). The highest species diversity was observed in SBR (13) and PF (11). The differences in vegetation between the sites were clearly reflected in the numerical contribution of most taxa. This information will help implement compensation actions, develop a reclamation plan, and consolidate a conservation management plan for the Quebrada del Morel private protected area.

Key Words. arthropods, conservation, coastal desert, Quebrada del Morel, Atacama Desert, Chile.

Introduction

The transitional coastal desert (25–32° Lat S, DCT), which includes the regions of Atacama and Coquimbo, is an important territory in terms of plant biodiversity, endemism, biological conservation, and the phenomenon of the flowering desert (Rundel et al. 2007; Gutiérrez et al. 2008). The southern part of the desert represents the southern limit of a plant biodiversity hotspot recognized for this part of the South American territory (Cowling et al. 1996; Gaston, 2000). The DCT is subject to both El Niño/Southern Oscillation (ENSO) events (Jaksic 1998; Cepeda-Pizarro et al. 2005a, 2005b) and the potential effects of global climate change (Young et al. 2010).

Due to the harsh nature of the landscape, coastal dunes and ravines are important landscape elements within the geomorphological diversity of the DCT (Paskoff et al. 2003; Paskoff & Manríquez 2004) and are of interest both to tourists and building companies. When these units become more accessible, they are rapidly subjected to strong human modification (Paskoff & Manríquez 1999; op. cit.). As foci of plant

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biodiversity and endemic taxa, some of them are also important natural heritage, attracting public interest in their conservation and sustainable use. These conditions pose a challenge for conservation and sustainable use (Muñoz et al. 1996) that necessitates informed decisions about the future of coastal dunes and ravines. Knowledge of the natural system of these units is limited. In the few cases that have been studied, more is known about the flora (Squeo et al. 2008) than about the fauna (Moreno et al. 2002; Cepeda-Pizarro et al. 2005a, b; Valdivia et al. 2008, 2011; Vidal et al. 2011).

Arthropods are one of the most diverse faunal groups in desert ecosystems and play a significant role in their structure and functioning. However, knowledge of these organisms in the DCT is limited and recent, both in terms of their role in ecosystem structure-function and their geographical distribution (Cepeda-Pizarro et al. 2005a, b; Pizarro-Araya et al. 2008). This paper reports the results of prospective studies conducted in Quebrada del Morel, an area not previously studied for its terrestrial arthropod assemblages. The goals of this work were to document the taxonomic composition of the arthropod communities in this area of the Coquimbo Region (Chile) and associate them, particularly Tenebrionidae (Coleoptera), to the different plant formations.

Materials and Methods

Study Site. The study was conducted in the Quebrada del Morel private protected area, located in the communes of Copiapó and Caldera in the Atacama Region, Chile (Fig. 1). The area includes the priority site of the same name, which has a surface area of ~110 km^2. The study sites occupy partially flat lands free from mist, and possess sandy soil on the coast, loamy soil on the plains, and gravelly soil in the ravines. The area has been characterized by Gajardo (1993) as part of the Tal-Tal Coastal Desert and Los Llanos Flowering Desert. Squeo et al. (2008) have catalogued 66 native plant species in the area, two of which are classified as endangered and two as vulnerable.

The flora of Quebrada del Morel is represented by different life forms, predominantly shrub species, annual and perennial herbs, and cacti (Table 1). Five species are classified as threatened: *Prosopis flexuosa* DC (endangered), *Balsamocarpon brevifolium* Clos, *Copiapoa megarhiza* Britton et Rose, *Eriosyce eriosyzoides* (F. Ritter) Ferryman, and *Suaeda multiflora* (Phil.) (vulnerable). Land use in this area is mostly grasslands, scrublands, and native shrubby forest (Squeo et al. 2010), where it is possible to find populations of *Prosopis flexuosa,* a species that shows genetic diversity within and between populations (Stoll et al. 2010).

