

ARTIGO / ARTÍCULO / ARTICLE

A new cave species of *Pseudosinella* (Collembola, Entomobryomorpha, Entomobryidae) from Sima del Campamento (Jaén, Southern Iberian Peninsula).

Javier I. Arbea

c/ Ría de Solía 3, ch. 39. E-39610 El Astillero (Cantabria, España). e-mail: jarbeapo@gmail.com

Abstract: A new species of Collembola, *Pseudosinella perezii* sp. nov., from a karstic cave in the "Sierras de Cazorla, Segura y las Villas" Natural Park (Jaén, Spain) is described. The new species can be distinguished from all other species in the genus by the combination of the following characters: 3+3 eyes, dorsal macrochaetotaxy R011/10/0101+2, labial chaetotaxy M₁M₂rEL₁L₂, abdominal II chaetotaxy -aBq₁q₂, tenent hair acuminate, unguis with 3 inner teeth (basal teeth of different size), unguiculus acuminate, without wing tooth and smooth external edge.

Key words: *Pseudosinella*, Entomobryidae, Collembola, cave fauna, Spain.

Resumen: Una nueva especie cavernícola de *Pseudosinella* (Collembola, Entomobryomorpha, Entomobryidae) de la Sima del Campamento (Jaén, sur de la Península Ibérica). Se describe una nueva especie de colémbolo, *Pseudosinella perezii* sp. nov., encontrado en una cueva kárstica en el Parque Natural de las Sierras de Cazorla, Segura y las Villas, Jaén, España. La nueva especie se distingue del resto de las de su género por la combinación de los siguientes caracteres: 3+3 ojos, R011/10/0101+2 macroquetas dorsales, chaetotaxia labial M₁M₂rEL₁L₂, chaetotaxia del terguito abdominal II -aBq₁q₂, espolón tibiotarsal acuminado, uña con 3 dientes internos (los basales de diferente tamaño), empodio acuminado, sin diente y con la cara externa lisa.

Palabras clave: *Pseudosinella*, Entomobryidae, Collembola, fauna cavernícola, España.

Recibido: 30 de mayo de 2013

Aceptado: 2 de junio de 2013

Publicado on-line: 9 de junio de 2013

urn:lsid:zoobank.org:pub:EBE2E3A8-7A97-4D14-AA9B-13ACC930EAEA

Introduction

The "Grupo de Espeleología de Villacarrillo" (G.E.V.) conducted a bio-speleological sampling in the "Sierras de Cazorla, Segura y las Villas" Natural Park (Jaén, Pre-Baetic Range). This led to the discovery of the new species described in this paper.

Springtails were captured in traps in the deepest part of a cave named Sima del Campamento and located in the region of Hornos del Segura (Jaén, Spain), UTM Coordinates 30S WH 1914 2633 (Fig. 1). The cave is located at medium elevation, with an altitude of 708 m above sea level, and with a total depth of 105 m and length of 500 m, divided into several wells, and with large verticals. It is structured around a large fracture, forming a grand entrance. Inside there are organic matter from the water drag and accidental fall from outside the cave. Cave systems have been developed on limestones of Senonense (Cretaceous) (López Limia & López Bermúdez, 1999; Durán Valsero, 2002).

Material and methods

The sampling was made with pitfall traps filled with chloral hydrate as preservative and ethanol

70% as transport medium. Specimens were mounted in Hoyer medium, after clearing in Nesbitt solution. Material is deposited in the Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN), Spain.

The description of the new species follows the traditional system for labial chaetotaxy and dorsal macrochaetae of Gisin (1967). The terminology defined by Christiansen *et al.* (1990) for *Pseudosinella* and the characters used by Jordana & Baquero (2007), Christiansen (2013) and Jordana *et al.* (2013) have been used for identification.

Abbreviations used. Abd I–VI: abdominal segments I to VI; Ant I–IV: antennal segments I to IV; Th I–III: Thoracic segments I to III; MNCN: Museo Nacional de Ciencias Naturales, Madrid, Spain; G.E.V. (Grupo de Espeleología de Villacarrillo).



