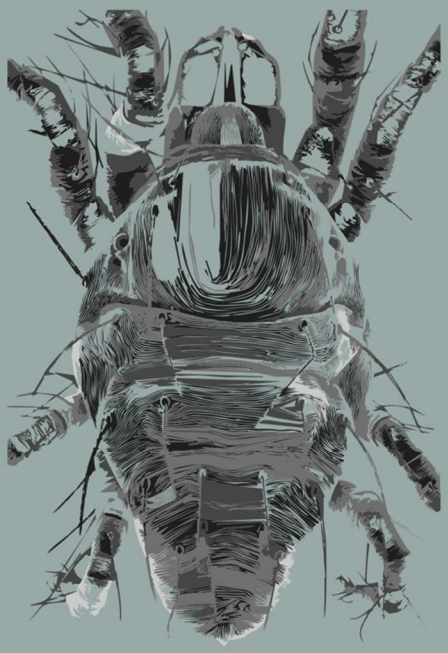
Acarological Studies

A Part of Acarological Science



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Aim and Scope

The aim of the journal *Acarological Studies* (*AS*) is to promote acarological research worldwide. The journal is international, peer reviewed, open access, on-line and it has no publication fees. *AS* publishes high quality research papers on any aspect of mites, including anatomy, behaviour, biodiversity, biological control, ecology, medical acarology, morphology, phylogeny, physiology, systematics, veterinary acarology and zoogeography. The journal also invites the submission of case studies, monographs, revisions, reviews, catalogues, checklists, descriptions of taxa and nomenclature for consideration.

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Manuscripts must be submitted to the journal *AS* through the online system of TÜBİTAK-ULAKBİM JournalPark, which provides online hosting services for academic journals, at http://dergipark.gov.tr/acarolstud. Other correspondence can be made to the chief editor: E-mail: acarolstud@gmail.com

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After initial evaluation, the manuscript will be double blind peer reviewed by at least two independent expert referees. If there are inconsistencies between the referees, more reviewers will be asked to review the manuscript. The editor will decide the acceptance or rejection of the manuscripts according to these referees. However, a manuscript may be rejected without external review by the editor thinking it as unacceptable. A manuscript is rejected without peer review if it does not comply with the instructions for authors or if it is beyond the scope of the journal. Throughout all entire processes, editors follow the code of conduct and best practice guidelines for journal editors designed by Committee on Publication Ethics (COPE).

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The requirements for electronic publications are that the work be registered in ZooBank before it is published. This is a recent change to the International Code of Zoological Nomenclature (ICZN). The papers published in Zootaxa and Zookeys by International Commission on Zoological Nomenclature (2012) explain how to do this, to make the new names available. Here is the web site for registration of your paper in ZooBank: http://zoobank.org/. We remind you that the data entered in ZooBank are your responsibility and we thank you making sure that the information provided is accurate and complete.

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Acarological Studies provides full open access to acarological information.

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This page should contain the full title. The title should be as short and informative, not contain non-standard acronyms or abbreviations. The higher taxa containing the taxa dealt with in the manuscript should be indicated in parentheses in the title. The full names of all authors must be given and surname should be typed in the upper case. The address of each author should be given in italic each starting a separate line. Authors are strongly encouraged to include an ORCID with their manuscript submission or revision (for more information on how to register for an ORCID click here). The contact e-mail address should be provided for the clearly identified corresponding author.

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The abstract should present the general scope, and give summarize information on the main results and conclusions of the paper. In the manuscripts written in Turkish, the abstract in English must be included in addition to the Turkish abstract. Any new names or new combinations proposed in the manuscript should be referred in the abstract. The abstract should not exceed 350 words, and not contain citations.

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Keywords are used for indexing purposes. For this reason, it is better to give keywords that are not present at the title. Abbreviations and acronyms should be avoided.

Introduction

The introduction should provide concisely description of the basic background, rationale, aims and objectives of the study. It should not include the findings.

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In this section, it should be provided concise but complete information about the materials and the analytical and statistical procedures used. This part should be as clear as possible to enable other scientists to repeat the research presented. Brand names should be supplied for all mentioned equipment, instruments, consumables etc.

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Results

In this section it should be presented only the data which support the objective without any discussion of the results. Figures and tables are used to present the results, but information in figures and tables should not be duplicated in the text.

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In this section the results are discussed and interpreted in the context of the existing knowledge. It can be presented here the relationships and generalizations shown by the results. Information in the Introduction and Results sections should not be repeated here. Main conclusion of the study can be clearly given in the end of this section.

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It should be given in a separate section at the end of the manuscript before the references, and not included them on the title page, as a footnote to the title or otherwise. It should be listed here those individuals who provided help during the research. List here funding sources. Names of funding organisations should be written in full.

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Tables should be editable tables in a word document or main text. All columns must have headings. If a table continues on more than one page, repeat column headings on subsequent page(s). Use approved abbreviations already defined in the text and define them in the general footnote.

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Journal article, 1 author

Ewing, H.E. 1911. New predaceous and parasitic Acarina. Psyche, 18: 37-43.
doi: 10.1155/1911/234794

Journal article, 2 authors

Fan, Q.-H. and Ueckermann, E.A. 2016. Resurrection of the genus *Nonocaligus* Habeeb with redefination of Nonocaligus and Mullederia Wood (Acari: Stigmaeidae). Systematic and Applied Acarology, 21 (11): 1447-1449.
doi: 10.11158/saa.21.11.1

Journal article, 3 and more authors

Cakmak, I., Janssen, A., Sabelis, M.W. and Baspinar, H. 2009. Biological control of an acarine pest by single and multiple natural enemies. Biological Control, 50: 60-65.
doi: 10.1016/j.biocontrol.2009.02.006

Note that titles of serial publications must be written in full. DOI (if available) should be given. If there are more than 10 authors, then include names of the first 10, followed by et al.

Electronic resource

OConnor, B. and Klimov, P. 2012. Family Cheyletidae Leach, 1815. Available http://insects.ummz.lsa.umich.edu/beemites/Species_Accounts/Cheyletidae.htm (Last accessed: 19 May 2018).

Book

Krantz, G.W. and Walter, D.E. 2009. A manual of Acarology. Third edition. Texas Tech University Press, Lubbock, 807 p.

Book Chapter

Kethley, J. 1990. Acarina: Prostigmata (Actinedida). In: Soil biology guide. Dindal, D.L. (Ed.). John Wiley and Sons, New York, 667-756 pp.

Congress

Tolstikov, A.V. 2001 Reproductive behaviour of the semi-aquatic mite *Homocaligus* cf. *amphibius* Wainstein, 1975 (Acari, Homocaligidae). In: Acarology: Proceedings of the 10th International Congress. Halliday, R.B., Walter, D.E., Proctor, H.C., Norton, R.A. and Colloff, M.J. (Eds). CSIRO Publishing, Melbourne, 180-182 pp.

Advisory Board

Acarological Studies
Vol 1 (1): 1-2

EDITORIAL

A new inspiration for acarological life: *Acarological Studies*

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Scientific publications are important information sources that contribute to the sharing of knowledge by ensuring the permanence of scientific research results and the incremental advancement of science by publishing results in a timely manner.

In parallel with the rapid development of information technologies, significant changes in the format of information and methods of access to that information have occurred. Electronic publishing has come into our lives and that sector is growing rapidly. Cost efficiency, high speed and easily accessibility are the most important elements making electronic publishing attractive.

Today, there are more than 246,000 regular and irregularly published serial publications in all types of academic and scholarly journals according to Ulrich's Periodicals Directory (57th edition, 2019). Only 16 journals are about acarology (three are not research journal and one is not dedicated to acarology). Of these, 10 are currently active but the others are no longer published (Zhang, 1996, 2014, 2017; Dhooria, 2016; SARAS, 2017) (Table 1).

The journal *Acarological Studies* (*AS*) has started life and is expected to give a new impulse to acarology. *AS* is a peer-reviewed, international scientific journal that publishes and promotes research in acarology worldwide. *AS* publishes quality research papers on any aspect of mites, including anatomy, behaviour, biodiversity, biological control, ecology, medical acarology, morphology, phylogeny, physiology, systematics, veterinary acarology and zoogeography. The journal also invites the submission of case studies, monographs, revisions, reviews, catalogues, checklists, descriptions of taxa and nomenclature for consideration. All submitted papers must be original and unpublished or not under consideration for publication. Manuscripts in English or Turkish with an abstract and with references in English will be accepted.

Acarological Studies, a new inspiration for acarological life, is a fully open access journal, published biannually by JournalPark for the "Turkish Academic Network and Information Center (ULAKBİM)", a unit of "The Scientific and Technological Research Council of Turkey (TÜBİTAK)". JournalPark provides online hosting services and an editorial workflow management system for academic journals published in Turkey. The JournalPark Project, undertaken by TÜBİTAK-ULAKBİM, is a public service in Turkey whose mission is the web-based publication of academic journals and the operation of an online journal management system. The project also organizes, conducts and coordinates the dissemination of scientific information in line with national targets.

AS providing full open access to acarological information uses LOCKSS digital preservation system. All papers published in *AS* are licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International.

In keeping with its commitment to best practices in publication, *AS* strongly supports and adheres to the Principles of Transparency and Best Practice for Scholarly Publication adopted by the Committee on Publication Ethics (COPE), Directory of Open Access Journals (DOAJ), Open Access Scholarly Publishers Association (OASPA) and World Association of Medical Editors (WAME).

The number of published articles on Acari has been about 12,000 every ten years but this number is increasing rapidly (Zhang, 2014, 2017). In addition, many journals, including *Zootaxa*, publish papers on mites but they are not dedicated to acarology (Zhang, 2014).

Acarology is an enormous field that is a richly rewarding but greatly understudied. I encourage you to introduce students to the extraordinary world of mites so that the next generation of acarologists is ready to embrace the countless research opportunities available.

Acknowledgements

I am grateful to all editors, all members of the advisory board, all the reviewers and authors for their contributions to the journal *Acarological Studies*, to JournalPark (ULAKBİM) for providing online publishing and hosting services to this journal, to Dr. Zhi-Qiang Zhang (The University of Auckland & Landcare Research, Auckland, New Zealand) and Dr. Gregory T. Sullivan (The University of Queensland, Brisbane, Australia) for their comments on this editorial.

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Dhooria, M.S. 2016. Historical account of acarology. In: Fundamentals of Applied Acarology, Springer Science+Business Media Singapore, 9-19 pp. doi: 10.1007/978-981-10-1594-6_2

SARAS, 2017. Arachnological and acarological journals. Available from: http://saras.pavuky.eu/ve04-2bibl.htm

Zhang, Z.-Q. 1996. Acarology information sources. Acarology Bulletin, 1: 27.

Zhang, Z.-Q. 2014. Acarological publications in the last 150 years: historical trends and an assessment of current journals. Systematic and Applied Acarology, 19 (2): 250-252.
doi: 10.11158/saa.19.2.16

Zhang, Z.-Q. 2017. Recent trends in four major journals in acarology: size and impact. Systematic and Applied Acarology, 22 (6): 895-896.
doi: 10.11158/saa.22.6.13

Table 1. List of acarological journals

1.	*Acari Bibliographia Acarologica* has been published tri-annually by Senckenberg Publications in Germany since 2001. It is not a research journal.
2.	*Acarina, Russian Journal of Acarology* has been issued semi-annually by KMK Scientific Press on behalf of the Zoological Museum of Moscow University in Russia since 1993.
3.	*Acarines* has been issued annually by Egyptian Society of Acarology in Egypt since 2007 but discontinued in 2015.
4.	*Acarologia* is published in one volume of 4 issues per year in France, and founded in 1959.
5.	*Acarologie*, was published by Hirschmann-Verlag Nürnberg in the years 1957-1993, now discontinued.
6.	*Acarology Bulletin* is a quarterly newsletter of the Systematic and Applied Acarology Society since 1996, but discontinued in 2007. It is not a research journal.
7.	*EURAAC Newsletter* is a semi-annual newsletter of European Association of Acarologists in Austria in the years 2009-2012, now discontinued. It is not a research journal.
8.	*Experimental and Applied Acarology* has been published monthly by Springer since 1985.
9.	*International Journal of Acarology* is one volume of 8 issues per year, published by Taylor and Francis, and founded in 1975.
10.	*Journal of Acarology*, initially *Indian Journal of Acarology*, is a semi-annual journal of the Acarological Society of India, published from 1976 to 2000 and publishing thereafter irregularly.
11.	*Journal of the Acarological Society of Japan* is a semi-annual journal published in Japan by The Acarological Society of Japan since 1992.
12.	*Journal of Entomological and Acarological Research*, formerly *Bollettino di Zoologia Agraria e di Bachicoltura*, is a tri-annual journal, and was founded in Italy in 1928. It is not dedicated to acarology, includes acarology but entomology may be the bigger part.
13.	*Persian Journal of Acarology*, a quarterly journal of the Acarological Society of Iran, has been published since 2012.
14.	*Systematic and Applied Acarology* is a monthly journal of the Systematic and Applied Acarology Society in the UK since 1996.
15.	*Systematic and Applied Acarology Special Publications* was active from 1997 to 2009, merged with its sister journal Systematic and Applied Acarology in 2012.
16.	*Ticks and Tick-borne Diseases*, a bimonthly journal, has been published by Elsevier since 2010.

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Acarological Studies
Vol 1 (1): 3-10

RESEARCH ARTICLE

A new species of the genus *Zercon* (Acari, Mesostigmata, Zerconidae) from Kastamonu, Turkey

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ABSTRACT: A new species, *Zercon kastamonuensis* sp. nov. is described and illustrated based on female specimens collected from Kastamonu, Turkey. The new species is closely related to *Z. hispanicus* Sellnick, 1958, *Z. lepurus* Błaszak, 1979 and *Z. osmaneliensis* Urhan, 2008. The similarities and differences between related species within the same genus are also discussed. Additionally, a key to species of the genus *Zercon* known from Turkey is given.

Keywords: Acari, *Zercon kastamonuensis* sp. nov., description, Kastamonu, Turkey.
Zoobank: http://zoobank.org/4A7EEDAE-96DD-4DCB-9E4A-DA816A8D699D

INTRODUCTION

The family Zerconidae includes about 40 genera and more than 400 species. They are free-living predators and mostly associated with hummus, soil, decomposed litter, leaf mold, plant parts, and mosses. However, there are occasional records in wood substrates, ant-hills, nests of birds and small terrestrial mammals (Mašán and Fend'a, 2004). Turkish zerconid mites are similar to European zerconid species and could be distributed in the whole of European continent. Of the about 40 genera of the family Zerconidae known from the northern hemisphere, only 2 of them (*Prozercon* and *Zercon*) are known from Turkey. *Zercon* is the richest genus in Turkey based on the number of species. The fauna of zerconid mites in Turkey includes 37 *Prozercon* species and 80 *Zercon* species. (Duran et al., 2017; Erman et al., 2007; Karaca and Urhan, 2016; Özkan et al., 1994; Urhan et al., 2016; Urhan and Duran, 2017). During a research on the zerconid mites in Turkey, an undescribed species was found and described in the present paper as a contribution to the acarological fauna of Turkey. So far, there is no study on zerconid mites from Kastamonu, Turkey. This study is the first time on zerconid mites in Kastamonu. The number of zerconid mites species known from Turkey have been raised 118 with this species.

MATERIAL AND METHODS

The new species described in this paper is from litter and soil samples taken by Drs. R. Urhan and M. Karaca of Kastamonu Turkey, placed in plastic bags, labelled, and transferred to the Acarology Laboratory of Pamukkale University, Denizli (Turkey). After that samples were put into combined Berlese funnels, and mites were extracted after 5–7 days according to the humidity of the samples. At the end of this process, the mites were transferred to Petri dishes, and mites were sorted under the stereo microscope (Nikon SMZ 745T) by using forceps. They were placed in 60% lactic acid for clearing and mounted on permanent microscope slides using a glycerine medium. The examination and drawing of the mites were carried out using a light microscope (Olympus CX41) with a DP25 camera. The examined holotype and paratypes were stored in 70% ethanol and deposited in the Acarology Laboratory of Pamukkale University, Denizli (Turkey). Morphological terminology, idiosomal chaetotaxy, and poroidotaxy are used in the descriptions follow that of Sellnick (1958), Halašková (1969), Błaszak (1974), Mašan and Fend'a (2004). All measurements are given in micrometers (μm).

RESULTS

Family: Zerconidae Canestrini, 1891

Genus: *Zercon* C. L. Koch, 1836

Type species: *Zercon triangularis* C. L. Koch, 1836

Zercon kastamonuensis sp. nov. (Figs 1, 2)

Material: Holotype (♀). Kastamonu, Turkey, (41° 24' 53.77'' N, 33° 46' 02.45'' E), 875 m a.s.l., 21.VI.2018, collected by R. Urhan & M. Karaca. Samples of litter and soil underlying *Pinus nigra* and *Juniperus* sp. – Paratypes: 2 ♀♀, same data as holotype.

Diagnosis. Anterior margin of the ventrianal shield with 2 setae. Dorsal cavities general size and appearance, saddle-like, well sclerotized, and axes parallel to that of the body. On podonotum, setae *j1* feathered or finely barbed and r4–r6 pilose. All the remaining setae on podonotum (*j2-j6*, *z1*, z2, *s1-s6* and *r1-r3*) are short, smooth, and needle-like. On opisthonotum, setae *J1*, *J2*, *Z1*, *Z2*, and *S1-3* similar in appearance, all of them short, smooth, and needle-like. Setae *J3, Z3, Z5,* and *R1-3* pilose without hyaline ending. Setae *J3* not reaching the base of setae *J4*. Setae *J4* and *J5* short and barbed with hyaline ending. Setae *J4* not reaching the base of setae *J5*. Setae *J6*, *Z4*, and *S4* similar in appearance and length, all of them elongated, finely barbed, with hyaline ending. Setae *Z3* not reaching the base of setae *Z4* but setae *Z4* reaches posterior margin of opis-

thonotum. Setae *S1-S3* not reaching margin of opisthonotum. Setae *R1-R3* pilose and *R4-R7* short and smooth. Podonotum covered by reticulate pattern. Opisthonotal shield with a distinct reticulate pattern in the anterior region and smooth pattern in the posterior region.

Description. Female (Figs 1A-B, 2A-C). Length of idiosoma of holotype (excluding gnathosoma) 407, width 280. Measurements of 2 paratypes: Mean length 406 (402–410), mean width 278 (276–280).