Taxonomic Composition and Relative Abundance of Arthropoda. The taxonomic composition (at species/family/order level) and relative abundance of the arthropod communities were determined from specimens captured using pitfall traps within 10 sites of contrasting vegetation and soil characteristics. The sites are as follows: Site 1, coastal steppe (CS); 315162 E, 6930283 N, 147 m; Site 2, ravine bottom (RB); 312876 E, 6926935 N, 242 m (Fig. 2A). Site 3, dunes with *Prosopis flexuosa* D.C. (PF); 312580 E, 6924926 N, 296 m (Fig. 2B). Site 4, sandy-bottomed ravine (SBR); 311302 E, 692478 N, 301 m (Fig. 2C). Site 5, dunes with *Skytanthus acutus* Meyen (SA); 313100 E, 6925662 N, 272 m (Fig. 2D). Site 6, coastal range (CR); 314302 E, 6924200 N, 363 m (Fig. 2E). Site 7, piedmont with *Nolana* sp. (PN); 314468 E, 6924753 N, 311 m (Fig. 2F). Site 8, inland dunes (ID); 322364 E, 6925640 N, 302 m.

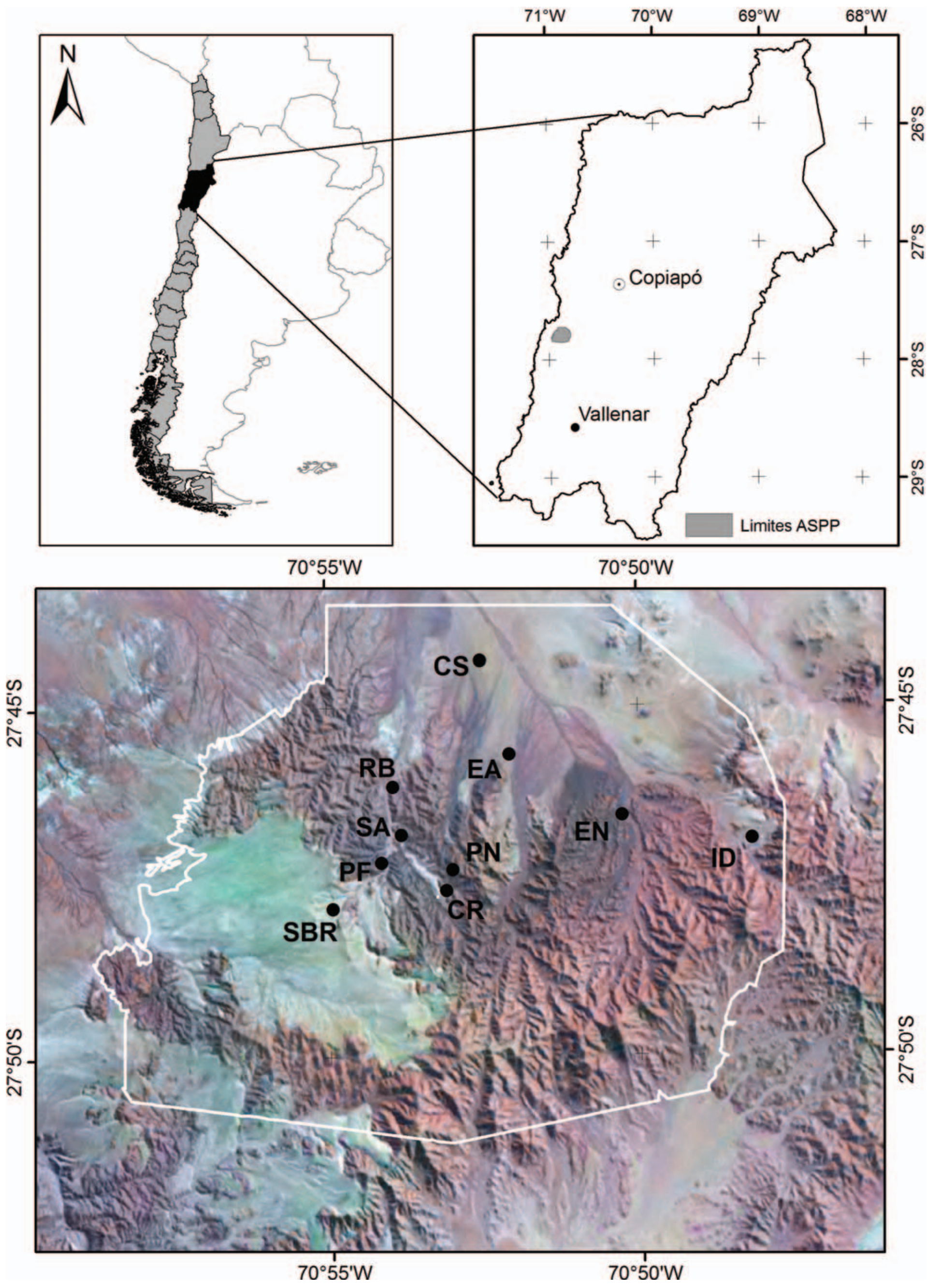

Figure 1. Geographical location of the study sites within the Quebrada del Morel private protected area in the Atacama Region, Chile: CS, coastal steppe; RB, ravine bottom; PF, dunes with *Proposis flexuosa;* SBR, sandy-bottomed ravine; SA, dunes with *Skytanthus acutus*; CR, coastal range; PN, piedmont with *Nolana* sp.; ID, inland dunes; EN, steppe with *Nolana* sp.; EA, steppe with *Atriplex* sp.