Fig. 1. - Geographic location of the studied cave. ● Sima del Campamento.

Description

Pseudosinella perezii sp. nov.

(Figs. 2–8, Table I)

Type locality. Spain, Sima del Campamento, UTM Coordinates 30S WH 1914 2633, 708 m a.s.l., in the “Sierra de Cazorla, Segura y las Villas” Natural Park of Hornos del Segura (Province of Jaén).

Type material.

Holotype: female (mounted on slide labelled EJA0154): Spain, Jaén, Hornos del Segura, “Sierra de Cazorla, Segura y las Villas” karst, Sima del Campamento, 07.IV.2013–11.V.2013, G.E.V. leg.

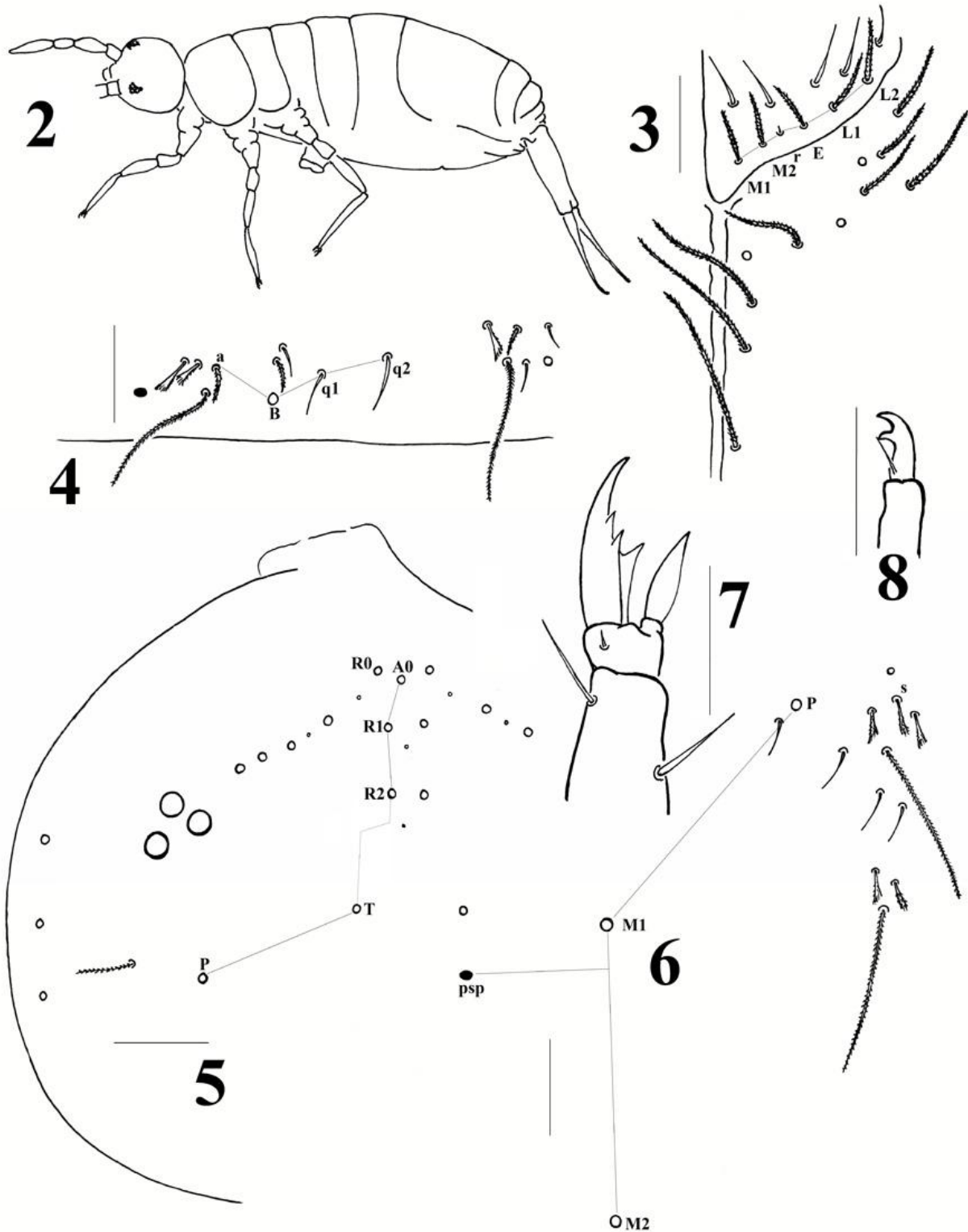
Paratypes: two males, one female (mounted on slides labelled EJA0154) collected together with holotype. Holotype and paratypes deposited in MNCN.