Dorsum (Figs 1A, 2A). Twenty pairs of different setae present on podonotum's dorsal side: *j*-row with 6 pairs, z-row with 2 pairs, s-row with 6 pairs, *r*-row with 6 pairs. On podonotum, setae *j1* feathered or finely barbed and *r4–r6* pilose. All the remaining setae on podonotum (*j2-j6*, *z1*, *z2*, *s1-s6* and *r1-r3*) are short, smooth, and needle-like. Twenty-two pairs of different setae present on opisthonotum's dorsal side: *J*-row with 6 pairs, *Z*-row with 5 pairs, *S*-row with 4 pairs, *R*-row with 7 pairs. On opisthonotum, setae *J1*, *J2*, *Z1*, *Z2* and *S1-S3* similar in appearance, all of them short, smooth, and needle-like. Setae *J3*, *Z3*, *Z5* and *R1-R3* pilose without hyaline ending. Setae *J3* not reaching the base of setae *J4*. Setae *J4* and *J5* short and barbed with hyaline ending. Setae *J4* not reaching the base of setae *J5*. Setae *J6*, *Z4* and *S4* similar in appearance and length, elongated, finely barbed, with hyaline ending. Setae *Z3* not reaching the base of setae *Z4*, but setae *Z4* reaches posterior margin of opisthonotum. The distances between setae *J6–J6* and *J6–Z5* are 95 (92-98) and 20 (18-22), respectively. Setae *S1-S3* not reaching margin of opisthonotum. But setae *S4* reaches beyond posterior margin of opisthonotum. Setae *R1-R3* pilose and *R4-R7* short and smooth. Average lengths of opisthonotal setae and distances between setae within longitudinal rows are given Table 1.

Pores. Location of pores is shown in Figs 1A and 2A. Three pairs of pores presented on podonotum. Pores *po1* located inside of the base of setae *s1*, *po2* under the line connecting setae *j4* and *s4*, *po3* located inside the line connecting setae *s5* and *s6* (closer to *s5*). Podonotum reticulated. Four pairs of pores present on opisthonotum. Pores *Po1* located anteromedially to the base of setae *Z1*, *Po2* under the line connecting *Z2* and *S2*, *Po3* on the line connecting setae *Z4* and *J4* (closer to *Z4*), *Po4* located below the base of setae *S4*. Opisthonotal shield with a distinct reticulate pattern in the anterior region and smooth pattern in the posterior region. Dorsal cavities general size and appearance saddle-like, well sclerotized, and axes parallel to that of the body (Figs 1A, 2A-B).

Venter (Figs 1B, 2C). Shape, chaetotaxy of ventral shields, and shapes of peritremes typical for the genus *Zercon*. Setae *p1* short, smooth, and needle-like, seta *p2* slightly elongated and finely barbed. Lateral ends of peritremal shield reach setae *R1*. Adgenital shields present, with 3 opening valves. Ventroanal shield with 8 pairs of setae and all of them short, smooth, and needle-like. Anterior margin of ventroanal shield with 2 setae, postanal seta is single.

Male and immature stages. Unknown.

Differential diagnosis. *Zercon kastamonuensis* sp. nov. is closely related to *Z. hispanicus* Sellnick, 1958, *Z. lepurus* Blaszak, 1979 and *Z. osmaneliensis* Urhan, 2008. The similarities and differences between the females of the four species are given in Table 2.

Etymology. Named after the Kastamonu province where the new species was collected.

Key to species of the genus *Zercon* known from Turkey (based on adult females)

1 (48) Anterior margin of ventrianal shield with one pair of setae (*Vm1* present)

2 (17) Seta *S3* not reaching beyond the lateral margins opisthonotum

3 (8) Seta *S3* smooth

4 (5) Setae *J4-J5* short, smooth and needle-like..... ..... ***Z. lepurus* Błaszak, 1979**

5 (4) Setae *J4-J5* long, finely barbed or hyaline ending.

6 (7) Setae *J4-J5* apically barbed ..... ***Z. hispanicus* Sellnick, 1958**

7 (6) Seate *J4-J5* hyaline ending ....***Z. kastamonuensis* sp. nov.**

8 (3) Seta *S3* long, finely barbed with hyaline ending.

9 (16) Setae *Z5* hyaline ending.

10 (11) Marginal setae of opisthonotum smooth and delicately barbed ..... ***Z. osmaneliensis* Urhan, 2008**

11 (10) Marginal setae of opisthonotum long, delicately barbed and hyaline ending.

12 (13) Setae *S1* long, delicately barbed and hyaline ending ..... ***Z. saphenus* Błaszak, 1979**

13 (12) Setae *S1* short and smooth.

14 (15) Setae *J2* long, delicately barbed and hyaline ending..... ***Z. istanbulensis* Duran and Urhan, 2015**

15 (14) Setae *J2* short and smooth .... ***Z. marinae* Ivan and Călugăr, 2004**

16 (9) Setae *Z5* delicately barbed .... ***Z. colligans* Berlese, 1920**

17 (2) Setae *S3* reaching beyond the lateral margins opisthonotum.

18 (29) Setae *J4* hyaline ending.

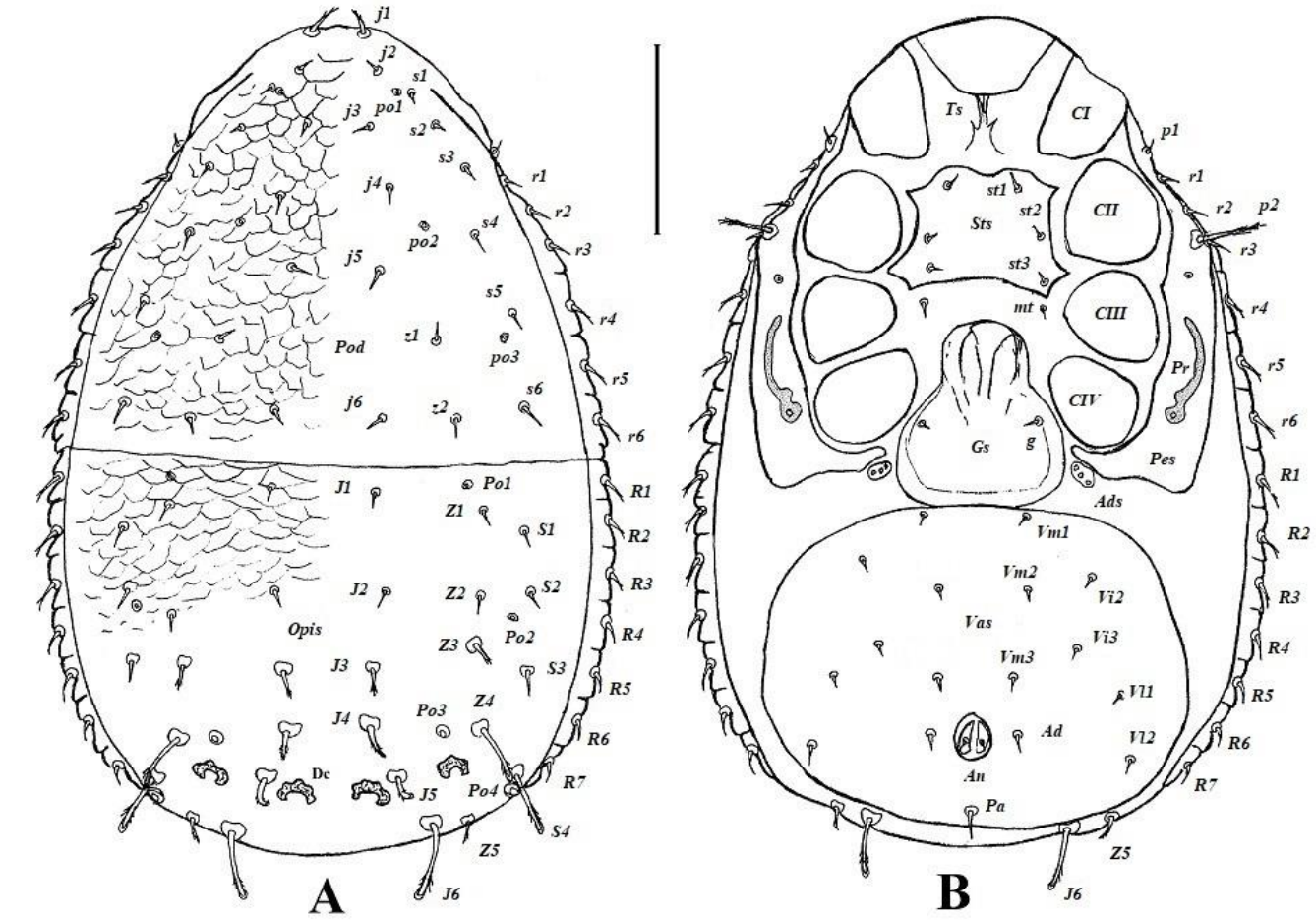

Figure 1. *Zercon kastamonuensis* sp. nov. (female): **A.** Dorsal view, **B.** Ventral view. Abbreviations: (*Pod*) podonotum, (*j1*–6, *z1*–2, *s1*–6, *p1*–2, and *r1*–7) podonotal setae, (*po1*–3) podonotal glands, (*Opis*) opisthonotum, (*J1*–6, *Z1*–5, *S1*–4, and *R1*–7) opisthonotal setae, (*Po1*–4) opisthonotal glands, (*Dc*) dorsal cavities, (*Ts*) tritosternum, (*Sts*) sternal shield, (*st1*–*st3*) sternal setae, (*mt*) metasternal seta, (*Gs*) genital shield, (*g*) genital seta, (*CI*–*CIV*) endopodal shields, (*Ads*) adgenital shield, (*Pr*) peritreme, (*Pes*) peritremal shield, (*Vas*) ventrianal shield, (*Vm1*–*Vm3*) ventromedial setae, (*Vi2*–*Vi3*) ventro-internal setae, (*VI1*–*VI2*) ventrolateral setae, (*An*) anal orifice, (*Ad*) adanal setae, (*Pa*) postanal seta. Scale =100 μm.

19 (20) Setae *J5* reaching beyond posterior margin of opisthonotum ..... ***Z. plumatopilus* Athias-Henriot, 1961**

20 (19) Setae *J5* not reaching beyond posterior margin of opisthonotum.

21 (22) Pores *Po2* outside the line connecting setae *S1* and S2 ..... ***Z. huseyini* Urhan, 2008**

22 (21) Pores *Po2* inside the line connecting setae *S1* and S2.

23 (24) Setae *S2* barbed ..... ***Z. insperatus* Błaszak, 1979**

24 (23) Setae *S2* hyaline ending.

25 (26) Pores *Po1* situated anteroparaxially to bases of setae *Z1*..... ***Z. cretensis* Ujvári, 2008**

26 (25) Pores *Po1* situated anteroantiparaxially to bases of setae Z1.

27 (28) Setae *J2* and *S2* smooth ..... ***Z. laczii* Ujvári, 2010**

28 (27) Setae *J2* and *S2* hyaline ending .... ***Z. salebrosus* Błaszak, 1979**

29 (18) Setae *J4* smooth or delicately barbed.

30 (35) Setae *J3-J5* delicately barbed.

31 (32) Setae *J5* long and reaching beyond posterior margin of opisthonotum..... ***Z. longisetosus* Urhan, 2008**

32 (31) Setae *J5* short and not reaching beyond posterior margin of opisthonotum.

33 (34) Setae *Z5* delicately barbed, setae *J3* reaching the bases of setae *J4*..... ***Z. fragilis* Urhan, 2001**

34 (33) Setae *Z5* short and smooth, setae *J3* not reaching the bases of setae J4 ..... ***Z. nemoralis* Urhan, 2001**

35 (30) Setae *J3-J5* short and smooth.

36 (39) Marginal setae *R1-R3* short and smooth.

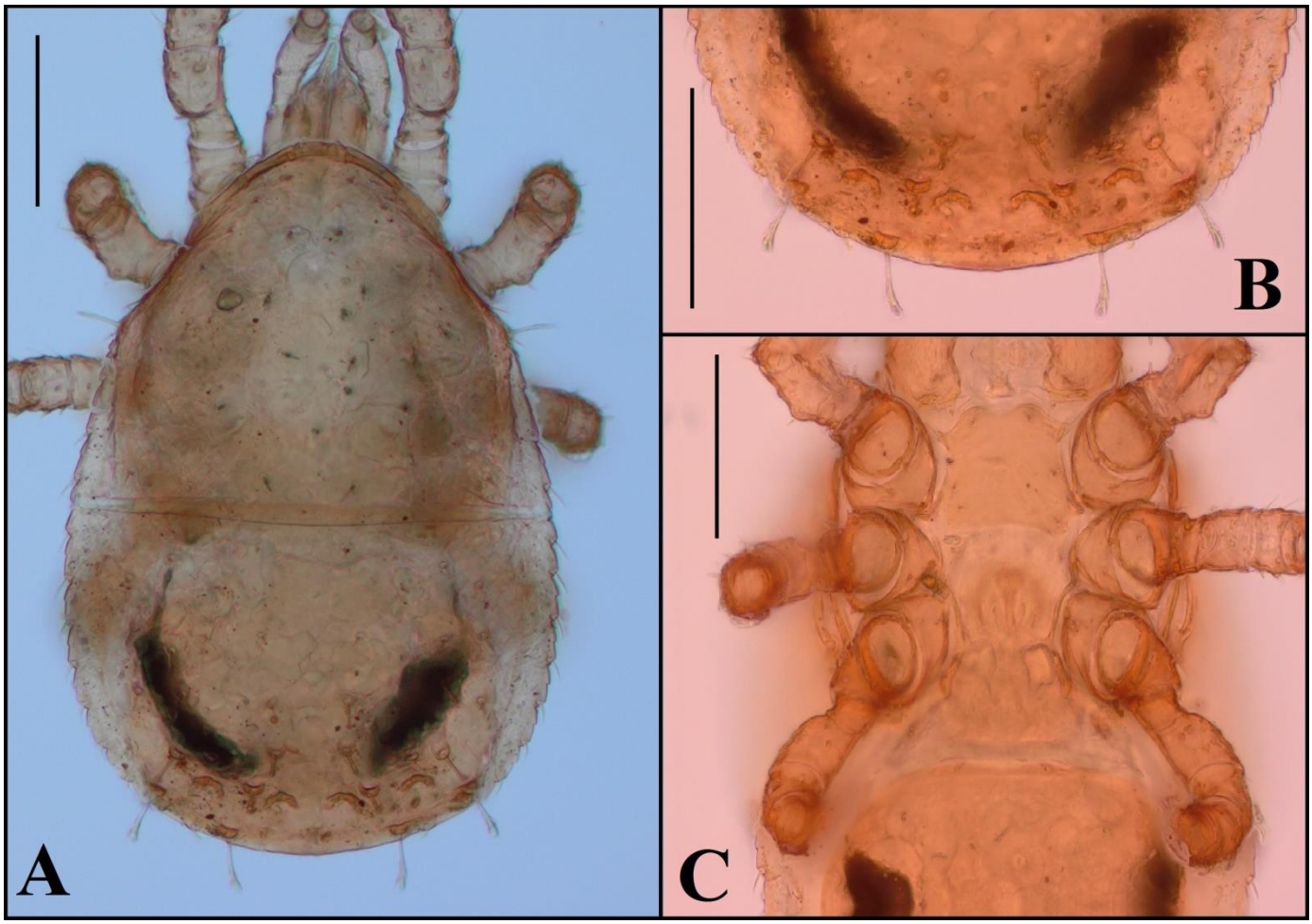

Figure 2. *Zercon kastamonuensis* sp. nov. (female) **A.** Dorsal, **B.** Posterior region of opisthonotum, **C.** Ventral. Scale =100 µm.

37 (38) Setae *Z3* short and smooth, not reaching the bases of setae *Z4* ..... ***Z. ignobilis*** **Błaszak, 1979**

38 (37) Setae *Z3* long, delicately barbed with hyaline ending, reaching the bases of setae *Z4*..... .....***Z. inonuensis*** **Urhan, 2007**

39 (36) Marginal setae *R1-R3* delicately barbed.

40 (41) Setae *S2* long, delicately barbed with hyaline ending ..... ***Z. solenites*** **Haarløv, 1942**

41 (40) Setae *S2* short and smooth.

42 (43) Setae *J6*, *Z4*, *S3* and *S4* with hyaline ending .... ***Z. separatus*** **Urhan, 2001**

43 (42) Setae *J6*, *Z4*, *S3* and *S4* delicately barbed.

44 (45) Setae *j2* and *r1-r3* delicately barbed .... ***Z. caucasicus*** **Błaszak, 1979**

45 (44) Setae *j2* and *r1-r3* short and smooth.

46 (47) Pores *Po3* on the line connecting setae *Z4-J3*, reticulation in posterior part of opisthonotum absent .... ***Z. adoxyphes*** **Błaszak, 1979**

47 (46) Pores *Po3* on the line connecting setae *Z4-J5*, posterior part of opisthonotum densely arranged punctations ..... ***Z. hungaricus*** **Sellnick, 1958**

48 (1) Anterior margin of ventrianal shield with two pairs of setae (*Vm1* and *Vi1* present).

49 (50) Between setal rows *J-J* and *J-Z* 8 extra setae present..... ***Z. trabzonensis*** **Urhan, 1997**

50 (49) Between setal rows *J-J* and *J-Z* extra setae absent.

51 (54) Setae *S2* absent.

52 (53) Setae *J2-J5* short and smooth, bases of opisthonotal setae *J6* and *Z5* adjacent .... ***Z. beleviensis*** **Urhan, 2002**

53 (52) Setae *J2-J5* long, delicately barbed with hyaline ending, bases of opisthonotal setae *J6* and *Z5* well separated..... ***Z. imperfectsetosus*** **Urhan, 2012**

54 (51) Setae *S2* present.

55 (58) Setae *S4* absent.

56 (57) Setae *J3-J5*, *Z3* and *S2* short and smooth .... ***Z. sklari*** **Balan, 1992**

Table 1. Length of opisthonotal seta and the distances between their bases in *J*, *Z*, and *S* rows of *Zercon kastamonuensis* sp. nov.

J Setae	Length	*Z* Setae	Length	*S* Setae	Length
J1	6–8	*Z1*	8	*S1*	8–10
J1–J2	48–53	*Z1–Z2*	46–56	*S1–S2*	28–37
J2	8	*Z2*	8	*S2*	10–12
J2–J3	36–41	*Z2–Z3*	26–32	*S2–S3*	28–36
J3	12	*Z3*	12–15	*S3*	12
J3–J4	25–29	*Z3–Z4*	33–35	*S3–S4*	55–69
J4	14–16	*Z4*	30–36	*S4*	30–36
J4–J5	26–31	*Z4–Z5*	38–44		
J5	12–16	*Z5*	12		
J5–J6	27–30				
J6	36				

57 (56) Setae *J3-J5*, *Z3* and *S2* long, delicately barbed with hyaline ending .. ***Z. sklarsimilis*** **Karaca and Urhan, 2016**

58 (55) Setae *S4* present.

59 (84) Setae *S3* absent.

60 (61) Setae *Z3* absent ..... ***Z. tefenniensis*** **Urhan, 2010**

61 (60) Setae *Z3* present.

62 (71) Setae *J3-J5* short and smooth.

63 (64) Dorsal fossae different size: outer fossae about 5 times larger than inner ones ..... ***Z. domanicensis*** **Urhan, 2010**

64 (63) All dorsal fossae equal in size.

65 (66) Setae *Z3* and *Z4* delicately barbed ..... ***Z. bulancakensis*** **Urhan, 2012**

66 (65) Setae *Z3* short and smooth, setae *Z4* long and hyaline ending.

67 (68) Setae *r3* and *S2* short and smooth ..... ***Z. soguticus*** **Urhan and Duran, 2017**

68 (67) Setae *r3* and *S2* long, delicately barbed with hyaline ending.