Table 1. Plant species present in the study sites within the Quebrada del Morel private protected area (Atacama Region, Chile).

Site	Family	Species	Conservation status	Life form
CS	Apocynaceae	*Skytanthus acutus* Meyen	FP	F
	Asteraceae	*Encelia canescens* Lam.	FP	SF
	Chenopodiaceae	*Atriplex clivicola* I.M.Johnst.	FP	F
RB	Apocynaceae	*Skytanthus acutus* Meyen	FP	F
	Asteraceae	*Encelia canescens* Lam.	FP	SF
		Ophryosporus triangularis Meyen	FP	F
	Ephedraceae	*Ephedra chilensis* K.Presl	FP	F
PF	Boraginaceae	*Heliotropium floridum* (A.DC.) Clos	FP	F
	Cactaceae	*Copiapoa echinoides* (Lemaire ex Salm-Dyck) Britton et Rose	IC	K
	Frankeniaceae	*Frankenia chilensis* K.Presl	FP	S
	Nolanaceae	*Nolana albescens* (Phil.) I.M.Johnst.	FP	F
SBR	Asteraceae	*Chuquiraga ulicina* (Hook. et Arn.) Hook. et Arn.	FP	F
		Encelia canescens Lam.	FP	SF
	Ephedraceae	*Ephedra chilensis* K.Presl	FP	F
	Nolanaceae	*Nolana carnosa* (Lindl.) Miers ex Dunal	FP	F
SA	Aizoaceae	*Tetragonia angustifolia* Barnéoud	FP	F
	Cactaceae	*Eulychnia acida* Phil.	FP	K
	Frankeniaceae	*Frankenia chilensis* K.Presl	FP	S
CR	Aizoaceae	*Tetragonia angustifolia* Barnéoud	FP	F
	Cactaceae	*Eulychnia acida* Phil.	FP	K
	Frankeniaceae	*Frankenia chilensis* K.Presl	FP	S
PN	Aizoaceae	*Tetragonia angustifolia* Barnéoud	FP	F
	Cactaceae	*Eulychnia acida* Phil.	FP	K
	Frankeniaceae	*Frankenia chilensis* K.Presl	FP	S
ID	Apocynaceae	*Skytanthus acutus* Meyen	FP	F
	Asteraceae	*Chuquiraga ulicina* (Hook. et Arn.) Hook. et Arn.	FP	F
		Encelia canescens Lam.	FP	SF
	Nolanaceae	*Nolana carnosa* (Lindl.) Miers ex Dunal	FP	F
EN	Asteraceae	*Encelia canescens* Lam.	FP	SF
	Chenopodiaceae	*Atriplex clivicola* I.M.Johnst.	FP	F
EA	Apocynaceae	*Skytanthus acutus* Meyen	FP	F
	Asteraceae	*Encelia canescens* Lam.	FP	SF
	Chenopodiaceae	*Atriplex clivicola* I.M.Johnst.	FP	F

Abbreviation Key. CS: coastal steppe; RB: ravine bottom; PF: dunes with *Prosopis flexuosa;* SBR: sandy-bottomed ravine; SA: dunes with *Skytanthus acutus;* CR: coastal range; PN: piedmont with *Nolana* sp.; ID: inland dunes; EN: steppe with *Nolana* sp.; EA: steppe with *Atriplex* sp.; FP: Out of Danger; IC: Insufficiently Known; F: Phanerophyte; S: Suffrutescent, K: Cactaceous. (Classification taken from Squeo et al. 2008.)

Site 9, steppe with *Nolana* sp. (EN); 319129 E, 6727087 N, 201 m. Site 10, steppe with *Atriplex* sp. (EA); 315947 E, 6927818 N, 198 masl (Fig. 1). A description of the plant communities found in the various sites is shown in Table 1 (Squeo et al. 2008, 2010).