Description.

Body: Length from 0,8 to 1,3 mm (Holotype: 1,3 mm). With scattered little spots of pigment over the body dorsum; antennae, furca and legs without pigment. Scales absent in the antennae and legs.

Head: 3+3 eyes with pigment. In the R complex R0 to R2 are present (Fig. 5). Formula of the labial base (Fig. 3): $M_1M_2rEL_1L_2$ (all chaetae conspicuously ciliated except r, that is a vestigial microchaeta).

Antennae: Ratio antenna/cephalic diagonal 1.3 (Fig. 2). Ratio of Ant I:II:III:IV is 10:20:12:29. Ant IV without apical bulb. Sensorial chaetae s of the sensory organ of Ant III short peg or rod-like.



Figs. 2-8. - *Pseudosinella perezii* sp. nov.

2.- Habitus. 3.- Labial chaetotaxy. 4.- Chaetotaxy of second abdominal tergite. 5.- Cephalic chaetotaxy and eyes. 6.- Macrochaetae and chaetae complex from anterior bothriotrichum of abdominal tergite IV. 7.- Unguis and unguiculus of leg III. 8.- mucro (scale: 25 micrometers).

Legs: Unguis (Fig. 7) with dental plate occupying 50% of the basal internal edge; basal teeth of different size, medial tooth well developed, approximately 65% from base of total unguis. Unguiculus

appendage lanceolate, 0.6, as long as unguis. Tibiotarsi with acuminate tenent hair, its ratio with the length of internal unguis is 0.59, differentiated inner chaeta on hind tibiotarsus, clear acuminate.

Ventral tube: with 5+5 anterior and 6-8 posterior ciliated macrochaetae, and 6+6 latero-distal microchaetae (2+2 smooth and 4+4 ciliated).

Furca: Retinaculum with 4+4 teeth and one ciliated chaeta in the base. Two internal and two external chaetae related to two distal pseudopores of manubrial plate. Mucro with distal tooth equal than the antepical; the basal spine reaches just to the tip of the first tooth.

Dorsal chaetotaxy: Formula of the dorsal macrochaetae: **R011/10/0101+2**. Anterior chaeta to Th II pseudopore absent. Abd II chaetotaxy: **-aBq₁q₂** (Fig. 4), **a** as a ciliated microchaeta. Accessory chaeta **s** in the anterior trichobothrial complex of Abd IV is present (Fig. 6).

Etymology. The species is dedicated to Toni Pérez, member of the Grupo de Espeleología de Villacarrillo (G.E.V.), and responsible for the sampling of this species from Jaén caves.

Discussion. According to the dorsal macrochaetotaxy (**R001/00/0201+2**), labial chaetotaxy (**M₁M₂rEL₁L₂**) and abdominal II chaetotaxy (**-aBq₁q₂**), this new species belongs to the group formed by *P. aidamar* Lucíañez & Simón, 1994 (Ávila, Spain), *P. arretzi* Simón, 1981 (central Spain), *P. cobosae* Lucíañez & Simón, 1994 (Ávila, Spain), *P. cordobensis* Simón, Bach & Gajú, 1987 (meridional and central Spain), *P. espagnoli* Simón & Selga, 1977 (central Spain), *P. jordanai* Simón & Palacios Vargas, 2007 (Madrid, Spain) and *P. tietarensis* Jordana & Baquero, 2007 (Ávila, Spain).