69 (70) Setae *S1* short and smooth, bases of opisthonotal setae *J6* and *Z5* adjacent ..... ***Z. afyonensis*** **Urhan and Duran, 2017**

70 (69) Setae *S1* long and hyaline ending, bases of opisthonotal setae *J6* and *Z5* well separated ..... ***Z. karacamehmeti*** **Urhan and Duran, 2017**

71 (62) Setae *J3-J5* long, delicately barbed or hyaline ending.

72 (75) Setae *J3-J5* hyaline ending.

73 (74) Setae *S1*, *Z2* and *J2* short and smooth, marginal setae *R1-R7* delicately barbed ..... ***Z. cokelezicus*** **Urhan, 2009**

74 (73) Setae *S1*, *Z2* and *J2* barbed, marginal setae *R1-R7* hyaline ending ..... ***Z. magdae*** **Ivan and Călugăr, 2004**

75 (72) Setae *J3-J5* delicately barbed.

76 (77) Setae *S4* short and delicately barbed ..... ***Z. geliboluensis*** **Karaca and Urhan, 2016**

77 (76) Setae *S4* long, delicately barbed with hyaline ending.

78 (79) Setae *S2* hyaline ending . ***Z. alattini*** **Urhan, 2010**

79 (78) Setae *S2* delicately barbed.

80 (81) Setae *Z3* hyaline ending ..... ***Z. tekirdagensis*** **Karaca and Urhan, 2016**

81 (80) Setae *Z3* delicately barbed.

82 (83) Dorsal fossae with star-like anterior margins, setae *J2-J4* not reaching apparently beyond the base of following setae ..... ***Z. uludagicus*** **Urhan, 2008**

83 (82) Dorsal fossae with saddle-like, setae *J2-J4* reaching apparently beyond the base of following setae ..... ***Z. yusufi*** **Urhan, 2010**

84 (59) Setae *S3* present.

85 (96) All podonotal and opisthonotal setae smooth.

86 (89) Setae *J5* long and reaching beyond posterior margin of opisthonotum.

87 (88) Dorsal fossae different size: outer fossae about 3-4 times larger than inner ones ..... ***Z. bulgaricus*** **Balogh, 1961**

88 (87) All dorsal fossae equal in size ..... ***Z. filiformis*** **Karaca and Urhan, 2016**

89 (86) Setae *J5* short and not reaching posterior margin of opisthonotum.

Table 2. Similarities and differences between *Zercon kastamonuensis* sp. nov. and related species.

Setae	*Zercon kastamonuensis* sp. nov.	*Zercon hispanicus* Sellnick, 1958	*Zercon lepurus* Blaszak, 1979	*Zercon osmaneliensis* Urhan, 2008
Setae *J1* and *Z1*	Short and smooth, needle-like	Short and smooth, needle-like	Short and smooth, needle-like	Long and barbed
Setae *J2* and *Z2*	Short and smooth, needle-like	Short and smooth, needle-like	Short and smooth, needle-like	Long and barbed with hyaline ending
Setae *J3*	Pilose, not reaching the base of setae *J4*	Feathered, reaches the base of setae *J4*	Short and smooth, needle-like	Long and barbed with hyaline ending, not reaching the base of setae *J4*
Setae *J4*-J5	Barbed with hyaline ending, setae *J4* not reaching the base of setae *J5*	Feathered, setae *J4* reach the base of setae *J5*	Short and smooth, needle-like, setae *J4* not reaching the base of setae *J5*	Long and barbed with hyaline ending, setae *J4* not reaching the base of setae *J5*
Setae *Z3*	Pilose, not reaching the base of setae *Z4*	Feathered, reaches the base of setae *Z4*	Short and smooth, needle-like, reaches the base of setae *Z4*	Long and barbed with hyaline ending, not reaching the base of setae *Z4*
Setae *Z5*	Pilose	Short and smooth	long and smooth	Barbed with hyaline ending
Setae *S2*	Short and smooth, needle-like	Short and smooth, needle-like	Short and smooth, needle-like	Long and barbed with hyaline ending
Setae *S3*	Short and smooth, needle-like, not reaching margin of opisthonotum	Short and smooth, needle-like, not reaching margin of opisthonotum	Long and smooth, reaches margin of opisthonotum	Long and barbed with hyaline ending, not reaching margin of opisthonotum
Ornamentation of posterior region of opisthonotum	Smooth	Punctate	Smooth	Punctate

90 (91) Setae *s1* absent, dorsal fossae different size: outer fossae about 2 times larger than inner ones ..... ***Z. cabylus*** **Athias-Henriot, 1961**

91 (90) Setae *s1* present, all dorsal fossae equal in size.

92 (93) Pores *Po3* with position between *J* and *Z* setal rows ..... ***Z. berlesei*** **Sellnick, 1958**

93 (92) Pores *Po3* with position between *Z* and *S* setal rows.

94 (95) Setae *Z3* long and reaching the bases of setae *Z4*, setae *S2* and *S3* long and reaching beyond lateral margin of opsthonotum..... ***Z. montanus*** **Willmann, 1943**

95 (94) Setae *Z3* short and not reaching the bases of setae *Z4*, setae *S2* and *S3* short and not reaching lateral margin of opsthonotum..... ***Z. perforatulus*** **Berlese, 1904**

96 (85) All podonotal and opisthonotal setae not smooth.

97 (120) All marginal setae (*R*) of opisthonotum smooth.

98 (109) Setae *J4* and *J5* short and smooth.

99 (100) Setae *J6* very long and delicately barbed ..... ***Z. honazicus* Urhan, 2009**

100 (99) Setae *J6* long with hyaline ending.

101 (104) Setae *S3* short and smooth.

102 (103) Dorsal fossae with saddle-like, well sclerotised and on the same horizontal line ..... ***Z. carpathicus* Sellnick, 1958**

103 (102) Dorsal fossae waved star-like, weakly sclerotised and outers located above from inners ..... ***Z. anatolicus* Urhan, 2008**

104 (101) Setae *S3* long with hyaline ending.

105 (106) Setae *S1* and *S2* short and smooth ..... ***Z. emirdagicus* Urhan et al., 2016**

106 (105) Setae *S1* and *S2* long with hyaline ending.

107 (108) Setae *Z3* short and smooth ..... ***Z. ozkani* Urhan and Ayyıldız, 1993**

108 (107) Setae *Z3* long, delicately barbed with hyaline ending ..... ***Z. andrei* Sellnick, 1958**

109 (98) Setae *J4* and *J5* delicately barbed or hyaline ending.

110 (115) Setae *J4* and *J5* delicately barbed.

111 (112) Setae *S2* long with hyaline ending ..... ***Z. septemporus* Urhan, 2001**

112 (111) Setae *S2* short and smooth.

113 (114) Setae *i2* short and smooth, setae *Z3* reaching the bases of setae *Z4* ..... ***Z. foveolatus* Halašková, 1969**

114 (113) Setae *i2* long and delicately barbed, setae *Z3* not reaching the bases of setae *Z4* ..... ***Z. pinicola* Halašková, 1969**

115 (110) Setae *J4* and *J5* hyaline ending.

116 (117) Setae *J2*, *J3*, *Z2*, *S1* and *S2* short and smooth ..... ***Z. similifoveolatus* Ivan and Călugăr, 2004**

117 (116) Setae *J2*, *J3*, *Z2*, *S1* and *S2* long and delicately barbed with hyaline ending.

118 (119) Setae *i2* and *Z5* short and smooth ..... ***Z. delicatus* Urhan and Ekiz, 2002**

119 (118) Setae *i2* delicately barbed, *Z5* delicately barbed with hyaline ending..... ***Z. mehmeturhani* Urhan, 2009**

120 (97) All marginal setae (*R*) of opisthonotum delicately barbed or hyaline ending.

121 (148) All marginal setae (*R*) of opisthonotum delicately barbed.

122 (129) Setae *J3* short and smooth.

123 (124) Setae *S2* long, delicately barbed with hyaline ending..... ***Z. kezbaniremae* Urhan, 2007**

124 (123) Setae *S2* short and smooth.

125 (126) Setae *J4* and *J5* short and smooth ..... ***Z. serratus* Urhan, 2001**

126 (125) Setae *J4* and *J5* delicately barbed or hyaline ending.

127 (128) Setae *Z5* smooth, setae *J3* reaching the bases of setae *J4*..... ***Z. peltatus* C. L. Koch, 1836**

128 (127) Setae Z5 delicately barbed, setae J3 not reaching the bases of setae J4 ..... ***Z. burdurensis* Urhan, 2001**

129 (122) Setae *J3* delicately barbed or hyaline ending.

130 (135) Setae *J3* delicately barbed.

131 (132) Setae *J5* hyaline ending ..... ***Z. thracicus* Karaca and Urhan, 2016**

132 (131) Setae *J5* delicately barbed.

133 (134) Setae *S3* long with hyaline ending ..... ***Z. mirabilis* Urhan, 2013**

134 (133) Setae *S3* short and delicately barbed ..... ***Z. kackaricus* Urhan and Ekiz, 2002**

135 (130) Setae *J3* hyaline ending.

136 (139) Setae *S1* short and smooth.

137 (138) Setae *Z5* hyaline ending, setae *J3* not reaching the base of setae *J4* and setae *Z3* not reaching the base of setae Z4 ..... ***Z. ekizi* Urhan et al., 2015**

138 (137) Setae *Z5* delicately barbed, setae *J3* reaching the base of setae *J4* and setae *Z3* reaching the base of setae *Z4* ..... ***Z. quadricavum* Urhan, 2001**

139 (136) Setae *S1* delicately barbed or hyaline ending.

140 (143) Setae *S1* delicately barbed.

141 (142) Setae *j2* short and smooth, *S2* delicately barbed ..... ***Z. denizliensis* Urhan, 2009**

142 (141) Setae *j2* delicately barbed, *S2* hyaline ending .... ***Z. turcicus* Urhan and Ayyıldız, 1994**

143 (140) Setae *S1* hyaline ending.

144 (145) Setae *j2* delicately barbed, *Z5* hyaline ending .... ***Z. kallimcii* Urhan, 2009**

145 (144) Setae *j2* short and smooth, *Z5* delicately barbed.

146 (147) Setae *J2* short and smooth, setae *J3* not reaching the base of setae *J4* ..... ***Z. encarpatus* Athias-Henriot, 1961**

147 (146) Setae *J2* delicately barbed, *J3* reaching the base of setae *J4* ..... ***Z. apladellus* Błaszak, 1979**

148 (121) All marginal setae (*R*) of opisthonotum hyaline ending.

149 (150) Pores *Po3* with position between *Z* and *S* setal rows ..... ***Z. notabilis* Błaszak, 1979**

150 (149) Pores *Po3* with position between *J* and *Z* setal rows.

151 (154) Setae *s6*, *J1* and *Z1* long with hyaline ending.

152 (153) Setae *j3-j6*, *z1*, *z2*, *s2-s5* delicately barbed ..... ***Z. arslani* Duran et al., 2016**

153 (152) Setae j3-j6, z1, z2, s2-s5 short and smooth ..... ***Z. ayyildizi* Urhan, 1997**

154 (151) Setae *s6*, *J1* and *Z1* short and smooth.

155 (156) Setae *J2* and *Z5* smooth ..... ***Z. karadaghiensis* Balan, 1992**

156 (155) Setae *J2* and *Z5* delicately barbed with hyaline ending.

157 (158) Pores *Po3* under the line connecting setae *Z4-J5*, the bases of setae *J4* above the line connecting setae *Z4-Z4* ..... ***Z. juvarae* Ivan and Călugăr, 2004**

158 (157) Pores *Po3* on the line connecting setae *Z4-J4*, the bases of setae *J4* under the line connecting setae *Z4-Z4*.

159 (160) Setae *S3* not reaching lateral margin of opsthonotum, setae *J2* reaching the base of setae *J3* ..... ***Z. agnostus* Błaszak, 1979**

160 (159) Setae *S3* reaching beyond lateral margin of opsthonotum, *J2* not reaching the base of setae *J3* ..... ***Z. salmani* Urhan, 2001**

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RESEARCH ARTICLE

Ticks (Acari: Ixodidae) infesting some wild animals and humans in Turkey: notes on a small collection

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ABSTRACT: In the present study, we collected a small number of tick specimens on some wild animals and humans in eleven different regions of Turkey, between November 2017 and October 2018. One hundred-eighty tick specimens were collected from 19 wild host animals (belonging to 10 different species) and humans. Ticks were identified as *Dermacentor marginatus* (4 nymphs), *Hyalomma* sp. (21 nymphs, 2 larvae), *Hyalomma aegyptium* (1 female), *Haemaphysalis inermis* (17 males, 25 females), *Ixodes redikorzevi* (1 female, 48 nymphs), *Ixodes ricinus* (7 males, 5 females, 1 nymph), *Ixodes laguri* (1 nymph), *Rhipicephalus bursa* (6 nymphs, 3 larvae), and *Rhipicephalus turanicus* (13 males, 25 females). To the best of our knowledge, *Ixodes redikorzevi* ticks were reported in the Marmara region, for the first time. Also, six new tick-host associations for Turkey were reported in the present study for the first time.

Keywords: Humans, wild animals, ticks, Turkey.

INTRODUCTION

Ticks (Acari: Ixodidae) are one of the best-known groups of blood-feeding ectoparasites of many kinds of terrestrial animals. Ticks have a major importance in medical and veterinary research not only because of their role of transmission of pathogenic agents to hosts but also cause blood loss and tick-induced paralysis. Turkish tick fauna is currently composed of 51 species, of which 43 were from the family Ixodidae and 8 from the family Argasidae (Bursali et al., 2012; Keskin et al., 2014; Kar et al., 2017; Keskin and Erciyas-Yavuz, 2018; Orkun and Karaer, 2018). The many of early studies that reported ticks on wild animals were based on individually or accidental reports in Turkey; however, in recent studies have been concentrate on tick-host relationships in Turkey (Keskin et al., 2013, 2016, 2018).

During our parasitological studies, we collected a small number of tick specimens from various wild animals and humans in different localities of Turkey. According to our knowledge, *Ixodes redikorzevi* Olenev ticks were reported in the Marmara region of Turkey, for the first time. Also, six new tick-host associations for Turkey were reported in the present study for the first time.

MATERIAL AND METHODS

The current study was conducted in 19 different localities of Turkey (Fig. 1). Between November 2017 and October 2018, ticks were collected from some wild animals which were captured by metal and plastic traps (Sherman and Economy Mammal Trip-Trap). In addition, some ticks were collected from road-killed wild animals. Ticks were manually removed from captured mammals and preserved in plastic tubes contained 70% ethanol. All live animals were immediately released to natural habitats. During the field work, some ticks were collected from humans (herdsmans and participants of the field work). Ticks were identified as morphological characters under the stereo microscope (SZ61, Olympus, Tokyo, Japan) using morphological keys or descriptions given by Özkan (1978) and Filippova (1977, 1997). All tick samples were deposited to tick collection at Tokat Gaziosmanpaşa University, Department of Biology for further studies. For the mammalian nomenclature, we followed Kryštufek and Vohralík (2001, 2009). Mammalian collection in the study has been conducted under the Ethical Principles in Animal Research which was approved by Ondokuz Mayıs University Animal Ethical Committee with the B.30.2.ODM.0.20.09.00-050.04-97 and B.30.2.ODM.0.20.09.00-050.04-09 ethical numbers.

RESULTS AND DISCUSSION

Identification of ticks infesting humans and wild animals is a fundamental step to the understanding the ecology of the ticks and their potential role as vectors of some zoonotic diseases (D'Amico et al., 2017). Tick species infesting humans have been investigated in detail in Turkey; however, the information about ticks infesting some wild animals is still very limited. In the current study, we performed an investigation on ticks infesting some wild animals in 19 different localities of Turkey; however ticks were found only in 11 different localities of Turkey (Fig. 1.) [Edirne (1), Demirköy/Kırklareli (2), Çilingöz National Park/İstanbul (3), Tekirdağ (4), Kapıdağ Peninsula/Balıkesir (5), Tavşan Mountain/Amasya (6), Sivas (7), Kars (8), Iğdır (9), Adana (10), Kahramanmaraş (11)]. In addition, we provided many new tick-host associations for Turkey.

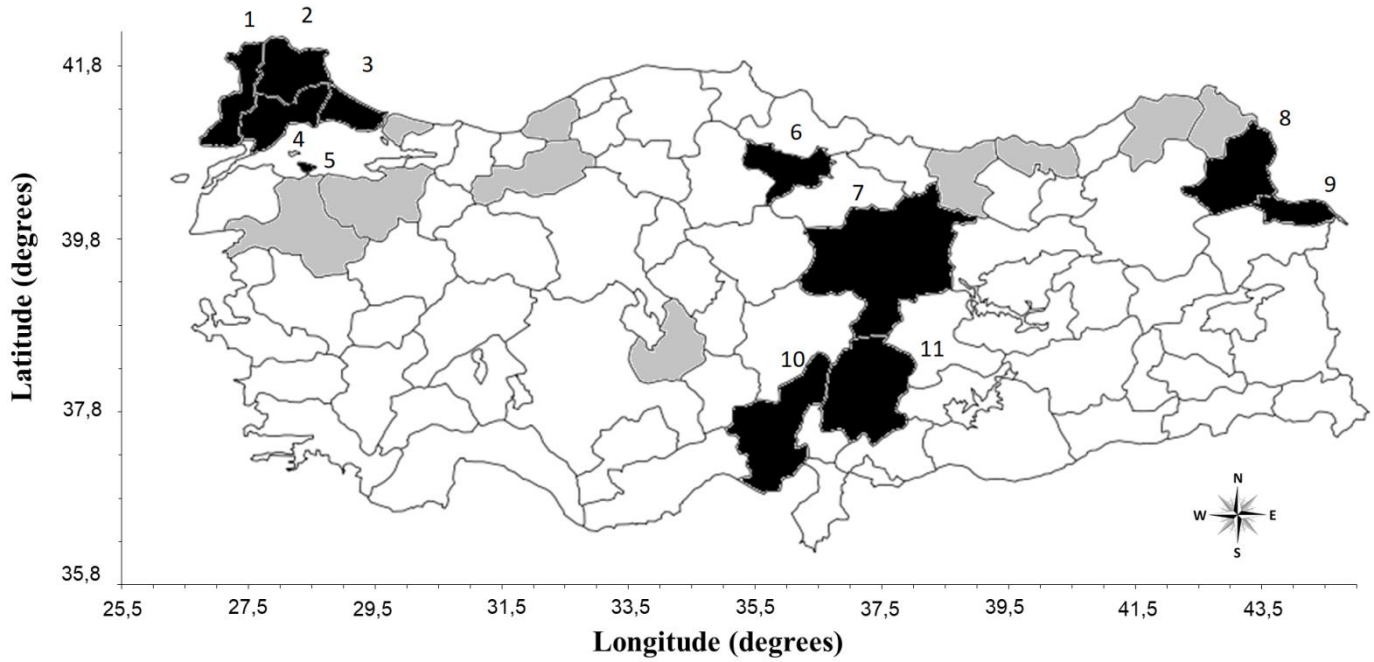

Figure 1. Map of the study area (gray + black). Geographical localities of ticks collected in the present study are marked black. **1.** Edirne, **2.** Demirköy (Kırklareli), **3.** Çilingöz National Park (İstanbul), **4.** Tekirdağ, **5.** Kapıdağ Peninsula (Balıkesir), **6.** Tavşan Mountain (Amasya), **7.** Sivas, **8.** Kars, **9.** Iğdır, **10.** Adana, **11.** Kahramanmaraş.