A transect was established in each site that consisted of three parallel rows of 10 pitfall traps each, for a total of 30 traps per site (300 traps in total) and an effective capture area equivalent to 660 m^2 (Péfaur & Díaz 2000; Cepeda-Pizarro et al. 2005b). The traps consisted of two plastic cups 7.4 × 10.2 cm and 7.6 × 12.0 cm in size. The smaller cup was placed inside the larger one and could be easily removed. The inner cup was filled to one third of its capacity with a mixture of formalin (10%), glycerin, and water with laundry powder (30%) in a 3:1:6 ratio. The traps operated for five

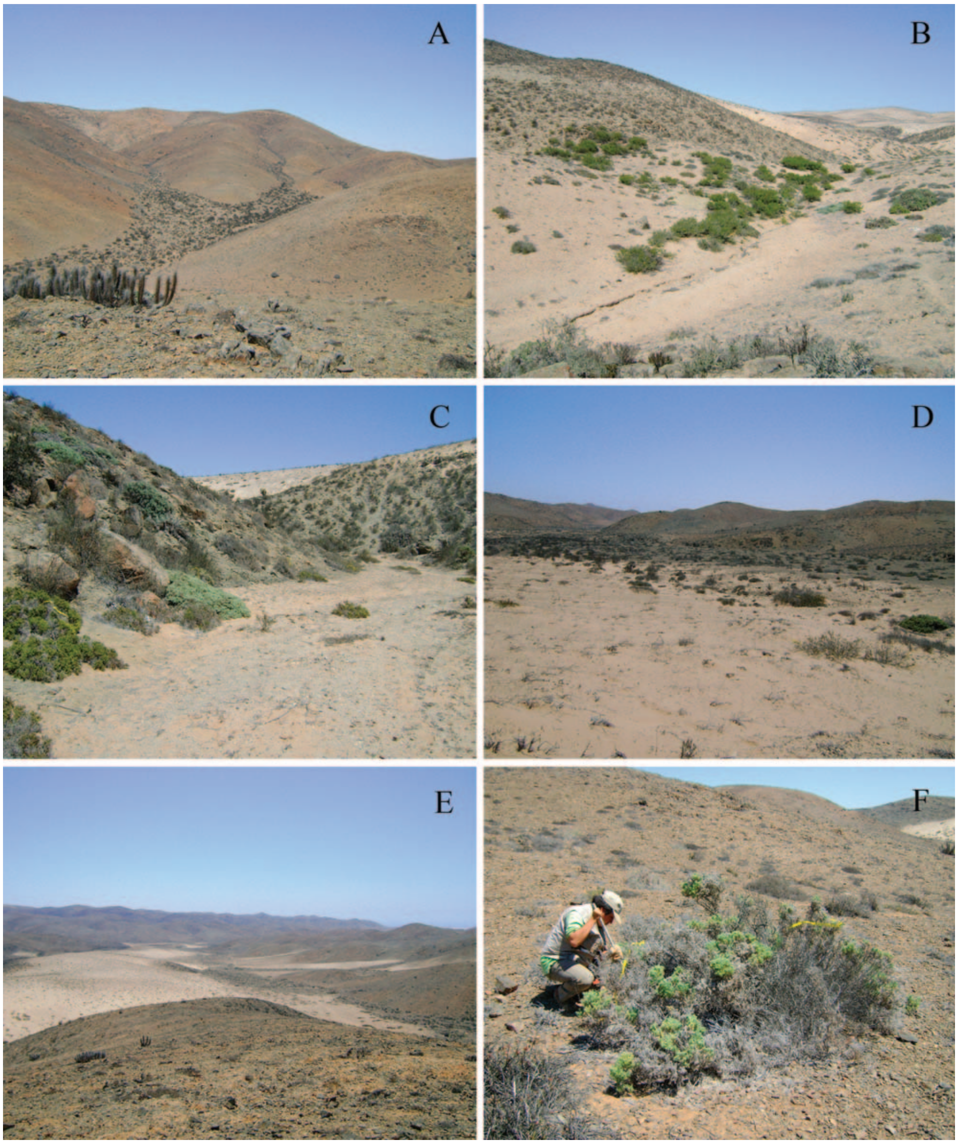

Figure 2. Study sites within the Quebrada del Morel private protected area in the Atacama Region, Chile: A, ravine bottom; B, dunes with *Prosopis flexuosa;* C, sandy-bottomed ravine; D, dunes with *Skytanthus acutus;* E, coastal range; F, piedmont with *Nolana* sp.

days between October and November of 2009. The captured specimens were removed, cleaned, and preserved in 70% alcohol until processing and mounting. The material captured was deposited in the collection of Laboratorio de Entomología Ecológica, Universidad de La Serena, La Serena, Chile (LEULS) and Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (MACN-Ar).