The Table I, with the 44 characters frequently used for the description of species of this genus, is sufficient to identify and compare the species of this group. These characters have been obtained studying the original papers where the species were described (Jordana & Baquero, 2007; Lucíañez & Simón, 1994; Simón, 1981; Simón *et al.*, 1987; Simón & Palacios Vargas, 2007; Simón & Selga, 1977) and completed using the Navikey dataset of Christiansen (2013) and Jordana *et al.* (2013).

The use of the number of eyes (Ch. 26), presence/absence of the accessory chaeta **s** of the anterior trichobothrial complex of Abd. IV (Ch. 20), tenent hair shape (Ch. 21), unguis shape (Ch. 22, 23 & 34), unguiculus shape (Ch. 24, 25 & 43), and mucronal shape (Ch. 44) allows to separate the new species within the considered group.

Acknowledgements

I express my gratitude to the Grupo de Espeleología de Villacarrillo (GEV), especially to Toni Pérez, for their kind support and cooperation in sampling. All specimens were collected under the permit of the "Consejería de Medio Ambiente, Junta de Andalucía" and "Sierras de Cazorla, Segura y las Villas" Natural Park. The material has been studied because of a specific grant of the "Diputación Provincial de Jaén" and the "Instituto de Estudios Giennenses".

References

- Christiansen, K. 2013. *NaviKey 2.3 for Collembola dataset*. Accessed on 2013/5/29 at <http://www.math.grin.edu/~twitchew/coll/navikey.html>
- Christiansen, K.; Bellinger, P. & Gama, M.M. 1990. Computer assisted identification of specimens of *Pseudosinella* (Collembola Entomobryidae). *Revue d'Ecologie et Biologie du Sol*, **27**: 231-246.
- Durán Valsero, J.J. 2002. El modelado kárstico en los parques naturales de la provincia de Jaén. *In: presente y futuro de las aguas subterráneas en la provincia de Jaén*, IGM, Madrid, pp. 39-43.
- Gisin, H. 1967. Espèces nouvelles et lignées évolutives de *Pseudosinella* endogés (Collembola). *Memórias e Estudos do Museu Zoológico da Universidade de Coimbra*, **301**: 5-25.

Jordana, R. & Baquero, E. 2007. New species of *Pseudosinella* Schäffer, 1897 (Collembola, Entomobryidae) from Spain. *Zootaxa*, **1465**: 1-14.

Jordana, R.; Baquero, E. & Ariño, A.H. 2013 (continuously updated). *Collembola DELTA database: Pseudosinella taxonomy*. University of Navarra. Accessed on 2013/5/29 at <http://www.unav.es/unzyec/collembola/Pseudosinella/>

López Limia, B. & López Bermúdez, F. 1999. Morfología kárstica del sector oriental del Prebético andaluz. *In: Karst en Andalucía*, J.J. Durán & J. López Martínez (Eds.), Instituto Tecnológico Geominero de España, Madrid, pp. 145-152.

Luciáñez, M.J. & Simón, J.C. 1994. Cinco especies nuevas del género *Pseudosinella* (Collembola: Entomobryidae) de la Península Ibérica. *Annales de la Société Entomologique de France (N.S.)*, **30**(3): 319-327.

Simón, J.C. 1981. *Pseudosinella arretzi* nov. sp. de la Sierra de Gredos (Collembola). *Eos*, **55-56**: 215-218.

Simón, J.C.; Bach, C. & Gajú, M. 1987. Colémbolos de la provincia de Córdoba (España). *Eos*, **62**: 297-306.

Simón, J.C. & Palacios Vargas, J.G. 2007. New species of *Pseudosinella* (Collembola: Entomobryidae) from Iberian Peninsula. *Zootaxa*, **1479**: 9-19.