A total of 106 wild mammals (73 Rodentia, 29 Eulipotyphla 3 Carnivora and 1 Lagomorpha) were examined for the presence of tick infestation. A total 180 tick specimens were collected from 24 wild mammalian species which recorded as follows (total numbers of examined/numbers of infested in parentheses): from Rodentia: *Apodemus* sp. (3/1), *Apodemus agrarius* (Pallas) (1/0), *Apodemus flavicollis* (Melchior) (9/2), *Apodemus uralensis* (Pallas) (9/0), *Apodemus witherbyi* (Thomas) (18/1), *Chionomys nivalis* (Martins) (4/0), *Microtus guentheri* (Danford & Alston) (3/0), *Microtus levis* Miller (1/0), *Microtus arvalis* (Pallas) (3/0), *Microtus subterraneus* (de Selys-Longchamps) (4/1), *Mus domesticus* Schwarz & Schwarz (1/0), *Mus macedonicus* Petrov & Ruzic (6/0), *Myodes glareolus* (Schreber) (5/0), *Nannospalax leucodon* (Nordmann) (1/0), *Nannospalax xanthodon* (Nordmann) (3/0) and *Prometheomys schaposchnikowi* Satunin (2/0); from Eulipotyphla: *Crocidura suaveolens* (Pallas) (10/7), *Erinaceus concolor* Martin (1/1) *Erinaceus roumanicus* Barrett-Hamilton (3/2) *Neomys anomalus* Cabrera (1/0) and *Talpa levantis* Thomas (14/0); from Carnivora: *Vulpes vulpes* (L.) (2/2) and *Herpestes ichneumon* (L.) (1/1); from Lagomorpha *Lepus europaeus* Pallas (1/1). In addition, 56 tick specimens were collected from 11 humans.

Ticks were identified as *Dermacentor marginatus* (Sulzer), *Hyalomma* spp., *Hyalomma aegyptium* (L.), *Haemaphysalis inermis* Birula, *Ixodes redikorzevi* Olenev, *Ixodes ricinus* (L.), *Ixodes laguri* Olenev, *Rhipicephalus bursa* Canestrini & Fanzago, and *Rhipicephalus turanicus* Pomerantzev. With the current study, six new tick-host associations found for Turkey were listed in Table 1.

The most abundant tick species was determined as *I. redikorzevi* in this study. *I. redikorzevi* mainly infests on small mammals, birds, and some wild carnivores. It may transmit the Hazara virus (Begum et al., 1970) and *Francisella tularensis* (Kolonin, 2009) to humans. It also may cause toxicosis in humans (Kassis et al., 1997). *I. redikorzevi* has been reported on some small mammalian species in Turkey, namely *Apodemus flavicollis, Apodemus sylvaticus, Chionomys roberti, Cricetulus migratorius, Crocidura suaveolens, Erinaceus concolor, Microtus majori, Sorex raddei, Neomys fodiens, Talpa caucasica* and *Sorex volnuchini* (Nemenz, 1967; Keskin et al., 2017). With the current study, *I. redikorzevi* was reported on *Apodemus* sp. and *Microtus subterraneus* in Iğdır (locality 9) and Kapıdağ peninsula (locality 5).

H. inermis was the second abundant tick species found in this study. It is generally found in broad-leaf and mixed forests (Guglielmone et al., 2014). It is sparsely distributed and frequently well adapted to different biotopes. The presence of several zoonotic agents (such as tick-borne encephalitis virus, *Rickettsia aeschlimannii, R. helvetica* and *Babesia bigemina)* in *H. inermis* were reported in previously studies (Nosek et al., 1981; Garcia-Sanmartin et al., 2008; Portillo et al., 2008; Hornok et al., 2010). However, the vectorial capacity of *H. inermis* is still poorly known. In Turkey, this tick was reported on several domestic animals, foxes, and humans. In the current study, *H. inermis* was only collected on humans in localities 2, 3 and 5.

R. turanicus were found on five different hosts in the present study. It is one of the most common tick species on domestic animals and humans in Turkey. Also, there are some reports on hedgehogs and foxes in Turkey. Although the presence of some zoonotic agents, such as Crimean-Congo Hemorrhagic Virus (Tekin et al., 2012) and *Rickettsia aeschlimannii* (Orkun et al., 2014) in *R. turanicus* have been reported in Turkey, currently we have limited information about its accurate vectorial capacity. *R. turanicus* was reported on *E. roumanicus* (localities 1 and 4) and

Table 1. The hosts of tick species collected in this study.

Host/ticks	*Dermacentor marginatus*	*Hyalomma* spp.	*Hyalomma aegyptium*	*Haemaphysalis inermis*	*Ixodes redikorzevi*	*Ixodes ricinus*	*Ixodes laguri*	*Rhipicephalus bursa*	*Rhipicephalus turanicus*	*Total*
Apodemus flavicollis					1F					1
Apodemus sp.					1N					1
Apodemus witherbyi	4N*									4
Crocidura suaveolens					46N					46
Erinaceus roumanicus									6M, 16F*	22
Erinaceus concolor			1F						2F	3
Herpestes ichneumon									3M, 2F*	5
Homo sapiens				17M, 25F		7M, 5F, 1N			1M	56
Lepus europaeus		21N, 2L						6N, 3L*		32
Microtus subterraneus					1N*		1N*			2
Vulpes vulpes									3M, 5F	8
Total	**4**	**23**	**1**	**42**	**49**	**13**	**1**	**9**	**38**	**180**

* New tick–host association for Turkey.
L larva, *N* nymph, *F* female, *M* male.

H. ichneumon (locality 10) for the first time in Turkey with the present study. In addition, limited number of specimens of *R. turanicus* were found on *V. vulpes* and humans in Sivas (locality 7) and Kırklareli (locality 2) provinces.

I. ricinus was other abundant tick species found in this study. It plays an important role in the transmission of numerous pathogenic agents, such as *Borrelia burgdorferi* s.l., *Anaplasma phagocytophilum, Francisella tularensis, Rickettsia* spp., *Babesia* spp., and *Neoehrlichia mikurensis* (Medlock et al., 2013). It can infest on numerous hosts such as birds, reptiles and mammals including humans. In early studies, *Crocidura suaveolens, Felis catus* (L.), *Felis sylvestris* Schreber, *Rattus rattus* (L.), *E. concolor, Oryctolagus cuniculus* (L.), *L. europaeus, Allactaga williamsi* Thomas, *S. volnuchini, N. leucodon* and *M. domesticus* (as *Mus musculus* L.) were reported as small mammals hosts of *I. ricinus* in Turkey (Bursali et al., 2012; Keskin et al., 2017). In the current study, both adults and nymphs of *I. ricinus* ticks were found on humans in localities 2, 3 and 5.

I. laguri is one of the rarest tick species collected on small mammals in the current study. The main hosts of *I. laguri* are rodents (Guglielmone et al., 2014). In the current study, a nymph of *I. laguri* was found only a *Microtus subterraneus* (locality 5); that is a new host record for Turkey. The distribution and host association of *I. laguri* are poorly known in Turkey (Bursali et al., 2015; Keskin et al., 2015). To date, *I. laguri* has been reported in only seven localities from Turkey. However, we believe that information on distribution and host association of *I. laguri* will be increased with the further studies.

In the current study, the limited number of ticks belonging to *D. marginatus, H. aegyptium* and *R. bursa* were collected from some wild animals. *A. witherbyii* for *D. marginatus* (locality 8) and *L. europaeus* for *R. bursa* are new host records for Turkey. In addition, (n= 23) immature individuals of *Hyalomma* sp. were collected from *L. europaeus* (locality 6); however, they were only identified as the genus level. Single female *H. aegyptium* was collected from *E. concolor* in Kahramanmaraş province (locality 11).

Finally, a small collection of ticks infesting some wild animals and humans in Turkey were represented in this study. To our knowledge, some hosts reported in this study were documented first time in Turkey. Also, *I. redikorzevi* ticks were reported in the Marmara region, for the first time. We believe that the results of this study provide useful information for the further studies on ticks and tick-host association.

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RESEARCH ARTICLE

A new species of the genus *Ledermuelleriopsis* Willmann (Acari: Stigmaeidae) from Turkey

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ABSTRACT: A new species viz. *Ledermuelleriopsis aydinensis* sp. nov., collected from soil and litter under *Pistacia lentiscus* (Anacardiaceae), *Pinus brutia* (Pinaceae), *Oenanthe pimpinelloides* (Apiaceae), *Salsola soda* (Chenopodiaceae), *Ptilostemon chamaepeuce* (Asteraceae), is described and illustrated based on adult females.

Keywords: Soil mite, Trombidiformes, Raphignathoidea, *Ledermuelleriopsis.*
Zoobank: http://zoobank.org/D79483A0-CA65-41C8-AF75-20BCA4074FA4

INTRODUCTION

Members of the family Stigmaeidae are predators and discovered from all biogeographical regions though most of them were discovered from the Palaearctic, Oriental, Nearctic, Afrotropical and Australian regions (Fan and Zhang, 2005). Stigmaeidae is the largest in the superfamily Raphignathoidea and includes about 598 species of 34 valid genera (Fan et al., 2016; Khaustov and Tsurikov, 2018).

Among them, the genus *Ledermuelleriopsis* with 33 species is known in the world (Fan et al., 2003; Dönel and Doğan, 2011; Khanjani et al., 2012a, 2012b; Maleki et al., 2013; Fan et al., 2016). *Ledermuelleriopsis* species live in soil, litter, grass, lichen, moss, old sand dune, bark trees and decayed stump. Up till now, 11 species of *Ledermuelleriopsis* have been reported from Turkey: *Ledermuelleriopsis ayyildizi* Doğan, *L. bisetalis* Doğan, *L. giresuniensis* Doğan and Ayyıldız, *L. indiscretus* Dönel and Doğan, *L. plumosa* Willmann, *L. punctata* Soliman, *L. rizeiensis* Doğan, *L. sezeki* Doğan, *L. tamariski* Maleki and Bagheri, *L. toleratus* Kuznetsov, *L. triscutata* Willmann (Koç and Ayyıldız, 1997; Doğan and Ayyıldız, 2003; Doğan, 2004a, 2004b, 2007; Erman et al., 2007; Dönel and Doğan, 2011; Özçelik and Doğan, 2011; Somoncu and Koç, 2012; Bingül and Doğan, 2016). In this paper, one more new species, *Ledermuelleriopsis aydinensis* sp. nov., is described and illustrated from Aydın, Turkey.

MATERIAL AND METHODS

The soil and litter samples taken from Dilek Peninsula-Büyük Menderes Delta National Park (located in the Aegean Region and within the boundaries of Aydın province) in 2015 and 2016 were brought to the laboratory in plastic bags and extracted Berlese-Tullgren funnels for 7 days. Mites were collected in 70% ethanol and mounted on slides in modified Hoyer's medium (pure water 50 ml, gum arabic 50g, chloral hydrate 125 g, glycerin 30 ml). The mite figures were drawn and measured by means of a research microscope (Nikon Eclipse E 400). The setal nomenclature follows those of Kethley (1990) and Grandjean (1944). All measurements are given in micrometers (µm). The holotype measurements were given first and followed by range measurements of paratypes in parentheses. Measurements of legs were taken from base of femur to tips of tarsal claws. The specimens mounted on slide are deposited in the Zoological Research Laboratory of Manisa Celal Bayar University, Manisa, Turkey.

RESULTS

Family: Stigmaeidae Oudemans

Genus: *Ledermuelleriopsis* Willmann

Type species: *Ledermuelleriopsis triscutata* Willmann

Diagnosis: Prodorsal shield bears 4 pairs of setae (*vi*, *ve*, *sci*, *sce*) and a pair of eyes. Dorsal hysterosomal area covered with either completely or incompletely divided two shields, each bear 3 pairs of setae, metapodosomal shield with setae (c_1, d_1, d_2), opisthosomal shield with setae (e_1, e_2, f_1). Suranal shield entire with 2 pairs of setae (h_1, h_2). Humeral shields ventro-lateral position, with setae c_2. Coxisternal shields divided or fused. Ventral opisthosoma with 1-3 pairs of aggenital setae ($ag_{1\text{-}3}$). Genital setae absent. Anogenital shields with 3 pairs of pseudanal setae ($ps_{1\text{-}2}$) Palp with a tridentate terminal eupathidium. Chelicerae separated. (Fan and Zhang, 2005; Dönel and Doğan, 2011; Bingül and Doğan, 2016).

Ledermuelleriopsis aydinensis sp. nov.

(Fig. 1)

Female (n=6)

Body ovoid, length (excluding gnathosoma) 338 (312 – 314), width 260 (247–250).

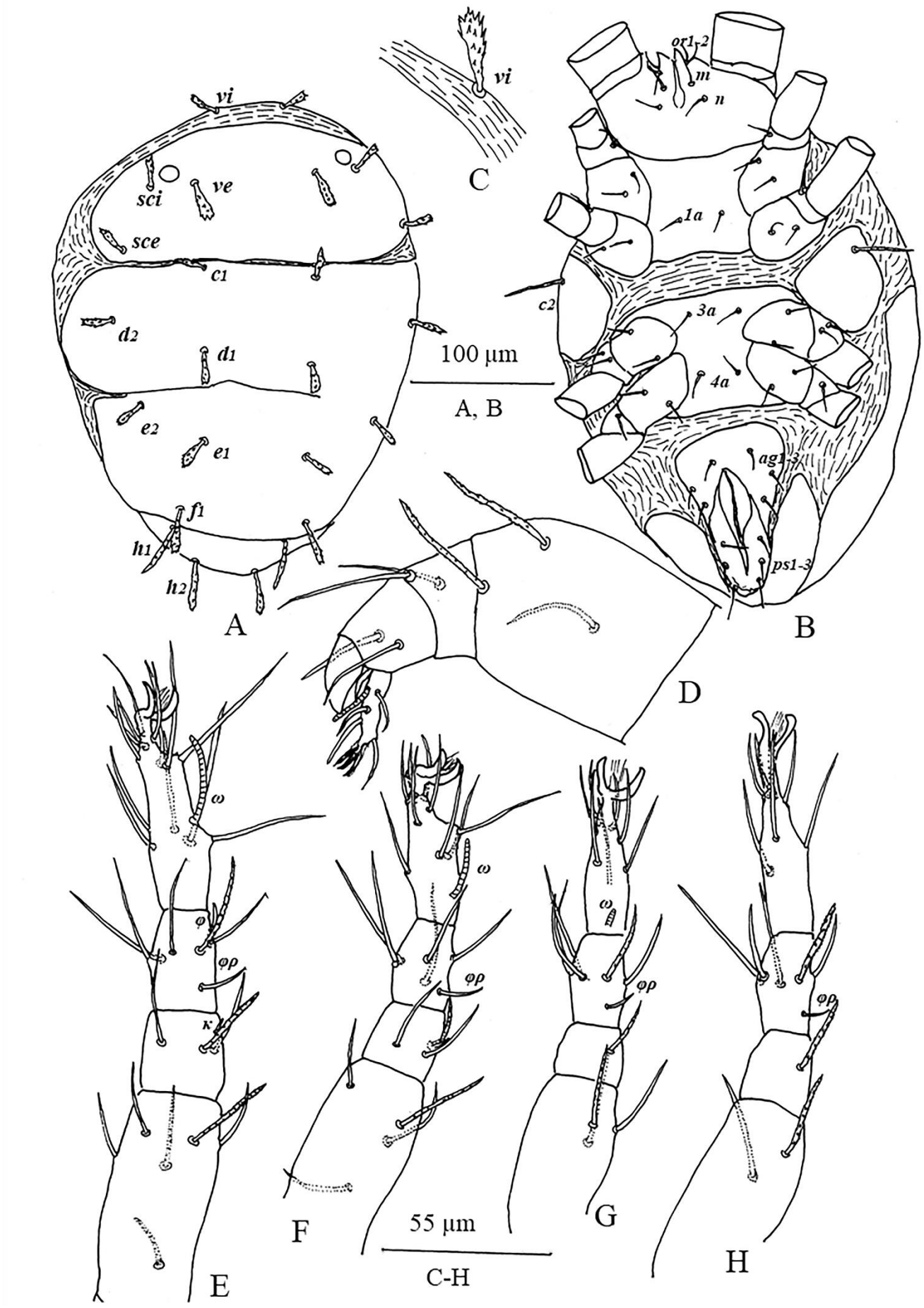

Figure 1. *Ledermuelleriopsis aydinensis* sp. nov. (Female) – A) Dorsal view of idiosoma, B) Ventral view of idiosoma, C) Dorsal seta *vi*, D) Palp, E) Leg I, F) Leg II, G) Leg III, H) Leg IV.

Gnathosoma. 70 (68) long. Chelicerae separate, 65 (65) long. Palp 117 (114) long. Counts of setae and solenidia from palptrochanter to palptarsus: 0, 3, 2, 2 + 1 claw + 1 seta like accessory claw, 4 + 1 solenidion+ 1 subterminal seta-like eupathidion + 1 tridentate eupathidion (Fig. 1 D). Subcapitulum with two pairs of adoral setae (or_{1-2}) and 2 pairs of subcapitular setae (*m*, *n*). Dimensions and distance between subcapitular setae, *m* 16 (13–16), *n* 16 (13), *m*–*m* 21 (16–18), *n*–*n* 29 (26–29), *m*–*n* 13 (13) (Fig. 1 B).

Dorsum of idiosoma. Dorsal shields smooth, without small pits and vacuoles (Fig. 1 A). Propodosomal shield with three pairs of setae (*ve*, *sci*, *sce*) and one pair of eyes located between setae *ve* and *sci*. Seta *vi* on the striated integument (Fig. 1 C). Metapodosomal shield with three pairs of setae (c_1, d_1, d_2). Opisthosomal shield with three pairs of setae (e_1, e_2, f_1). Suranal shield with two pairs of setae (h_1, h_2). Humeral shields ventro-lateral, similar that of other dorsal shields, with setae c_2 (Fig. 1 B). All dorsal setae clavate except for setae c_2. Lengths and distances of dorsal idiosomal setae as follows: *vi* 23 (23), *ve* 26 (26), *sci* 21 (21), *sce* 23 (23), c_1 26 (23), c_2 36 (34–36), d_1 21 (21), d_2 23 (23), e_1 23 (23), e_2 23 (23), f_1 31 (26), h_1 34 (26–29), h_2 31 (26), *vi*–*vi* 34 (35), *vi*–*ve* 52 (42–47), *ve*–*ve* 86 (78–81), *ve*–*sci* 29 (26), *sci*–*sci* 146 (135), *sci*–*sce* 49 (47), *sce*–*sce* 200 (187), *sce*–c_1 62 (62), c_1–c_1 78 (70), c_2–c_2 208 (198–203), d_2–d_2 216 (198–200), c_1–d_1 62 (57), d_1–d_1 78 (73–75), d_1–e_1 65 (60–62), e_1–e_1 75 (62–65),), e_1–e_2 52 (49–57), e_2–e_2 166 (156), e_1–f_1 47 (47), f_1–f_1 88 (78–83), h_1–h_1 42 (39), h_1–h_2 26 (26), h_2–h_2 81 (78).