The nomenclature of arachnid (Arthropoda: Chelicerata) taxa follows Platnick & Shadab (1982), Coyle (1986), Goloboff (1995), and Ramírez (2003) for Araneae;

Table 2. Number of taxa (family, genus, and species) and ratios between the taxonomic levels of arthropods in the Quebrada del Morel private protected area (Atacama Region, Chile).

	Taxa				
Class–order	Family	Genus	Species	Genus/family	Species/family
Arachnida	17	16	26	0.94	1.53
Scorpiones	1	2	4	2.00	4.00
Solifugae	2	5	5	2.50	2.50
Araneae	13	16	16	1.23	1.23
Pseudoescorpiones	1	1	1	1.00	1.00
Insecta	14	29	47	2.07	3.36
Hymenoptera	1	1	5	1.00	5.00
Coleoptera	7	22	34	3.14	4.86
Orthoptera	5	6	7	1.20	1.40
Thysanura	1	1	1	1.00	1.00

Kraus (1966), Muma (1971), Maury (1987) and Valdivia et al. (2011) for Solifugae; Mello-Leitão (1941), Mattoni & Acosta (2006), Ojanguren-Affilastro (2002, 2005), Ojanguren-Affilastro & Ramírez (2009), and Ojanguren-Affilastro et al. (2007a, 2007b) for Scorpiones. The nomenclature of insect (Arthropoda: Mandibulata) taxa follows Kulzer (1955, 1958, 1959), Peña (1971, 1973, 1974, 1985, 1995), Kaszab (1969), Moore (1985, 1994), Cigliano (1989), Cigliano et al. (1989), Artigas (1994), Estrada & Solervicens (1999), Elgueta et al. (1999), Roig-Juñent & Domínguez (2001), and Pizarro-Araya & Jerez (2004). Ants were analyzed separately as they represent a different body size scale compared to the other arthropods; their smaller size provided much higher relative abundance compared to other Arthropoda taxa (*sensu* Flores et al. 2004). Tenebrionids were studied at the species level because of the knowledge we have of this assemblage. The other groups were analyzed at the family level because there is very little taxonomic knowledge of them (*sensu* Cepeda-Pizarro et al. 2005b).

Results and Discussion

Taxonomic Composition of the Assemblage of Arthropods. A total of 2187 specimens were collected belonging to 73 species in 31 families. Of these 73 species, 26 belong to Arachnida and 47 to Insecta (Table 2). We collected eight orders of Arthropoda, the most diverse being Coleoptera (34 species), Araneae (16 species), and Orthoptera (7 species) (Table 2). Formicidae was excluded from the analysis because of the relatively high number of specimens captured compared to other taxa, because of their small body size. Furthermore, owing to the biology of these insects, only worker ants were trapped and captured (Flores et al. 2004).

We identified four orders of Arachnida: Solifugae, Araneae, Scorpiones, and Pseudoscorpiones. The two dominant orders were Solifugae (22.8% of total capture) and Araneae (5.7%). The main solpugid families were Mummuciidae and Ammotrechidae, and the main arachnid families were Gnaphosidae, Nemesiidae, and Salticidae. The orders Scorpiones and Pseudoscorpiones accounted for 2.3% and 0.05% of the total capture, respectively.

The abundance of solpugids may not necessary represent their actual relative abundance. Scorpions are usually dominant the arachnids in this kind of