Simón, J.C. & Selga, D. 1977. Colémbolos de suelo de sabinar en la provincia de Segovia. *Graellsia*, **31**: 213-230.

Table I.- Comparison of *P. perezii* sp. nov. with the species sharing dorsal macrochaetotaxy (R011/10/0101+2), labial chaetotaxy (M₁M₂EL₁L₂) and abdominal II chaetotaxy (-aBq₁q₂). State of characters after Christiansen *et al.* (1990) and Jordana & Baquero (2007).

Character, place, description.

Ch.1, dorsal cephalic macrochaeta S, 1. absent/ 2. present;

Ch.2, dorsal cephalic macrochaeta T, 1. absent/ 2. Present;

Ch.3, m1 <ventral labial>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. smooth macrochaeta with supplementary seta/ 6. ciliated macrochaeta with supplementary seta/ 7. Absent;

Ch.4, m2 <ventral labial>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. smooth macrochaeta with supplementary seta/ 6. ciliated macrochaeta with supplementary seta / 7. absent;

Ch.5, r <ventral labial>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. absent;

Ch.6, e <ventral labial>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. absent;

Ch.7, L1 <ventral labial, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. absent;

Ch.8, L2 <ventral labial>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. ciliated macrochaeta/ 5. absent;

Ch.9, a <second abdominal seta>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. Ciliated macrochaeta/ 5. absent;

Ch.10, b <second abdominal seta>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. Ciliated macrochaeta/ 5. absent;

Ch.11, p <second abdominal seta>, 1. absent/ 2. present;

Ch.12, q1 <second abdominal seta>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. Ciliated macrochaeta/ 5. absent;

Ch.13, q2 <second abdominal seta>, 1. smooth microchaeta/ 2. ciliated microchaeta/ 3. smooth macrochaeta/ 4. Ciliated macrochaeta/ 5. absent;

Ch.14, posterior thoracic segment 2 macrochaeta, 1. acuminate/2. clavate/ 3. truncate/ 4. absent;

Ch.15, posterior thoracic segment 2 macrochaeta, number;

Ch.16, thoracic segment 3 macrochaetae, 1.acuminate/ 2. clavate/ 3. absent,

Ch.17, thoracic segment 3 macrochaetae, number;

Ch.18, anterior lateral (P) fourth abdominal dorsal macrochaetae, 1. 0/ 2. 1/ 2m. 1 mesochaetae;

Ch.19, median (M) 4th abdominal dorsal macrochaetae, 1. 1/ 2. 2/ 3. 3/ 4. 4/ 5. 0;

Ch.20, supplementary seta <4th abdominal segment>, 1. absent/ 2. present;

- Ch.21, tenent hair shape, 1. acuminate/2. clavate/ 3. truncate;
 Ch.22, number of teeth of inner unguis, 1. 2/ 2. 3/ 3. 4/ 4. 0;
 Ch.23, unguis wing tooth, 1. absent/ 2. present;
 Ch.24, unguiculus wing tooth, 1. absent/2. minute/3. weak/ 4. fully developed;
 Ch.25, unguiculus shape, 1. acuminate/ 2. clavate/ 3. basally swollen;
 Ch.26, eyes per side, number;
 Ch.27, inner setae manubrial plaque, 1. 1/ 2. 2/ 3. 3/ 4. 4/ 5. more than 4;
 Ch.28, outer setae manubrial plaque, number;
 Ch.29, habitat, 1. cave/2. surface/ 3. both cave and surface/ 4. under stones at low tide, in the sea;
 Ch.30, region located, 1. Europe and North Africa/ 2. North America/ 3. Mexico, Central America, West Indies/ 4. South America/ 5. Sub-Saharan Africa/ 6. Asia/ 7. Australia/ 8. Oceania/ 9. New Zealand;
 Ch.31, apical antennal bulb, 1. absent/2. present/ 3. Unclear;
 Ch.32, apical organ of third ant. segment, 1. peg or rod-like/ 2. expanded (leaf shaped)/ 3. paddle-shaped;
 Ch.33, maximum length, mm;
 Ch.34, distance distal unpaired unguis tooth from base/total unguis, <%>;
 Ch.35, antennal/cephalic diagonal, ratio (mean);
 Ch.36, differentiated inner seta on hind tibiotarsus, 1. unclear or absent/ 2. clear, acuminate/ 3. clear, truncate or clavate;
 Ch.37, cephalic seta R0, 1. absent/ 2. present;
 Ch.38, cephalic seta R1, 1. absent/ 2. present;
 Ch.39, cephalic seta R2, 1. absent/ 2. present;
 Ch.40, cephalic seta R3, 1. absent/ 2. present;
 Ch.41, cephalic seta P, 1. absent/ 2. present;
 Ch.42, anterior to pseudopore thoracic segment II seta, 1. absent/ 2. present;
 Ch.43, unguiculus external edge, 1. smooth/ 2. serrate;
 Ch.44, apical tooth of mucro, 1. similar than second/ 2. longer than second.