Venter of idiosoma. Ventral cuticle transversely striated between coxae II and III. Coxisternal shields between coxae I–II, III –IV fused at midline, smooth and bearing three pairs of setae (*1a*, *3a*, *4a*) (Fig. 1 B). Length of setae *1a* 13 (10), *3a* 13 (10), *4a* 13 (10). Aggenital shield with three pairs of setae (ag_{1-3}) and three pairs of pseudanal setae (ps_{1-3}). Lengths of ventral setae as follows: ag_1 = ag_2 = ag_3 10 (10), $ps_1$18 (18), ps_2 = ps_3 16 (16).

Legs. Leg I 182 (169–177), leg II 156 (143–148), leg III 143 (130–138), leg IV 166 (161–164). Chaetotaxy of leg segments as follows: coxae 2–2–2–2, trochanters 1–1–2–1, femora 6–4–3–2, genua 3(+1κ)–3(+1κ)–1–1, tibiae 5(+1φ+1φρ)–5(+1φρ)–5(+1φρ)–5(+1φρ), tarsi 13(+1ω)–9(+1ω)–7(+ 1ω)–7 (Fig. 1 E–H).

Male and immature stages. Unknown.

Etymology. The name of the new species is refers to distribution in Aydın (Turkey).

Material examined. Holotype female from litter and soil under *Pistacia lentiscus*, 600 m a.s.l., 14 March 2016; one paratype female from litter and soil under *Pinus brutia*, 450 m a.s.l., 15 November 2015; one paratype female from litter and soil under *Oenanthe pimpinelloides*, 600 m a.s.l. and two paratype females from litter and soil under *Salsola soda*, 300 m a.s.l., 12 December 2015; one paratype female from litter and soil under *Ptilostemon chamaepeuce*, 600 m a.s.l., 16 May 2016; Dilek Peninsula - Büyük Menderes Delta National Park, Kuşadası district, Aydın province, Turkey, coll. M. P. Gül.

Remarks. *Ledermuelleriopsis aydinensis* sp. nov. resembles *L. plumosa* Willmann in general appearance and all dorsal setae clavate and setae c_2 longer than other dorsal satae. However, it can easily be differentiated by following characters: (1) setae *vi* on the striated integument whereas setae *vi* on the propodosomal shield in *L. plumosa* (2) dorsal and ventral shields smooth, without small pits and vacuoles in the former oppose to reticulation, with small pits and vacuoles (3) tarsus II with nine setae in the former oppose to eight in the latter. Actually, this new species can be readily distinguished from the known species of the genus in that setae *vi* on the striated integument.

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Acarological Studies
Vol 1 (1): 20-22

RESEARCH ARTICLE

First record of the rotundabaloghid mites (Acari: Mesostigmata) in Sierra Leone with the description of a new species

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ABSTRACT: The first record of the rotundabaloghid mites in Sierra Leone is presented here. A new species, *Rotundabaloghia* (*Circobaloghia*) *leonensis* sp. nov., is described based on two females and one male specimen. The new species differs from the other Afrotropical roundabaloghid mites in following character combination: the setae *V7* and *V8* pilose, female genital shied and the ventral shields are ornamented by irregular pits. This character combination is unknown within the African rotundabaloghids.

Keywords: Soil mites, Uropodina, taxonomy, West-Africa.
Zoobank: http://zoobank.org/935C2409-41C7-4FC7-8BED-63D8C047665F

INTRODUCTION

The rotundabaloghid mites are the better-known group of the Uropodina with more than 100 described and named species. The rotundabaloghid species are divided into two subfamilies, four genera and four subgenera (Kontschán, 2010). The larges subgenus (*Rotundabaloghia* (*Circobaloghia*) Kontschán, 2010) has the largest distributional pattern, *Circobaloghia* species occur in Neotropical, Afrotropical and Oriental regions.

The West-African sub-region of the Ethiopian realm is the most scarcely investigated part of the world from rotundabaloghid mite point of view. Rotundabaloghid mites from this sub-region are presented only from Cameroon, Ghana, Republic of Congo and Ivory Coast (Kontschán, 2010). Sierra Leone is one of unknown country of West Africa from Uropodina point of view. Till today no Uropodina records are published from this country. In the present paper, a new rotundabaloghid mite is described.

This work is a new part of the study of African Uropodina mites (Kontschán and Starý, 2014, 2015) which is based on the investigation of the Arachnida collection of the Natural History Museum in Geneva.

MATERIAL AND METHODS

Specimens of the new species were cleared in lactic acid for a week. The drawings were made with the aid of a drawing tube of Leica 1000 scientific microscope. All specimens are stored in ethanol and deposited in the Natural History Museum in Geneva, Switzerland (MHNG). The system and nomenclature of the ventral setation follow Kontschán (2010). Abbreviations: *St* = sternal setae, *ad* = adanal setae, *V* = ventral setae. All measurements and the scales in the figures are given in micrometres (μm).

RESULTS

Taxonomy

Rotundabaloghia (*Circobaloghia*) *leonensis* sp. nov.

(Figs 1–8)

Diagnosis. Genital shield of female, sternal and the ventral shields of both gender ornamented by oval pits. Setae *V7* and *V8* as long as *V2* and *V6*, but *V7* and *V8* marginally pilose, *V2* and *V6* smooth.

Material examined. Holotype female from Sierra Leone, Guma, 500 m, 18 January 1979, coll. J. and S. Klapperich. Paratypes: One female and one male, collection data as in holotype.

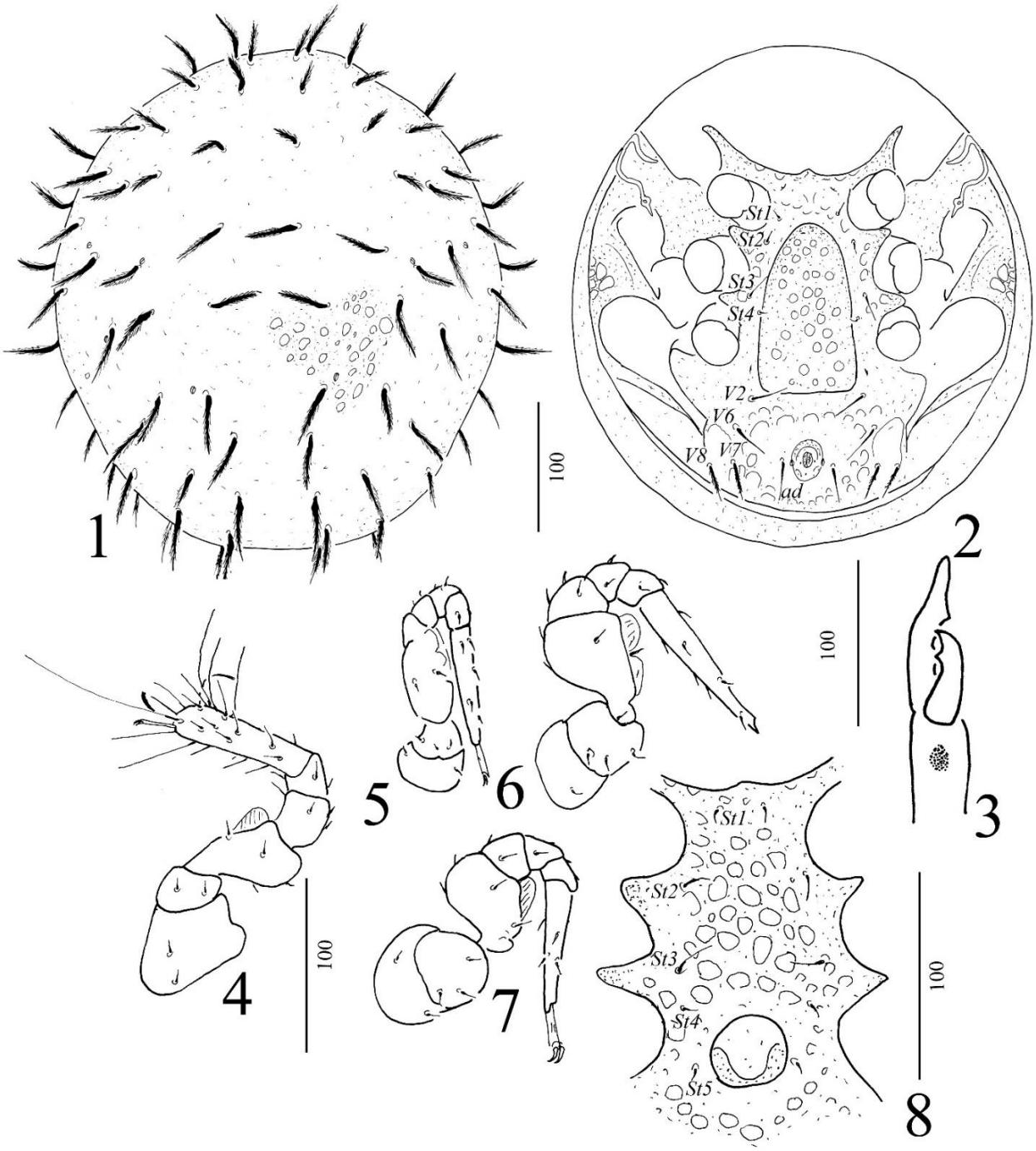
Description

Female (n=2)

Length of idiosoma 383–385, width 340–342. Shape circular, posterior margin rounded, colour reddish brown.

Dorsal idiosoma (Fig. 1). Marginal and dorsal shields fused. Dorsal setae basally curved, margins of all dorsal setae pilose (ca 35–42). Four pairs of pore-like organs situated on central and centrolateral areas of dorsal shield. Surface of dorsal shield covered by irregular pits (ca 4–11×5–13).

Ventral idiosoma (Fig. 2). Sternal shield covered by irregular pits. All sternal setae smooth and needle-like, *St1–St2* short (ca 7–9), *St3* long (ca 19–22), *St4* extreme short (ca 5–6). *St1* situated at level of central area of coxae II, *St2* at



Figures 1-8. *Rotundabaloghia* (*Circobaloghia*) *leonensis* sp. nov. Female, holotype. 1. Dorsal view of idiosoma. 2. Ventral view of idiosoma. 3. Lateral view of chelicera. 4. Leg I in lateral view. 5. Leg II in lateral view. 6. Leg III in lateral view. 7. Leg IV in lateral view. 8. Intercoxal area of paratype male.

level of anterior margin of coxae III, *St3* at level of posterior margin of coxae III, *St4* at level of central area of coxae IV. Ventral setae *V2*, *V6* and adanal setae (*ad*) smooth and needle-like (ca 27–30), *V7* and *V8* as long as *V2* and *V6* (ca 25–28), but marginally pilose. *V2* situated near basal line of genital shield, *V7* and *V8* situated at level of setae *ad*. V6 situated at level of end of pedofossae IV. Setae *ad* placed lateral to anal opening. Ventral shield covered by irregular pits, but smooth around anal opening. One pair of lyriform fissures situated close to anterior margin of sternal shield, one pair close to basal edges of genital shield and one pair of poroids close to *ad*. Stigmata situated between coxae II and III. Peritremes with a short straight poststigmatid part and a longer hook-shaped prestigmatid part. Genital shield wide, linguliform (130–135 long and 68–70 wide at base), without apical process. Surface of genital shield with irregular pits. Pedofossae deep, their surface smooth, separate furrows for tarsi IV present. Base of tritosternum narrow, vase-like, tritosternal laciniae smooth, subdivided into three smooth branches in its distal half.

Gnathosoma. Corniculi horn-like, internal malae smooth and as long as corniculi. Hypostomal setae (*h1*, *h2*, *h3* and *h4*) long (ca 9–13), smooth and needle-like. Apical part of epistome marginally pilose. Palp with smooth setae

except for one ventral serrate seta on palp trochanter. Fixed digit of chelicerae longer than movable digit and both digits bearing one central tooth. Internal sclerotized node present (Fig. 3).

Legs (Figs 4–7). All legs with ambulacral claws and smooth and needle-like setae, but the claws on first leg shorter than others. All femora bearing flap-like ventral processes. Leg I 235–240, leg II 210–225, leg III 225–234, leg IV 250–263.

Male (n=1)

Length of idiosoma 382 width 340.

Dorsal idiosoma. Ornamentation and chaetotaxy of dorsal shield as for female.

Venteral idiosoma (Fig. 8). Four pairs of sternal setae situated anterior to genital shield, *St1*, *St4* and *St5* short (ca 6–8 long), *St2* long (ca 12–13 long) and *St3* longer (ca 15–17 long), all sternal setae smooth and needle-like. Two pairs of lyriform fissures situated on sternal shield, first pair close to anterior margin of sternal shield, second pair close to anterior margin of genital shield. Surface of sternal shield with numerous irregular pits anterior to genital shield. Surface of ventral shield, and shape and size of ventral setae as in female. Genital shield oval (34×36) and situated between coxae IV.

Larva and nymphs unknown.

Etymology. The name of the new species refers to the country where this species was collected.

Remarks. Till today 14 species are described from the West-African sub-region of the Ethiopian realm (Kontschán, 2010). Setae *V7* and *V8* are smooth in the following six species *R.* (*C.*) *endroedyi* Hirschmann, 1992; *R.* (*C.*) *kintampoensis* Hirschmann, 1992; *R.* (*C.*) *browni* Kontschán, 2009; *R.* (*C.*) *congoensis* Hirschmann, 1992; *R.* (*C.*) *campanellasimilis* Hirschmann, 1992 and *R.* (*C.*) *daelei* Hirschmann, 1992, contrary with the new one, where these setae are pilose. Setae *V6* pilose in the species *R.* (*C.*) *masoumbouensis* Hirschmann, 1992; *R.* (*C.*) *masoumbooides* Hirschmann, 1992; *R.* (*C.*) *bueaensis* Hirschmann, 1992; *R.* (*C.*) *perstructura* Hirschmann, 1992, but these setae are smooth in the new species. Setae *V7* is not pilose in the case of the species *R.* (*C.*) *africaguttaseta* Hirschmann, 1992 and *R.* (*C.*) *camerunis* Hirschmann, 1992, but pilose in the *R.* (*C.*) *leonensis* sp. nov. The setae *V7* and *V8* are pilose and setae *V6* and *V2* are smooth in the species *R.* (*C.*) *campanellae* Hirschmann, 1992 and *R.* (*C.*) *ghanaensis* Hirschmann, 1992 similar to the new species. But the sternal setae are very long (*St1* is reaching to insertion of *St2*) in the *R.* (*C.*) *ghanaensis* Hirschmann, 1992, which are short in the new one (*St1* is not reaching to insertion of *St2*) and female genital shield has an apical process in the species *R.* (*C.*) *campanellae* Hirschmann, 1992, which is missing in the new one.

Zoogeographical notes

The West-African sub-region of the Ethiopian realm is the poorly investigated part of the world for Uropodina and rotundabaloghid mite point of view. Only 15 rotundabaloghid species are listed in this region. The majority of the known species are presented from Cameroon (*R.* (*C.*) *campanellasimilis* Hirschmann, 1992 and *R.* (*C.*) *daelei* Hirschmann, 1992; *R.* (*C.*) *masoumbouensis* Hirschmann, 1992; *R.* (*C.*) *masoumbooides* Hirschmann, 1992; *R.* (*C.*) *bueaensis* Hirschmann, 1992; *R.* (*C.*) *perstructura* Hirschmann, 1992; *R.* (*C.*) *africaguttaseta* Hirschmann, 1992 and *R.* (*C.*) *camerunis* Hirschmann, 1992; *R.* (*C.*) *campanellae* Hirschmann, 1992), three species are described from Ghana (*R.* (*C.*) *ghanaensis* Hirschmann, 1992; *R.* (*C.*) *endroedyi* Hirschmann, 1992; *R.* (*C.*) *kintampoensis* Hirschmann, 1992), one species from republic of Congo (*R.* (*C.*) *congoensis* Hirschmann, 1992), one species from Ivory Coast (*R.* (*C.*) *browni* Kontschán, 2009) and one species from Sierra Leone (*Rotundabaloghia* (*Circobaloghia*) *leonensis* sp. nov.). The other countries of the sub-region are absolutely unknown, numerous undescribed, new rotundabaloghids species can be lived in different habitats of these West-African countries.

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RESEARCH ARTICLE

Oküler dandrufflu hastalarda *Demodex folliculorum* ve *D. brevis* (Acari: Demodicidae) yaygınlığı ve yoğunluğu

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ÖZET: *Demodex* akarlar (Acari) Demodicidae familyasına mensup mikro eklembacaklı mikroorganizmalardır. İnsanlarda parazitlenen iki türü tanımlanmıştır: *Demodex folliculorum* ve *D. brevis*. Günümüzde göz hastalıkları uzmanlarının da dikkatini çeken bu akarların oluşturdukları silindirik, sporadik ve diffüs dandruff gibi göz kapağı hastalıklarının patogenezinde önemi olduğu düşünülmektedir. *D. brevis ve D. folliculorum*'un ana besin kaynağı folikül içi epitel hücreleri ve sebumdur. Folikül içi epitel hücreleri delip sindirmek için birtakım enzimlere ve delici ağız uzuvlarına sahiptirler. Akarların beslenmesine bağlı olarak oluşan folikül içi hücre atıkları zamanla folikül yüzeyine doğru itilir. Sonuç olarak, bu atıklar kirpiklerin tabanında birikerek dandruff (kepek) oluşturur. Oküler dandrufflu hastalarda *Demodex* spp. yaygınlığı ve yoğunluğunu belirlemek amacı ile bu çalışma yapıldı. Tanısı göz hastalıkları polikliniğinde konulan dandrufflu 186 hasta ve 183 sağlıklı kontrol çalışmaya dâhil edildi. Bu katılımcıların kişisel bakım ve hijyen uygulamaları, demografik özellikleri, cilt biyofiziksel parametreleri kayıt altına alınıp yüz bölgelerinden (kirpik, kaş ve yanak) örnekler alındı. Çalışmada örnekleme yapılan yüz bölgelerinin tümü değerlendirildiğinde silindirik dandrufflu hastaların %90,9'unda (ortalama 38,39), kontrollerin %83,1'inde (ortalama 21,86) *Demodex* spp. pozitifliği tespit edildi. Katılımcıların cilt biyofiziksel özellikleri dikkate alındığında, *Demodex* yoğunluğunun ortalama nem ve sıcaklık değeri düşük, pH değeri yüksek olan hasta ve kontrollerde daha fazla olduğu tespit edildi. Demografik özelliklerde ise yaş artışı ile birlikte *Demodex* pozitifliği ve yoğunluğunun arttığı belirlendi. Sonuç olarak hastalarda en yaygın oküler şikâyetlerin kaşıntı ve yabancı cisim olduğu belirlenmiş olup oküler dandrufflu hastalarda *Demodex* spp.'nin çok yaygın ve yoğun olduğu tespit edildi. Bu hastaların klinik değerlendirme ve tedavisinde *Demodex* akarlarında dikkate alınmasının faydalı olabileceği düşünüldü.