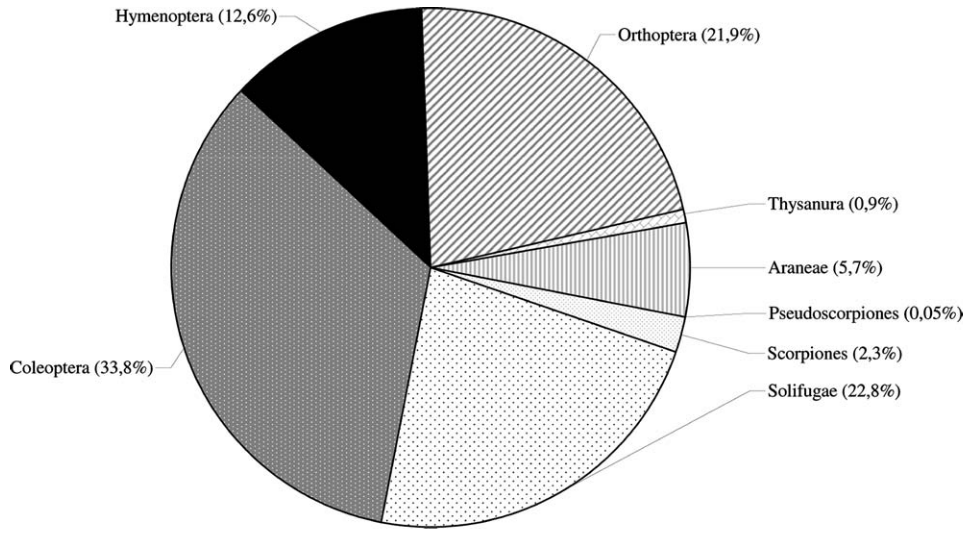

Figure 3. Relative abundance Arthropoda orders in the Quebrada del Morel private protected area in the Atacama Region, Chile.

environment. Previous collection campaigns near the study area have shown the presence of very dense populations of scorpions, especially of genus *Brachistosternus* (Cepeda-Pizarro et al. 2005a; Agusto et al. 2006). All the scorpions present in the area belong to family Bothriuridae, and they are all fossorail, this means that they build their burrows in the soil and remain in them, or very close to them, most of their lives; only during the mating season scorpions are more vagile (specially males) and more easily captured in pitfall traps. The period chosen to place the traps in this research matches with the beginning of the mating season of most bothriurids of the area, which should have increased the chances of higher capture rates of this group; however, the low number of collected specimens may be related to other environmental factors, such as the presence of full moon or cold temperatures (Sissom et al. 1990). In addition, spiders are usually well represented in deserts, even if they are not dominant in this kind of environment (Whitehouse et al. 2002; Cepeda-Pizarro et al. 2005b); however, several species complete their life cycle in, or at least near, their web, and very rarely walk on the ground, so in these cases the pitfall traps would not be recommended to capture these species. In contrast, solpugids are very vagile and active predators, so that they are easily captured with pitfall traps as long as they are active; this could explain their high abundances.

The assemblage of Insecta accounted for 69.1% of all captured specimens. We identified four orders within this group: Hymenoptera (excluding Formicidae), Coleoptera, Orthoptera, and Thysanura. The two dominant orders were Coleoptera (33.8% of total capture) and Orthoptera (21.9%) (Fig. 3). The most abundant families of Coleoptera were Tenebrionidae, Curculionidae, Buprestidae, and Melyridae. Within Orthoptera, the Gryllidae, Tettigoniidae, and Tristiridae represented most of the captures. Of the entire arthropodan assemblage (excluding Formicidae) the most abundant families were Mummucidae (22.5% of total capture), Tenebrionidae (19.4%), and Gryllidae (18.8%) (Table 3).

Table 3. Number of species (S) and relative abundance for the different families of the assemblage of Arthropoda in the Quebrada del Morel private protected area (Atacama Region, Chile).

Order	Family	S	n_{captured}	%
Araneae	Anyphaenidae	1	1	0.1
	Dipluriidae	1	1	0.1
	Filistatidae	1	1	0.1
	Gnaphosidae	3	60	2.7
	Nemesiidae	1	19	0.9
	Palpimanidae	1	3	0.1
	Philodropidae	2	14	0.6
	Salticidae	1	13	0.6
	Scytodidae	1	1	0.1
	Sicariidae	1	7	0.3
	Theraphosidae	1	1	0.1
	Theridiidae	1	1	0.1
	Zodaridae	1	3	0.1
Pseudoscorpiones	Indeterminate	1	1	0.1
Scorpiones	Bothriuridae	4	50	2.3
Solifugae	Ammotrechidae	2	8	0.4
	Mummuciidae	3	491	22.5
Coleoptera	Bostrichidae	1	1	0.1
	Buprestidae	3	245	11.2
	Carabidae	2	11	0.5
	Curculionidae	7	15	0.7
	Melyridae	2	41	1.9
	Ptinidae	1	1	0.1
	Tenebrionidae	18	425	19.4
Hymenoptera	Mutillidae	5	275	12.6
Orthoptera	Acrididae	1	1	0.1
	Gryllidae	2	412	18.8
	Proscopiidae	1	1	0.1
	Tettigoniidae	2	62	2.8
	Tristiridae	1	2	0.1
Thysanura	Indeterminate	1	20	0.9
Total	31	73	2.187	100