The symbol "-" means absence of data. Differences in bold.

Character	perezi sp. nov.	aidamar	arretzi	cobosae	cordobensis	espagnoli	jordanai	tietarensis
Ch.1	1	1	1	1	1	1	1	1
Ch.2	2	2	2	2	2	2	2	2
Ch.3	4	4	4	4	4	4	4	4
Ch.4	4	4	4	4	4	4	4	4
Ch.5	1	1	1	1	1	1	1	1
Ch.6	4	4	4	4	4	4	4	4
Ch.7	4	4	4	4	4	4	4	4
Ch.8	4	4	4	4	4	4	4	4
Ch.9	2	2	1-2	2	1	2	1	2
Ch.10	4	4	4	4	4	4	4	4
Ch.11	1	1	1	1	1	1	1	1
Ch.12	1	1	1	1	1	1	1	1
Ch.13	1	1	1	1	1	1	1	1
Ch.14	-	-	-	-	-	-	1-3	-
Ch.15	1	1	1	1	1	1	1	1
Ch.16	3	3	3	3	3	3	3	3
Ch.17	0	0	0	0	0	0	0	0
Ch.18	2	2	2	2	2	2	2	2
Ch.19	2	2	2	2	2	2	2	2
Ch.20	2	2	2	2	2	1	1	2
Ch.21	1	2	2	2	2	2	1	2
Ch.22	2	3	3	3	3	2	2	2

Character	perezi sp. nov.	aidamar	arretzi	cobosae	cordobensis	espagnoli	jordanai	tietarensis
Ch.23	2	1	1	1	1	2	2	2
Ch.24	1	1	4	4	1	4	1	3
Ch.25	1	1	3	1	1	3	1	1
Ch.26	3	2	3	2	3	2	1	3
Ch.27	2	2	2	2	-	2	2	1
Ch.28	2	2	2	2	-	2	2	2-3
Ch.29	1	2	2	2	2	2	2	2
Ch.30	1	1	1	1	1	1	1	1
Ch.31	1	1	1	1	-	-	1	1
Ch.32	1	1	1	1	1	1	1	1
Ch.33	1.3	1.17	0.9	1.05	0.84	0.9	1	1
Ch.34	65	95	70	90	90	65	66	67
Ch.35	1.3	1.3	1.5	1.46	1.5	1.45	0.8	1.35
Ch.36	2	2	-	2	2	2	2	-
Ch.37	2	-	2	-	2	2	2	2
Ch.38	2	2	2	2	2	2	2	2
Ch.39	2	2	2	2	2	2	2	2
Ch.40	1	1	1	1	1	1	1	1
Ch.41	2	2	2	2	2	2	2	2
Ch.42	1	-	1	-	1	-	-	1
Ch.43	1	2	1	1	1	1	1	2
Ch.44	1	2	1	2	2	2	-	2