Anahtar Kelimeler: Akar, *Demodex*, folikül, kaş, kepek, kirpik.

The prevalence and intensity of *Demodex folliculorum* and *D. brevis* (Acari: Demodicidae) in patients with ocular dandruff

ABSTRACT: *Demodex* mites (Acari) are micro-arthropods belonging to the family Demodicidae. Two species of these mites have been identified in humans: *Demodex folliculorum* and *D. brevis*. It is believed that these mites are important in the pathogenesis of eyelid symptoms such as cylindrical, sporadic and diffuse dandruff. The follicular epithelial cells and sebum are the main nutritional source of these mites. With the help of salivary enzymes and their mouthparts, they permeate the follicular epithelial cells. The follicular cell waste formed due to the feeding of the mites are moves towards the follicle surface, and as a result of it accumulates at the base of the lashes and form dandruff. This study was performed to determine the prevalence and intensity of *Demodex* spp. in patients with ocular dandruff. A total of 186 patients with ocular dandruff and 183 healthy controls were included in the study. Personal care and hygiene practices, demographic characteristics and skin biophysical parameters of these participants were recorded, and samples were taken from the facial areas (eyelash, eyebrow and cheek). In the study, *Demodex* positivity was detected in 90.9% of the cylindrical dandruff patients (mean 38.39) and 83.1% of the controls (mean 21.86). When the skin biophysical properties were taken into consideration, the density of *Demodex* was higher in participants with low moisture and temperature values and high pH values. On the other hand, *Demodex* positivity and density were increased with age of the participants. The most common ocular complaints were itching and foreign body sensation. *Demodex* mites were found to be very common and intense in the patients with ocular dandruff. Accordingly, *Demodex* mites should be taken in to consideration during the clinical evaluation and treatment of these patients.

Keywords: *Demodex*, follicle mite, dandruff, eyebrow, eyelash.

GİRİŞ

Demodex cinsi akarlar (Acari), Trombidiformes takımının Demodicidae familyasının bir üyesidir. Bu familyanın günümüzde 8 cinse bağlı 117 türü ve 1 alttürü tanımlanmıştır. (Bochkov, 2009; Izdebska vd., 2016; Izdebska ve Rolbiecki, 2016; Tilki vd., 2017b). *Demodex* cinsinin konakçısı insan olan iki türü bulunmaktadır. Bunlardan daha uzun opistozomaya sahip olan *D. folliculorum* (Şekil 1), kıl foliküllerinde tek veya gruplar halinde yaşarken, kısa opistozomaya sahip olan *D. brevis* ise sebase bezlerde genelde tek olarak yaşamaktadır. *D. folliculorum* daima kıl folikülünün arka tarafında ve aşağısında yerleşerek, delici ağız parçaları ile hücre duvarını delip foliküler epitel hücrelerinin içeriği ile *D. brevis* ise benzer şekilde sebase bezlerin epitelleri ve salgı ürünleri (sebum) ile beslenmektedir (Aycan vd., 2007; Aktaş, 2009; Fırat vd., 2010; Zhao vd., 2011).

Şekil 1. *Demodex folliculorum* (Dişi)

Demodex akarlar insan vücudunda daha çok yüz bölgesindeki alın, yanak, çene, burun, nazolabiyal ve göz kapaklarına yerleşirler. Son yıllarda pek çok araştırmacı rozase, akne vulgaris, perioral dermatit, seboreik dermatit ve blefarit gibi dermatolojik ve göz kapağı hastalıklarının patogenezinde *Demodex* enfestasyonunun etkili olduğunu düşünmektedir (Unat vd., 1995; Yazar vd., 2012).

Blefarit göz hastalıkları uzmanlarının klinikte sıklıkla karşılaştığı, tedavisi hem hasta hem de hekim açısından zor olan, tedavi edilse bile çoğunlukla nüksedebilen kronik bir göz kapağı hastalığıdır. Blefarit gözlerde kaşıntı, yanma, batma, fotofobi, yabancı cisim hissi, kapak kenarlarında kızarıklık, göz kuruluğu, kirpiklerde dökülme ve dandruff (kirpik diplerinde kepeklenme) gibi semptomlarla karakterizedir. Özellikle tedaviye dirençli veya tedavi sonrası tekrarlayan blefaritli olgularda bakteriyel etkenlerle birlikte *Demodex* akarların önemli oldukları bildirilmiştir (Lacey vd., 2009; Liu vd., 2010a; Luo vd., 2017). *Demodex* enfestasyonuna bağlı olarak gelişen blefarit demodektik blefarit olarak isimlendirilmektedir.

Demodektik blefarite neden olan mekanizmaların başında akarların bulundukları bölgede sayılarının artması gelmektedir. *Demodex* sayısının artması ile folliküllerde oluşan tıkaç ve gerginlik kirpiklerde şekil bozukluklarına ve meibomian bezlerde işlev bozukluğuna neden olabilmekle birlikte, meibomian bezlerin derinlerine girdiğinde yabancı cisim hissine ve kitin iskelete karşı immün yanıt gelişmesine neden olabilmektedir (Lacey vd., 2009; Liu vd., 2010a; Aytekin vd., 2017). Ayrıca akarların bacakları ile yaptıkları mikro aşınmalar kirpik diplerinde epitelyal hiperplazi ve reaktif hiperkeratinizasyona neden olabilmektedir. Bu hiperplazi ve hiperkeratinizasyon bazı yazarlar tarafından *Demodex* enfestasyonu için patagnomonik olarak kabul edilen silindirik kepek (cylindrical dandruff) oluşmasının nedeni olarak gösterilmiştir (Gao vd., 2005a, 2007; Lacey vd., 2009; Liang vd., 2010; Kim vd., 2011). Oküler dandruff kepeklenen kirpik sayısına göre iki kısma ayrılır: Eğer kepeklenen kirpik sayısı <10 ise "*sporadik dandruff*", ≥10 ise "*diffüs dandruff*" olarak isimlendirilir (Gao vd., 2005a).

Paraziter kökenli hastalıklarda parazit yaygınlığı ve yoğunluğunun belirlenmesi bu hastalıkların patogenezinin daha iyi anlaşılabilmesine, tedavi edilebilebilmesine ve bu hastalığın beraberinde getirdiği psikolojik ve ekonomik yükün giderilebilmesine, iş ve zaman kayıplarının engellenebilmesine önemli katkılar sağlayacabilecektir. Bu çalışma oküler dandrufflu hastalar ve sağlıklı kontrollerde *D. folliculorum* ve *D. brevis* yaygınlığı ve yoğunluğunu belirlemek amacı ile yapılmıştır.

MATERYAL ve YÖNTEM

Hasta ve kontrollerin belirlenmesi

Bu çalışma Eylül 2016-Haziran 2017 tarihleri arasında Erzincan Binali Yıldırım Üniversitesi Mengücek Gazi Eğitim ve Araştırma Hastanesi Dörtyol Yerleşkesinde yürütüldü. Çalışmaya Göz Hastalıkları Polikliniğine başvuran, blefarit haricinde başka bir oküler hastalığı olmayan, daha önce herhangi bir oküler cerrahi geçirmemiş ve kirpiklerinde silindirik kepeklenme tespit edilen 186 hasta dâhil edildi. Çalışmaya alınan hastaların kepekli kirpikleri optik mikroskopta sayıldı. Kepeklenen kirpik sayısı 10'dan az olanlar ''*sporadik dandrufflu hastalar*'' (SDH), 10 ve daha fazla olanlar ''*diffüs dandrufflu hastalar*'' (DDH) olarak 2 gruba ayrıldı. Blefarit harici herhangi bir oküler veya sistemik bir hastalığı bulunan, blefaritli olup silindirik kepeklenmeye sahip olmayan, oküler cerrahi geçirmiş, sistemik veya topikal tedavi alan, gebe veya laktasyon döneminde bulunan hastalar çalışma dışı bırakıldı. Çalışmaya ayrıca herhangi bir oküler, kronik veya sistemik hastalığı olmayan ve daha önce oküler cerrahi geçirmemiş 183 sağlıklı kontrol dâhil edildi. Çalışma için Erzincan Binali Yıldırım Üniversitesi Klinik Araştırmalar Etik Kurul Başkanlığından onay (Etik Kurul Karar No: 2016-08/07) alındıktan sonra tüm hasta ve kontrollere bilgilendirilmiş onam formu okunarak imzalatıldı.

Ayrıca tüm hastaların kaşıntı, kızarıklık, sulanma, yabancı cisim hissi (batma), yanma ve çapaklanma gibi oküler semptomları sorgulanarak Hasta Bilgi Formuna kaydedildi. Hastalardan semptomlarını hafif (ara sıra rahatsız eden, günlük aktiveteleri engellemeyen), orta (sık sık rahatsız eden, ara sıra günlük aktiviteleri engelleyen), ağır (sürekli rahatsız eden ve sıklıkla günlük aktiviteleri engelleyen) olarak değerlendirmeleri istendi. Herhangi bir semptomun olmaması 0, semptomun hafif olması 1, orta olması 2 ve şiddetli olması 3 şeklinde puan verilerek semptom skorları elde edildi (Gao vd., 2012; Laspina vd., 2015).

Cildin nem, pH ve ısı ölçümleri

Tüm hasta ve kontrollerin cilt pH ve ısı değerleri cilt-pH-metre (Hanna HI 1414, Romanya), nem değeri ise dijital cilt nemölçerle (DMM, Türkiye) cihazın örnek alınacak bölgeye yaklaşık 30 saniye temas ettirilmesiyle ölçüldü. Ölçümler sağ yanak, sol yanak, sağ göz kapağı ve sol göz kapaklarında yapıldı. Daha sonra yanaklar ve göz kapakları için ayrı ayrı olmak üzere ölçüm değerlerinin ortalaması hesaplanarak kaydedildi.

Ayrıca katılımcılara yaş, cinsiyet, medeni durum, öğrenim seviyesi, günlük yüz yıkama sayısı, haftalık banyo yapma sayısı, nemlendirici krem kullanma, ortak yüz havlusu kullanma ve sigara kullanımı gibi sosyal özellikleri, kişisel hijyen ve alışkanlıkları sorularak Hasta Bilgi Forumu'na kaydedildi.

Örnek materyallerinin alınması

Standart yüzeyel deri biyopsi (SYDB) yöntemi

Yanak bölgesinden örnek materyallerinin alınmasında Standart Yüzeyel Deri Biyopsi (SYDB) yöntemi kullanıldı. Bunun için önce temiz bir lam alınarak üzerine 1 cm^2'lik alan çizildi. Sonra lamın diğer yüzü çevrildi ve çizilen alanın ortasına gelecek şekilde bir damla siyanoakrilat damlatılarak örnek alınacak yüzeye bastırıldı ve yaklaşık 1 dakika beklendikten sonra yavaşça kaldırıldı (Şekil 2). Örnek materyalinin üzerine 1-2 damla Hoyer eriyiği damlatılarak hava kabarcığı kalmayacak şekilde lamel ile kapatıldı ve preparat incelemeye hazır hale getirildi.

Şekil 2. SYDB yöntemi A. Hazırlık aşaması, B. Örnek alma

Epilasyon yöntemi

Her bir gözün alt ve üst kapağından ikişer adet olmak üzere toplam 8 adet kirpik, her bir kaştan ikişer adet olmak üzere toplam 4 adet kaş örneği epilasyon yöntemi ile alındı. Örnek alınmadan önce, katılımcıların göz ve kaş bölgesinde rimel, kalem gibi kozmetik ürünlerin olmamasına özen gösterildi. Önce temiz bir lam alınarak üzerine 1-2 damla Hoyer eriyiği damlatıldı. Sonra her bir gözün alt ve üst kapakları ile her bir kaştan ayrı ayrı olmak üzere ikişer adet uygun örnek steril cımbız ile epile edildi. Alınan örnekler daha önce hazırlanmış olan lamdaki Hoyer eriyiğinin üzerine bırakılarak hava kabarcığı kalmayacak şekilde lamel ile kapatıldı. Hazırlanan her bir preparatın üzerine katılımcıların adı, soyadı ve örneğin alındığı bölge yazılarak incelenmeye hazır hale getirildi (Şekil 3).

Şekil 3. A. Diffüs dandrufflu kirpik, B. Sporadik dandrufflu kirpik, C. Sağlıklı kirpik

Demodex türlerinin teşhisi ve sayımı

Epilasyon ve SYDB yöntemi ile alınan örnek materyalleri ışık mikroskobunda (Leica DM750, İsviçre) 4X, 10X, 40X ve 100X büyütmelerle akar varlığı ve sayısı bakımından incelendi. *Demodex* türlerinin teşhisi ve sayımı her bir katılımcının yanakları, göz kapakları ve kaşları için ayrı ayrı yapıldı ve elde edilen veriler Hasta Bilgi Formu'na kaydedildi. *Demodex* akarların sayımı ve teşhisi aynı araştırmacı tarafından ilgili literatüre göre yapıldı (Desc ve Nutting 1972). *Demodex* akarların fotoğraflama işlemleri DIC (Differantial Interference Contrast) donanımlı araştırma mikroskobunda (Olympus DP73, Japonya) yapıldı. Örnek materyallerinde *Demodex* akarların larva, nimf veya erginine rastlanılan katılımcılar *Demodex* bakımından pozitif kabul edildi (Arıcı vd., 2005; İnceboz vd., 2009; Wesolowska vd., 2014). Ortalama *Demodex* sayısı, toplam *Demodex* sayısının *Demodex* pozitif katılımcı sayısına bölünmesi ile hesaplandı.

Verilerin analizi

Verilerin istatistiksel değerlendirmesi SPSS (Statistical Package for Social Sciences) paket programı kullanılarak yapıldı. Değişkenlerin normal dağılıma uygunluğu Kolmogorov-Smirnov testi kullanılarak incelendi. Normal dağılım gösteren değişkenler için tanımlayıcı analizler ortalama ve standart sapma, normal dağılım göstermeyenler içinse ortanca ve minimum-maksimum değerler verildi. Gruplar arası karşılaştırmalar yapılırken Mann-Whitney U ve Kruskal Wallis testi kullanıldı. Korelasyon analizlerinde Spearman Korelasyon testi kullanıldı. Kategorik verilerin değerlendirilmesinde ise Ki Kare testi kullanıldı. P değerinin 0.05'den küçük olması istatistiksel olarak anlamlı kabul edildi.

BULGULAR

Katılımcıların yaş ve cinsiyet dağılımı

Çalışmaya 98 sporadik dandrufflu, 88 diffüs dandrufflu olmak üzere toplam 186 silindirik dandrufflu hasta (110 kadın, 76 erkek, ortalama yaş 59,64 ± 13,7) ve 183 kontrol (96 kadın, 87 erkek, ortalama yaş 51,22 ± 22,1) dahil edildi (Tablo 1).

Hasta ve kontrollerde *Demodex* spp. yaygınlığı ve yoğunluğu

Çalışmada hastaların %90,3'ünde *D. folliculorum* (ortalama 38,02; toplam 6387), %19,4'ünde *D. brevis* (ortalama 2,78; toplam 100) olmak üzere %90,9'unda *Demodex* spp. (ortalama 38,39; toplam 6487) tespit edildi. Kontrollerin ise %83,1'inde *D. folliculorum* (ortalama 21,07; toplam 3202), %18'inde *D. brevis* (ortalama 3,64; toplam 120) olmak üzere %83,1'inde *Demodex* spp. (ortalama 21,86; toplam 3322) saptandı. Hasta ve kontroller *Demodex* spp. pozitifliği ve yoğunluğu bakımından karşılaştırıldığında aradaki farklar istatistiki olarak anlamlı bulundu (akar pozitifliği için $p = 0,026$**;** akar yoğunluğu için $p < 0,001$) (Tablo 2).

Sporadik ve diffüs dandrufflu hastalarda *Demodex* spp. pozitifliği ve yoğunluğu

Çalışmada sporadik dandrufflu (SD) hastaların %82,7'sinde, diffüs dandrufflu (DD) hastaların tamamında *Demodex* spp. pozitifliği tespit edildi. SD'li hastalardan toplam 1094 (ortalama 13,51), DD'li hastalardan toplam 5393 (ortalama 61,28) *Demodex* akar örnekleri izole edildi. *Demodex* akar pozitifliği ve yoğunluğu bakımından SD ve DD'li hastalar arasındaki fark istatistiki olarak anlamlı bulundu ($p < 0,001$) (Tablo 3).

Hasta ve kontrollerin yüz bölgelerindeki *Demodex* pozitifliği

Hasta ve kontrollerin yüz bölgelerindeki *D. folliculorum, D. brevis* ve *Demodex* spp. pozitifliği Tablo 4'de ayrıntılı olarak verilmiştir. Çalışmada silindirik dandrufflu hastalardan %81,2'sinin yanaklarında, %68,8'inin göz kapaklarında, %22,6'sının kaşlarında, kontrollerden ise %81,4'ünün yanaklarında, %34,4'ünün göz kapaklarında, %4,4'ünün kaşlarında *Demodex* akar türleri tespit edildi. Hasta ve kontroller yüz bölgelerindeki *Demodex* spp. pozitifliği bakımından karşılaştırıldığında aradaki farklar yanak için anlamlı bulunmazken ($p > 0,05$) göz kapakları ve kaşlar için anlamlı bulundu ($p < 0,001$) (Tablo 4).

Hasta ve kontrollerin yüz bölgelerindeki *Demodex* yoğunluğu

Hasta ve kontrollerin yüz bölgelerindeki *D. folliculorum*, *D. brevis* ve *Demodex* spp. yoğunluğu Tablo 5'de ayrıntılı olarak verilmiştir. Çalışmada yanaklar, göz kapakları ve kaşlardaki *Demodex* yoğunluğunun hastalarda sırası ile 35,31, 8,20 ve 2,52, kontrollerde ise sırası ile 20,50, 3,91 ve 1,38 olduğu tespit edildi. Hasta ve kontrollerin yüz bölgeleri *Demodex* yoğunluğu bakımından karşılaştırıldığında aradaki farklar yanak için anlamlı bulunmazken ($p > 0,05$) göz kapakları ve kaşlar için anlamlı bulundu ($p < 0,001$).

Sporadik ve diffüs dandrufflu hastaların yüz bölgelerindeki *Demodex* pozitifliği

SD ve DD'li hastaların yüz bölgelerindeki *D. folliculorum, D. brevis* ve *Demodex* spp. pozitifliği Tablo 6'da ayrıntılı olarak verilmiştir. SD'li hastaların %73,5'inin yanaklarında, %41,8'inin göz kapaklarında, %6,1'inin kaşlarında, DD'li hastaların ise %89,8'inin yanaklarında, tamamının göz kapaklarında, %40,1'inin kaşlarında *Demodex* akar türleri tespit edildi. SD ve DD'li hastaların yüz bölgeleri *Demodex* pozitifliği bakımından karşılaştırıldığında aradaki farklar anlamlı bulundu (yanaklar için $p = 0.005$; göz kapakları ve kaşlar için $p < 0,001$).