Taxonomic Composition of Tenebrionidae Associated With Vegetation. Within epigean arthropods, the family Tenebrionidae stands out as a characteristic group of arid and semiarid ecosystems (Cloudsley-Thompson 2001; Deslippe et al., 2001). The assemblage of tenebrionids accounted for 19.4% of all captured arthropods (Table 3). We registered 18 species from 11 genera. The most abundant species were *Lepidocnemeplatia murina* (55.8%) and *Thinobatis* sp. (12.0%), whereas the sites with the highest abundance were PF (61.9%) and SBR (11.8%). The high abundance found in PF was due to the presence of *Lepidocnemeplatia murina,* a species observed mainly on sandy substrate. The highest species richness was observed in SBR (13 species) and PF (11 species), whereas the lowest abundance and richness were observed in ID with 0.9% and 2 species, respectively (Table 4).

Arthropod Associations With Plant Communities. The abundance and species richness of Arthropoda varied with vegetation types. The sites with the highest abundances were PF (24.0%), SBR (19.8%), and RB (12.9%), while the site with the lowest abundance was ID (3.9%). The highest species richness was observed in PF

Table 4. Percent relationships of tenebrionids in the Quebrada del Morel private protected area (Atacama Region, Chile).

Species	Site										Total captured	
	CS	RB	PF	SBR	SA	CR	PN	ID	EN	EA	*n*	%
Diastoleus bicarinatus	0	0	0.8	1.5	0	0.6	0	0	0	0	15	3.5
Discopleurus quadricollis	0	0	0.2	0.5	0	0	0.3	0	0.1	0	8	1.9
Entomochilus sp.	0	0	0.3	0.2	0	0	0.3	0	0	0	4	0.9
Gyriosomus batesi	0	0	0	0.3	0	0	0	0	0	0	2	0.5
Gyriosomus planatus	0	1.7	0	0.5	0	4.4	0	0	0	0	23	5.4
Gyriosomus planicollis	0	0	0	0.2	0	0	0	0	0	0	1	0.2
Lepidocnemeplatia murina	0	0	36.6	0	0	0	0	0	0	0.3	237	55.8
Nycterinus sp.	0.3	0	0	0	0	0	0	0	0	0	1	0.2
Praocis calderana	1.7	0	0	0.7	1.4	0	0	0	0	0	12	2.8
Praocis curtisi	0.6	0.8	0.9	0.3	0	0	1.4	0	1.9	0.3	35	8.2
Praocis subreticulata	0	0	0.2	0	0	0	0	0	0	0	1	0.2
Psammetichus pilipes	0.6	0.6	0.6	0.3	0.7	1.9	0.8	2.1	0	0	22	5.2
Psectrascelis crassiventris	0	0	0	0.2	2.0	0	0	0	0	0	4	0.9
Psectrascelis elongata	0	0	0.3	0	0	0	0	0	0	0	2	0.5
Psectrascelis sp.	0	0	0.3	0	0	0	0	0	0	0	2	0.5
Scotobius inauditus	0	0	0.3	0.3	0	0	0	0	0	0	4	0.9
Scotobius sp.	0	0	0	0.2	0	0	0	0	0	0	1	0.2
Thinobatis sp	2.8	0.3	0.3	3.2	1.4	0	0	2.1	1.4	1.1	51	12.0
$n_{captured}$	21	28	263	50	8	11	10	4	24	6	425	100
Number of species in each site	5	4	11	13	4	3	4	2	3	3	18	

Table 5. Percent relationships of assemblage of arthropods in the Quebrada del Morel private protected area (Atacama Region, Chile).