Sporadik ve diffüs dandrufflu hastaların yüz bölgelerindeki *Demodex* yoğunluğu

SD ve DD'li hastaların yüz bölgelerindeki *D. folliculorum, D. brevis* ve *Demodex* spp. yoğunluğu Tablo 7'de ayrıntılı olarak verilmiştir. SD'li hastaların yanak, göz kapakları ve kaşlarındaki *Demodex* yoğunluğu sırası ile 13,82, 2,15 ve 1,83, DD'li hastalarda sırası ile 54,90, 10,92 ve 2,64 olarak tespit edildi. SD ve DD'li hastaların yüz bölgelerindeki *Demodex* spp. yoğunlukları ile ilgili farkların istatistiki olarak anlamlı olduğu belirlendi (yanaklar, göz kapakları ve kaşlar için $p < 0,001$).

Tablo 1. Hasta ve kontrollerin yaş ve cinsiyet özellikleri

	SDH (n: 98)	DDH (n: 88)	Tüm Hastalar (n: 186)	Kontroller (n 183)
Yaş (yıl)				
Ortalama ± SS	55,4 ± 13,6	64,3 ± 12,2	59,64 ± 13,7	51,22 ± 22,1
Ortanca (min–mak)	57 (17- 89)	63 (34 – 87)	61 (17 – 89)	44 (16 – 86)
Cinsiyet				
Kadın	63/98 (%64,3)	47/88 (%53,4)	110/186 (%59,1)	96/183 (%52,5)
Erkek	35/98 (%35,7)	41/88 (%46,6)	76/186 (%40,9)	87/183 (%47,5)

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar **SS:** Standart sapma; **min:** Minimum; **mak:** Maksimum

Tablo 2. Hasta ve kontrollerde *Demodex* pozitifliği ve yoğunluğu

	Hastalar (n: 186)	Kontroller (n: 183)	p
Akar pozitifliği			
D. folliculorum	168/186 (%90,3)	152/183 (%83,1)	0,040 [a]
D. brevis	36/186 (%19,4)	33/183 (%18,0)	> 0,05 [a]
Demodex spp.*	169/186 (%90,9)	152/183 (%83,1)	0,026 [a]
Akar yoğunluğu			
Ortalama [c]			
D. folliculorum	38,02	21,07	< 0,001 [b]
D. brevis	2,78	3,64	> 0,05 [b]
Demodex spp.	38,39	21,86	0,001 [b]
Toplam			
D. folliculorum	6387	3202	< 0,001 [b]
D. brevis	100	120	> 0,05 [b]
Demodex spp.	6487	3322	0,001 [b]

a: Ki-kare testi**, b:** Mann-Whitney U testi **c:** Sadece *Demodex* pozitif olan katılımcılar hesaba katılmıştır.
***** *Demodex folliculorum* ve *D. brevis* türlerini kapsamaktadır.

Tablo 3. Sporadik ve diffüs dandrufflu hastalarda *Demodex* pozitifliği ve yoğunluğu

	Silindirik Dandrufflu Hastalar (n: 186)		
	SDH (n: 98)	**DDH (n: 88)**	**p**
Akar pozitifliği			
D. folliculorum	81/98 (%82,7)	87/88 (%98,9)	< 0,001 [a]
D. brevis	11/98 (%11,2)	25/88 (%28,4)	0,003
Demodex spp.	81/98 (%82,7)	88/88 (%100)	< 0,001 [a]
Akar yoğunluğu [c]			
Ortalama			
D. folliculorum	13,11	61,21	< 0,001 [b]
D. brevis	2,91	2,72	0,003
Demodex spp.	13,51	61,28	< 0,001 [b]
Toplam			
D. folliculorum	1062	5325	< 0,001 [b]
D. brevis	32	68	0,003
Demodex spp.	1094	5393	< 0,001 [b]

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar
a: Ki-kare testi, **b:** Mann-Whitney U testi, **c:** Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.

Tablo 4. Hasta ve kontrollerin yüz bölgelerindeki *Demodex* pozitifliği

		***Demodex* Pozitifliği (%)**		
		Hastalar (n: 186)	**Kontroller (n: 183)**	**p [a]**
D. folliculorum	Sağ yanak	129/186 (%69,4)	132/183 (%72,1)	> 0,05
	Sol yanak	129/186 (%69,4)	119/183 (%65,0)	> 0,05
	Yanaklar	151/186 (%81,2)	149/183 (%81,4)	> 0,05
	Sağ göz kapağı	92/186 (%49,5)	45/183 (%24,6)	< 0,001
	Sol göz kapağı	99/186 (%53,2)	34/183 (%18,6)	< 0,001
	Göz kapakları	127/186 (%68,3)	63/183 (%34,4)	< 0,001
	Sağ kaş	32/186 (%17,2)	7/183 (%3,8)	< 0,001
	Sol kaş	28/186 (%15,1)	1/183 (%0,6)	< 0,001
	Kaşlar	42/186 (%22,6)	8/183 (%4,4)	< 0,001
D. brevis	Sağ yanak	16/186 (%8,6)	26/183 (%14,2)	> 0,05
	Sol yanak	20/186 (%10,8)	15/183 (%8,2)	> 0,05
	Yanaklar	31/186 (%16,7)	33/183 (%18,0)	> 0,05
	Sağ göz kapağı	2/186 (%1,1)	0/183 (%0)	> 0,05
	Sol göz kapağı	4/186 (%2,2)	0/183 (%0)	0,046
	Göz kapakları	6/186 (%3,2)	0/186 (%0)	0,014
	Sağ kaş	0/186 (%0)	0/183 (%0)	> 0,05
	Sol kaş	0/186 (%0)	0/183 (%0)	> 0,05
	Kaşlar	0/186 (%0)	0/186 (%0)	> 0,05
***Demodex* spp.**	Sağ yanak	129/186 (%69,4)	132/183 (%72,1)	> 0,05
	Sol yanak	129/186 (%69,4)	120/183 (%65,6)	> 0,05
	Yanaklar	151/186 (%81,2)	149/183 (%81,4)	> 0,05
	Sağ göz kapağı	92/186 (%49,5)	46/183 (%25,1)	< 0,001
	Sol göz kapağı	100/186 (%53,8)	34/183 (%18,6)	< 0,001
	Göz kapakları	128/186 (%68,8)	63/183 (%34,4)	< 0,001
	Sağ kaş	32/186 (%17,2)	7/183 (%3,8)	< 0,001
	Sol kaş	28/186 (%15,1)	1/183 (%0,6)	< 0,001
	Kaşlar	42/186 (%22,6)	8/183 (%4,4)	< 0,001

a: Ki-kare testi

Sporadik ve diffüs dandrufflu hastaların oküler semptomlarının karşılaştırılması

SD ve DD'li hastaların oküler semptom şiddetleri Tablo 8'de ayrıntılı olarak karşılaştırılmıştır. Çalışmada kaşıntı, kızarıklık, sulanma, batma, yanma ve çapaklanma gibi oküler semptomlardan SD'li hastaların ya şikayetçi olmadığı ya da hafif derecede şikayetçi olduğu, ancak DD'li hastaların aynı semptomlardan orta veya şiddetli derecede şikayetçi olduğu belirlendi. SD ve DD'li hastalar oküler-semptom dereceleri bakımından karşılaştırıldığında aradaki farkların anlamlı olduğu görüldü (p < 0,001).

Sporadik ve diffüs dandrufflu hastalarda oküler semptomlar ile *Demodex* spp. yoğunluğu arasındaki korelasyon

SD ve DD'li hastaların ortalama oküler semptom skorları ile *Demodex* spp. yoğunlukları Tablo 9'da ayrıntılı olarak karşılaştırılmıştır. Ortalama oküler semptom skorlarına göre değerlendirildiğinde, DD'li hastaların en fazla batma ve kaşıntıdan şikayetçi olduğu, bunları kızarıklık,

Tablo 5. Hasta ve kontrollerin yüz bölgelerindeki *Demodex* yoğunluğu

		***Demodex* Yoğunluğu [a]**				
		Ortalama		**Toplam**		
		Hastalar	**Kontroller**	**Hastalar**	**Kontroller**	**p [b]**
D. folliculorum	Sağ yanak	19,68	11,10	2539	1465	> 0,05
	Sol yanak	20,92	12,43	2699	1480	> 0,05
	Yanaklar	34,69	19,77	5238	2945	> 0,05
	Sağ göz kapağı	5,45	3,51	501	158	< 0,001
	Sol göz kapağı	5,48	2,59	542	88	< 0,001
	Göz kapakları	8,21	3,91	1043	246	< 0,001
	Sağ kaş	1,56	1,43	50	10	< 0,001
	Sol kaş	2,00	1,00	56	1	< 0,001
	Kaşlar	2,52	1,38	106	11	< 0,001
D. brevis	Sağ yanak	2,25	2,62	36	68	> 0,05
	Sol yanak	2,90	3,47	58	52	> 0,05
	Yanaklar	3,03	3,64	94	120	> 0,05
	Sağ göz kapağı	1,00	0	2	0	> 0,05
	Sol göz kapağı	1,00	0	4	0	0,046
	Göz kapakları	1,00	0	6	0	0,014
	Sağ kaş	0	0	0	0	> 0,05
	Sol kaş	0	0	0	0	> 0,05
	Kaşlar	0	0	0	0	> 0,05
***Demodex* spp.**	Sağ yanak	19,96	11,61	2575	1533	> 0,05
	Sol yanak	21,37	12,77	2757	1532	> 0,05
	Yanaklar	35,31	20,57	5332	3065	> 0,05
	Sağ göz kapağı	5,47	3,44	503	158	< 0,001
	Sol göz kapağı	5,46	2,59	546	88	< 0,001
	Göz kapakları	8,20	3,91	1049	246	< 0,001
	Sağ kaş	1,56	1,43	50	10	< 0,001
	Sol kaş	2,00	1,00	56	1	< 0,001
	Kaşlar	2,52	1,38	106	11	< 0,001

a: Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.
b: Mann-Whitney U testi

çapaklanma, yanma ve sulanmanın takip ettiği belirlendi. SD'li hastalarda ise ortalama oküler semptom skorlarının hemen hemen aynı olduğu tespit edildi. Ayrıca ortalama *Demodex* yoğunluğunun oküler şikayetleri olan DD'li hastalarda SD'li hastalardan yaklaşık 5 kat daha fazla olduğu tespit edildi. Çalışmada DD'li hastalarda *Demodex* spp. yoğunluğu ile oküler semptom skorları arasındaki korelasyon istatistiksel olarak anlamlı bulunurken ($p < 0,001$), SD'li hastalarda anlamlı bulunmadı ($p > 0,05$).

Hasta ve kontrollerin cilt biyofiziksel parametreleri ile *Demodex* spp. yoğunluğu arasındaki korelasyon

Hasta ve kontrollerin yanak ve göz kapaklarının biyofiziksel parametreleri ile *Demodex* spp. yoğunluğu arasındaki korelasyon Tablo 10'da ayrıntılı olarak gösterilmiştir. Hastaların ortalama nem ve sıcaklık değerlerinin göz kapaklarında yanaklara oranla daha yüksek olduğu, pH değerinin ise hemen hemen aynı olduğu, ancak kontrollerde ortalama nem, pH ve sıcaklık değerlerinin göz

Tablo 6. Sporadik ve diffüs dandruflu hastaların yüz bölgelerindeki *Demodex* pozitifliği

		***Demodex* Pozitifliği (%)**		
		SDH (n: 98)	**DDH (n: 88)**	**p [a]**
D. folliculorum	Sağ yanak	57/98 (%58,2)	72/88 (%81,8)	< 0,001
	Sol yanak	56/98 (%57,1)	73/88 (%83,0)	< 0,001
	Yanaklar	72/98 (%73,5)	79/88 (%89,8)	0,005
	Sağ göz kapağı	27/98 (%27,6)	65/88 (%73,9)	< 0,001
	Sol göz kapağı	24/98 (%24,5)	75/88 (%85,2)	< 0,001
	Göz kapakları	41/98 (%41,8)	86/88 (%97,7)	< 0,001
	Sağ kaş	4/98 (%4,1)	28/88 (%31,8)	< 0,001
	Sol kaş	2/98 (%2,0)	26/88 (%29,6)	< 0,001
	Kaşlar	6/98 (%6,1)	36/88 (%40,1)	< 0,001
D. brevis	Sağ yanak	6/98 (%6,1)	10/88 (%11,4)	> 0,05
	Sol yanak	6/98 (%6,1)	14/88 (%15,6)	0,031
	Yanaklar	10/98 (%10,2)	21/88 (%23,9)	0,013
	Sağ göz kapağı	1/98 (%1,0)	1/88 (%1,1)	> 0,05
	Sol göz kapağı	0/98 (%0)	4/88 (%4,6)	0,033
	Göz kapakları	1/98 (%1,0)	5/88 (%5,7)	> 0,05
	Sağ kaş	0/98 (%0)	0/88 (%0)	> 0,05
	Sol kaş	0/98 (%0)	0/88 (%0)	> 0,05
	Kaşlar	0/98 (%0)	0/88 (%0)	> 0,05
***Demodex* spp.**	Sağ yanak	57/98 (%58,2)	72/88 (%81,8)	< 0,001
	Sol yanak	56/98 (%57,1)	73/88 (%83,0)	< 0,001
	Yanaklar	72/98 (%73,5)	79/88 (%89,8)	0,005
	Sağ göz kapağı	27/98 (%27,6)	65/88 (%73,9)	< 0,001
	Sol göz kapağı	24/98 (%24,5)	76/88 (%86,4)	< 0,001
	Göz kapakları	41/98 (%41,8)	88/88 (%100)	< 0,001
	Sağ kaş	4/98 (%4,1)	28/88 (%31,8)	< 0,001
	Sol kaş	2/98 (%2,0)	26/88 (%29,6)	< 0,001
	Kaşlar	6/98 (%6,1)	36/88 (%40,1)	< 0,001

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar
a: Ki-kare testi

kapakları ve yanaklarda yaklaşık aynı olduğu belirlendi. Bununla birlikte ortalama *Demodex* yoğunluğunun nem ve sıcaklık değeri düşük, pH değeri yüksek olan hasta ve kontrollerde daha fazla olduğu tespit edildi. Bu yönde elde edilen veriler istatistiki olarak değerlendirildiğinde, nem değeri ile *Demodex* yoğunluğu arasında negatif bir korelasyon, pH ve sıcaklık değerleri ile *Demodex* yoğunluğu arasında pozitif bir korelasyon olduğu görüldü.

Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. pozitifliği arasındaki ilişki

Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. pozitifliği arasındaki ilişki Tablo 11'de ayrıntılı olarak karşılaştırılmıştır. *Demodex* spp. pozitifliğinin yaş artışına bağlı olarak arttığı, erkeklerde ve evli olanlarda daha fazla olduğu, öğrenim durumuna göre önemli farklılık göstermediği belirlendi. Bu yönde elde edilen veriler istatistiksel olarak karşılaştırıldığında yaş ve medeni durum ile *Demodex* pozitifliği arasında anlamlı farklılık bulunurken (yaş, p = 0,002; medeni durum, p < 0,001), cinsiyet ve öğrenim durumu ile *Demodex* pozitifliği arasında bulunmadı (p > 0,05).

Tablo 7. Sporadik ve diffüs dandrufflu hastaların yüz bölgelerindeki *Demodex* yoğunluğu

		***Demodex* Yoğunluğu [a]**				
		Ortalama		**Toplam**		
		SDH	**DDH**	**SDH**	**DDH**	**p [b]**
D. folliculorum	Sağ yanak	7,65	29,21	436	2103	< 0,001
	Sol yanak	9,43	29,74	528	2171	< 0,001
	Yanaklar	13,39	54,10	964	4274	< 0,001
	Sağ göz kapağı	1,63	7,03	44	457	< 0,001
	Sol göz kapağı	1,79	6,65	43	499	< 0,001
	Göz kapakları	2,12	11,12	87	956	< 0,001
	Sağ kaş	1,25	1,61	5	45	< 0,001
	Sol kaş	3,00	1,92	6	50	< 0,001
	Kaşlar	1,83	2,64	11	95	< 0,001
D. brevis	Sağ yanak	1,50	2,70	9	27	> 0,05
	Sol yanak	3,67	2,57	22	36	0,035
	Yanaklar	3,10	3,00	31	63	0,014
	Sağ göz kapağı	1,00	1,00	1	1	> 0,05
	Sol göz kapağı	0	1,00	0	4	0,033
	Göz kapakları	1,00	1,00	1	5	> 0,05
	Sağ kaş	0	0	0	0	< 0,001
	Sol kaş	0	0	0	0	< 0,001
	Kaşlar	0	0	0	0	< 0,001
***Demodex* spp.**	Sağ yanak	7,81	29,58	445	2130	< 0,001
	Sol yanak	9,82	30,23	550	2207	< 0,001
	Yanaklar	13,82	54,90	995	4337	< 0,001
	Sağ göz kapağı	1,67	7,05	45	458	< 0,001
	Sol göz kapağı	1,79	6,62	43	503	< 0,001
	Göz kapakları	2,15	10,92	88	961	< 0,001
	Sağ kaş	1,25	1,61	5	45	< 0,001
	Sol kaş	3,00	1,92	6	50	< 0,001
	Kaşlar	1,83	2,64	11	95	< 0,001

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar
a: Sadece *Demodex* pozitif olan hastalar hesaplamaya katılmıştır.
b: Mann-Whitney U testi

Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. yoğunluğu arasındaki ilişki

Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. yoğunluğu arasındaki ilişki Tablo 12'de ayrıntılı olarak karşılaştırılmıştır. *Demodex* spp. yoğunluğunun yaş arttıkça arttığı, erkeklerde ve evli olanlarda daha fazla olduğu, öğrenim seviyesine göre önemli farklılık göstermediği ancak orta öğrenim seviyesindeki hastalarda ve yüksek öğrenim seviyesindeki kontrollerde daha yüksek olduğu tespit edildi. Bu yönde elde edilen veriler analiz edildiğinde yaş ve medeni durum ile *Demodex* yoğunluğu arasında istatistiki olarak anlamlı fark bulunurken ($p < 0,001$), cinsiyet ve öğrenim durumu ile *Demodex* yoğunluğu arasında anlamlı fark bulunmadı ($p > 0,05$).