Order	Family	Sites										$n_{captured}$
		CS	RB	PF	SBR	SA	CR	PN	ID	EN	EA	
Araneae	Anyphaenidae	0	0	0.2	0	0	0	0	0	0	0	1
	Dipluriidae	0	0	0	0	0	0.9	0	0	0	0	1
	Filistatidae	0.6	0	0	0	0	0	0	0	0	0	1
	Gnaphosidae	3.9	2.8	0.4	1.2	0	4.3	1.5	4.7	8.6	9.1	60
	Nemesiidae	1.9	0.7	1.3	0.9	1.4	0	0	1.2	0	0	19
	Palpimanidae	0	0.4	0	0	0	0	0	0	0.5	1.0	3
	Philodropidae	0.6	0	0.2	0.2	0	0	0	2.4	4.1	0	14
	Salticidae	0.6	0.4	0.6	0.7	0	0.9	0	0	0.9	2.0	13
	Scytodidae	0	0	0.2	0	0	0	0	0	0	0	1
	Sicariidae	1.9	0	0	0.5	0.7	0	0	1.2	0	0	7
	Theraphosidae	0	0	0	0.2	0	0	0	0	0	0	1
	Theridiidae	0	0	0	0	0.7	0	0	0	0	0	1
	Zodaridae	0	0	0	0	0	0	1.5	0	0.5	0	3
Pseudoscorpiones	Indeterminate	0.6	0	0	0	0	0	0	0	0	0	1
Scorpiones	Bothriuridae	1.3	0.7	5.9	1.6	2.9	0.9	0	0	0	3.0	50
Solifugae	Ammotrechidae	0	0.4	0	0	0	0.9	0.8	0	1.4	2.0	8
	Mummuciidae	32.3	12.4	16.6	28.9	46.8	26.7	21.8	28.2	10.0	23.2	491
Coleoptera	Bostrichidae	0	0.4	0	0	0	0	0	0	0	0	1
	Buprestidae	5.8	14.1	4.6	11.1	9.4	15.5	21.1	4.7	24.9	6.1	245
	Carabidae	0	0	2.1	0	0	0	0	0	0	0	11
	Curculionidae	0	0.7	0.8	0.9	0	0	0	3.5	0	2.0	15
	Melyridae	0	7.1	0.2	0	0.7	8.6	3.8	0	1.8	0	41
	Ptinidae	0	0	0.2	0	0	0	0	0	0	0	1
	Tenebrionidae	13.5	9.9	50.2	11.6	5.8	9.5	7.5	4.7	10.9	6.1	425
Hymenoptera	Mutillidae	9.0	9.2	11.5	14.1	20.1	4.3	16.5	22.4	11.8	14.1	275
Orthoptera	Acrididae	0	0	0	0.2	0	0	0	0	0	0	1
	Gryllidae	27.7	32.9	4.4	21.5	11.5	22.4	17.3	27.1	19.0	30.3	412
	Proscopiidae	0	0.0	0	0.2	0	0	0	0	0	0	1
	Tettigoniidae	0	5.3	0.4	6.0	0	5.2	2.3	0	4.1	1.0	62
	Tristiridae	0	0	0.4	0	0	0	0	0	0	0	2
Thysanura	Indeterminate	0	2.8	0	0	0	0	6.0	0	1.8	0	20
$n_{captured}$		155	283	524	432	139	116	133	85	221	99	2.187
Number of species in each site		23	35	40	39	19	22	24	16	27	23	

(40 species), SBR (39 species), and RB (35 species), whereas the lowest was found in ID (16 species) (Table 5).

The higher abundances of PF and SBR (sites with mostly sandy substrate) may be because these sites maintain an edaphic humidity that lowers the probability of larval mortality due to dehydration (Deslippe et al. 2001). The sites are also important food sources as a result of the phytophagous and detritivorous habits of larvae and adults (Slobodchikoff 1983). For the different groups of Arthropoda, including Solifugae, we observed higher abundance in SA. The higher abundance of solpugid species associated with sandy substrates may be because these systems favor excavation, copulation, and hibernation (Martins et al. 2004; Rocha & Carvalho 2006). These data are consistent with reports by Valdivia et al. (2008, 2011) on the fauna of solpugids of the coastal area of Los Choros (29°21′ S, 71°10′ W; 17 masl) (Coquimbo Region, Chile) with regard to the relationship between the type of substrate (sandy) and the microdistribution of the species. The abundance of the families Gryllidae and Buprestidae was similar under the different types of vegetation.

This contribution is a first to characterize the arthropod fauna of this area, and many questions have arisen from our results. More fieldwork, including other collection techniques as well as collections during other periods of the year, would be necessary to more comprehensively establish the species assemblage of the area. Future works in the area should attempt to quantify the species diversity and characterize population dynamics, life cycles, interactions with ENSO events, and behavior under a given plant composition (Cepeda-Pizarro et al. 2005a; Deslippe et al. 2001).

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