Tablo 8. Sporadik ve diffüs dandrufflu hastaların oküler semptomlarının karşılaştırılması

Oküler Semptomlar	Yok	Hafif [a]	Orta [a]	Şiddetli [a]	p [b]
Kaşıntı					
SDH	45/98 (%46)	48/98 (%49)	3/98 (%3)	2/98 (%2)	< 0,001
DDH	10/88 (%11)	20/88 (%23)	31/88 (%35)	27/88 (%31)	
Kızarıklık					
SDH	45/98 (%46)	48/98 (%49)	3/98 (%3)	2/98 (%2)	< 0,001
DDH	13/88 (%15)	18/88 (%21)	30/88 (%34)	27/88 (%31)	
Sulanma					
SDH	49/98 (%50)	46/98 (%47)	3/98 (%3)	0/98 (%0)	< 0,001
DDH	15/88 (%17)	19/88 (%22)	31/88 (%35)	23/88 (%26)	
Batma					
SDH	48/98 (%49)	42/98 (%43)	6/98 (%6)	2/98 (%2)	< 0,001
DDH	13/88 (%15)	9/88 (%10)	25/88 (%28)	41/88 (%47)	
Yanma					
SDH	48/98 (%49)	43/98 (%44)	5/98 (%5)	2/98 (%2)	< 0,001
DDH	13/88 (%15)	18/88 (%21)	30/88 (%34)	27/88 (%31)	
Çapaklanma					
SDH	45/98 (%46)	48/98 (%49)	3/98 (%3)	2/98 (%2)	< 0,001
DDH	13/88 (%15)	18/88 (%21)	30/88 (%34)	27/88 (%31)	

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar
a: **Hafif**: Ara sıra rahatsız eden, günlük aktiviteleri engellemeyen, **Orta**: Sık sık rahatsız eden, ara sıra günlük aktiviteleri engelleyen, **Şiddetli:** Sürekli rahatsız eden ve sıklıkla günlük aktiviteleri engelleyen
b: Ki-kare testi

Hasta ve kontrollerin kişisel bakım ve hijyen uygulamaları ile *Demodex* spp. pozitifliği arasındaki ilişki

Hasta ve kontrollerin kişisel bakım ve hijyenik uygulamaları ile *Demodex* spp. pozitifliği arasındaki ilişki Tablo 13'de ayrıntılı olarak gösterilmiştir. Hasta ve kontrollerin günlük yüz yıkama ve haftalık banyo yapma sıklığının *Demodex* pozitifliğini doğrudan etkilediği, bu hijyenik uygulamaların tekrarı arttıkça *Demodex* pozitifliğinin düştüğü ve aradaki farkların istatistiksel olarak anlamlı olduğu tespit edildi (yüz yıkama sıklığı için $p = 0,011$; banyo yapma sıklığı için $p < 0,001$).

Hasta ve kontrollerin kişisel bakım ve hijyen uygulamaları

Ayrıca nemlendirici krem kullanan, kişisel havlu kullanmayı tercih eden ve sigara kullanmayan katılımcılarda *Demodex* pozitifliğinin daha düşük olduğu belirlendi. Elde edilen veriler istatistiki olarak değerlendirildiğinde aradaki farklar anlamlı bulundu (nemlendirici krem kullanımı için $p < 0,001$; kişisel havlu tercihi için $p < 0,001$; sigara kullanımı için $p = 0,027$).

Hasta ve kontrollerin kişisel bakım ve hijyen uygulamaları ile *Demodex* spp. yoğunluğu arasındaki ilişki

Hasta ve kontrollerin kişisel bakım ve hijyenik uygulamaları ile *Demodex* spp. yoğunluğu arasındaki ilişki Tablo 14'de ayrıntılı olarak verilmiştir. Hasta ve kontrollerin günlük yüz yıkama ve haftalık banyo yapma sıklığı artıkça *Demodex* yoğunluğunun düştüğü ve aradaki farkların istatistiksel olarak anlamlı olduğu saptandı (yüz yıkama sıklığı için $p < 0,001$; banyo yapma sıklığı için $p < 0,001$).

Ayrıca, katılımcılardan nemlendirici krem kullanlarda, kişisel havlu kullanmayı tercih edenlerde ve sigara kul lanmayanlarda *Demodex* yoğunluğunun daha düşük olduğu belirlendi. Elde edilen veriler istatistiksel olarak değerlendirildiğinde aradaki farkların anlamlı olduğu tespit edildi (nemlendirici krem kullanımı için $p < 0,001$; kişisel havlu tercihi için $p = 0,006$; sigara kullanımı için $p = 0,008$).

Tablo 9. Sporadik ve diffüs dandrufflu hastalarda oküler semptomlar ile *Demodex* spp. yoğunluğu arasındaki korelasyon

Oküler Semptomlar	Oküler Semptom Skoru [a] Ortalama (min-mak)	*Demodex* spp. Yoğunluğu Ortalama (min-mak)	p [b] (r)
Kaşıntı			
SDH	0,61 (0 – 3)	13,51 (0 – 151)	> 0,05 (105)
DDH	1,85 (0 – 3)	61,28 (1 – 646)	< 0,001 (552)
Kızarıklık			
SDH	0,61 (0 – 3)	13,51 (0 – 151)	> 0,05 (105)
DDH	1,81 (0 – 3)	61,28 (1 – 646)	< 0,001 (521)
Sulanma			
SDH	0,53 (0 – 2)	13,51 (0 – 151)	> 0,05 (173)
DDH	1,70 (0 – 3)	61,28 (1 – 646)	< 0,001 (494)
Batma			
SDH	0,61 (0 – 3)	13,51 (0 – 151)	> 0,05 (148)
DDH	2,07 (0 – 3)	61,28 (1 – 646)	0,001 (363)
Yanma			
SDH	0,60 (0 – 3)	13,51 (0 – 151)	> 0,05 (142)
DDH	1,81 (0 – 3)	61,28 (1 – 646)	< 0,001 (521)
Çapaklanma			
SDH	0,61 (0 – 3)	13,51 (0 – 151)	> 0,05 (105)
DDH	1,81 (0 – 3)	61,28 (1 – 646)	< 0,001 (521)

SDH: Sporadik dandrufflu hastalar; **DDH:** Diffüs dandrufflu hastalar; **r:** Korelasyon katsayısı; **min:** Minimum; **mak:** Maksimum
a: 0-yok; 1-hafif; 2-orta; 3-şiddetli
b: Spearman korelasyon testi

TARTIŞMA, SONUÇ ve ÖNERİLER

Tartışma

Çalışmada örnekleme yapılan yüz bölgelerinin tümü değerlendirildiğinde silindirik dandrufflu hastaların %90,9'unda (ortalama *Demodex* sayısı 38,39), kontrollerin %83,1'inde (ortalama *Demodex* sayısı 21,86) tespit edildi. Günümüze kadar gerek Türkiye'de gerekse diğer ülkelerde blefaritli hastalarda *Demodex* akar yaygınlığını belirlemeye yönelik çok sayıda epidemiyolojik çalışma yapılmıştır. Bunlardan Türkiye'de yapılan çalışmalarda *Demodex* pozitifliği; Sivas'ta 35 hastada %62,9 (Sümer vd., 2000); Sivas'ta başka bir çalışmada 170 hastada %28,8, 330 kontrolde %26,7 (Arıcı vd., 2005); İzmir'de 37 hastada %29,72, 48 kontrolde %4,16 (Türk vd., 2007); İzmir'de başka bir çalışmada 82 hastada %68,3 (İnceboz vd., 2009); Malatya'da 58 hastada %56,9, 131 kontrolde %10 (Emre vd., 2008); Ankara'da 67 hastada %67,2, 51 kontrolde %54,9 (Kabataş vd., 2017); İstanbul'da 93 hastada %66,7 (Altınkurt vd., 2017); Bursa'da 39 hastada %73,9 (Alver vd., 2017) olarak bildirilmiştir. Ayrıca Hatay'da yapılan bir çalışmada blefaritli 96 hastanın %81,25'inde, 197 kontrolün %27,9'unda *Demodex* pozitifliği bildirilmiştir. Aynı çalışmada hastaların %50'sinde sadece *D. folliculorum*, %26,04'ünde D. folliculorum ve *D. brevis* birlikteliği tespit edilirken tek başına *D. brevis* saptanmadığı belirtilmiştir (Yula vd., 2013). Diğer ülkelerden ise; Almanya'da 139 blefaritli hastada %52 (Demmler vd., 1997); Kore, Seul'de 170 hastada %70 (Lee vd., 2010), Kolombiya'da 32 dandrufflu hastada %96,9 (Galvis vd., 2011); Filipinler, Manila'da yapılan çalışmada anterior blefaritli 20 hastanın %95'inde (ortalama *Demodex* 8,95), karışık blefaritli 32 hastanın %97'sinde (ortalama *Demodex* 13,63) ve 50 kontrolün %34'ünde (ortalama *Demodex* 0,98/kirpik) (de Venecia ve Siong, 2011); Hindistan, Tamil Nadu'da blefaritli 150 hastanın %78,7'sinde, 50 kontrolün %18'inde (Bhandari ve Reddy, 2014); Şili, Santiago'da 178 posterior blefaritli hastanın %83,7'sinde (ortalama *Demodex* 0,96/kirpik) (Lopez-Ponce vd., 2017) *Demodex* pozitifliği bildirilmiştir. Kheirkhah vd. (2007) tarafından ABD, Florida'da yapılan çalışmada blefaritli 6 hastanın tamamında *D. folliculorum*, %50'sinde *D. brevis* (ortalama *Demodex* 6,8) saptandığı rapor edilmiştir. Tayland, Bangkok'da yapılan çalışmada blefaritli 100

Tablo 10. Hasta ve kontrollerin cilt biyofiziksel parametreleri ile *Demodex* spp. yoğunluğu arasındaki korelasyon

	Biyofiziksel Parametreler Ortalama (min-mak)	***Demodex* spp. Yoğunluğu [a] Ortalama (min-mak)**	**p [b] (r)**
HASTALAR			
Nem (%RH)			
Yanaklar [e]	31,8 (18,4 – 62,0)	35,31 (1 – 610)	0,017 (- 193 [c])
Göz kapakları [f]	39,3 (23,0 – 68,8)	8,20 (1 – 46)	0,036 (- 186 [c])
pH			
Yanaklar [e]	5,4 (4,0 – 6,6)	35,31 (1 – 610)	0,002 (246 [d])
Göz kapakları [f]	5,3 (3,9 – 6,1)	8,20 (1 – 46)	0,018 (209 [d])
Isı (°C)			
Yanaklar [e]	23,9 (16,6 – 31,1)	35,31 (1 – 610)	0,031 (170 [d])
Göz kapakları [f]	26,1 (21,9 – 33,0)	8,20 (1 – 46)	0,043 (180 [d])
KONTROLLER			
Nem (%RH)			
Yanaklar [e]	31,4 (20,5 – 57,4)	20,57 (1 – 328)	0,021 (- 190 [c])
Göz kapakları [f]	30,0 (18,2 – 54,1)	3,91 (1 – 25)	0,027 (- 279 [c])
pH			
Yanaklar [e]	5,3 (4,0 – 6,7)	20,57 (1 – 328)	0,008 (216 [d])
Göz kapakları [f]	5,2 (4,1 – 6,3)	3,91 (1 – 25)	0,021 (290 [d])
Isı (°C)			
Yanaklar [e]	24,7 (19,0 – 31,0)	20,57 (1 – 328)	0,030 (179 [d])
Göz kapakları [f]	24,5 (19,6 – 31,0)	3,91 (1 – 25)	0,023 (286 [d])

r: Korelasyon katsayısı; **min:** Minimum; **mak:** Maksimum
a: Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.
b: Spearman korelasyon testi
c: Negatif korelasyon (nem değeri arttıkça akar sayısı azalmaktadır)
d: Pozitif korelasyon (pH/ısı değeri arttıkça akar sayısı artmaktadır)
e: Sağ ve sol yanaklarda ölçülen değerlerin ortalaması alınmıştır.
f: Sağ ve sol göz kapaklarında ölçülen değerlerin ortalaması alınmıştır.

hastanın %42'sinde *D. folliculorum*, %1'inde *D. brevis* tespit edildiği bildirilmiştir (Kasetsuwan vd., 2017). Yukarıda özetlenen epidemiyolojik çalışmalar dikkate alındığında hastalardaki *Demodex* pozitifliği %28,8 ile %97 arasında değişmektedir. Bu araştırmada elde edilen pozitiflik neticesi %90 civarındadır ve literatürdeki değişim aralığına uymaktadır. Değişik araştırmalarda görülen bu farklar, araştırmaların metodolojik farklılıklarından, katılımcıların yaş ve cinsiyet farklılıkları, sağlık durumları, kişisel bakım ve hijyen uygulamalarındaki faklılılardan kaynaklı olabilir.

Çalışmada hastalardan SD'li olanların %82,7'sinin (ortalama *Demodex* 13,51), DD'li olanların tamamının (ortalama *Demodex* 61,28) *Demodex* spp. ile enfeste olduğu belirlendi. *Demodex* spp. enfestasyonunun yüzdeki dağılımına bakıldığında silindirik dandrufflu hastalarda enfestasyonun en fazla yanakta olduğu (ortalama *Demodex* 35,31), bunu sırası ile göz kapakları (ortalama *Demodex* 8,20) ve kaşların (ortalama *Demodex* 2,52) izlediği tespit edildi. Yapılan çeşitli çalışmalarda *Demodex* spp.'nin yüzdeki alın, yanak, çene, burun ve nazolabiyal bölgeler başta olmak üzere genital bölgeler, meme, saçlı deri, boyun ve dış kulak yolu gibi vücudun çeşitli kısımlarına da yerleşebileceği, ancak enfestasyonun en fazla yüz bölgesinde, yanakta olduğu bildirilmiştir (Erbağcı vd., 1998, Zhao vd., 2009, Durmaz vd., 2015, Demirdağ vd., 2016; Tilki vd., 2017b; Zeytun 2017; Zeytun vd., 2017). Bu durum yanak bölgesinin daha fazla sayıda kıl folikülüne sahip olması, ayrıca sebase bezlerinin ve dolayısı ile sebum miktarının yanak bölgesinde daha yoğun olmasıyla ilgili olabilir.

Sadece göz kapakları değerlendirildiğinde, silindirik dandrufflu hastalardaki *Demodex* yogunluğunun (ortalama *Demodex* 8,20) kontrollere (ortalama *Demodex* 3,91) oranla yaklaşık 2 kat daha fazla olduğu, ayrıca DD'li hastalarda (ortalama *Demodex* 10,92), SD'li hastalara (ortalama *Demodex* 2,15) oranla yaklaşık 5 kat daha fazla olduğu belirlendi. Göz kapakları; burun, yanak ve kaş gibi vücut

Tablo 11. Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. pozitifliği arasındaki ilişki

	***Demodex* spp. Pozitifliği**		
	Hastalar	**Kontroller**	**p [a]**
Yaş (yıl)			
13 – 20	2/3 (%66,7)	8/14 (%57,1)	0,002
21 – 40	14/17 (%82,3)	57/70 (%81,4)	
41 – 60	63/68 (%92,7)	16/22 (%72,7)	
60 +	90/98 (%91,8)	71/77 (%92,2)	
Cinsiyet			
Kadın	97/110 (%88,2)	78/96 (%81,3)	> 0,05
Erkek	72/76 (%94,7)	74/87 (%85,1)	
Medeni Durum			
Bekar	17/22 (%77,3)	53/73 (%72,6)	< 0,001
Evli	152/164 (%92,7)	99/110 (%90,0)	
Öğrenim Durumu			
Okur-Yazar Değil	50/55 (%90,9)	12/3 (%92,3)	> 0,05
İlk / Orta Okul	92/102 (%90,2)	53/65 (%81,5)	
Lise	17/18 (%94,4)	52/62 (%83,9)	
Önlisans / Lisans	9/10 (%90,0)	29/36 (%80,6)	
Lisansüstü	1/1 (%100)	6/7 (%85,7)	

a: Ki-kare testi

çıkıntıları tarafından çevrelendiği için günlük yüz temizliği ve hijyeninin daha az ulaşabildiği bölgelerdir. Bu nedenle göz kapaklarının *Demodex* enfestasyonuna açık olduğu söylenebilir (Lacey vd., 2009; Liu vd., 2010a).

Günümüze kadar yapılan birçok çalışmada *D. folliculorum*'un anterior blefarit'e, *D. brevis*'in ise posterior blefarite neden olduğu bildirilmiştir (Lacey vd., 2009; Liu vd., 2010a; Cheng vd., 2015). *D. folliculorum* kirpik foliküllerinde birikmesinin foliküllerde tıkanıklık ve gerginlik oluşturduğu ve kirpiklerin deformasyonuna yol açtığı belirtilmektedir. Buna ek olarak, *D. folliculorum*'un kirpik diplerinde yaptığı mikro aşınmalar, epitelyal hiperplazi ve reaktif hiperkeratinizasyona neden olmakta ve sonuçta *D. folliculorum* enfestasyonu için patognomonik olarak kabul edilen silindirik kepek oluşumuna yol açmaktadır (Gao vd., 2005a; Lacey vd., 2009, Liu vd., 2010a; Luo vd., 2017). Ayrıca *D. brevis*'in, meibomian bezlerin açıklığını bloke ederek lipid sekresyonunu önlediği ve bunun disfonksiyona neden olduğu bildirilmiştir (Lacey vd., 2009, Liu vd., 2010a, Cheng vd., 2015, Liang vd., 2017). Bu nedenle, *Demodex* akarlar ile ilgili yapılacak epidemiyolojik çalışmalarda, *D. folliculorum* ve *D. brevis* yaygınlığı ve yoğunluğunun ayrı ayrı belirlenmesi, hastalık patogenezinin daha iyi anlaşılabilmesine ve klinik tablonun daha iyi değerlendirilmesine olanak sağlayabilecektir.

Göz hastalıkları uzmanlarının klinikte sıklıkla karşılaştığı kronik blefarit gözlerde kaşıntı, kızarıklık, yabancı cisim hissi, yanma, sulanma, çapaklanma ve fotofobi gibi semptomlarla karakterizedir. Bazı araştırmacılar tarafından blefaritteki en yaygın semptomların kaşıntı, kızarıklık ve yabancı cisim hissi (batma) olduğu bildirilmiştir (Kheirkhah vd., 2007; de Venecia ve Siong 2011; Wesolowska vd., 2014). Bununla birlikte çeşitli çalışmalarda oküler semptomlarla Demodex akarlar arasındaki ilişki araştırılmıştır. İnceboz vd. (2009) blefaritli hastalarda Demodex akarların kaşıntı ve kızarıklığı tetiklediğini bildirmiştir. Başka bir çalışmada Demodex pozitif blefaritli hastaların en fazla yabancı cisim hissi, kaşıntı ve yanmadan şikayetçi oldukları bildirilmiştir (Alver vd., 2017). Kabataş vd. (2017) tarafından yapılan çalışmada Demodex pozitif blefaritli hastalardaki en yaygın semptomun kaşıntı olduğu ve bunu sırası ile yabancı cisim hissi, kızarıklık, yanma ve sulanmanın takip ettiği rapor edilmiştir. Bu çalışmada ise SD'li hastaların kaşıntı, kızarıklık, sulanma, batma, yanma ve çapaklanma gibi oküler semptomlardan ya şikâyetçi olmadığı ya da hafif derecede şikâyetçi olduğu, ancak DD'li hastaların aynı semptomlardan orta veya şiddetli derecede şikayetçi olduğu belirlendi. Ayrıca ortalama oküler semptom skorlarına bakıldığında, DD'li hastaların en fazla batma ve kaşıntıdan şikayetçi olduğu ve bunu kızarıklık, çapaklanma, yanma ve sulanmanın takip ettiği; SD'li hastalarda ise ortalama oküler semptom skorlarının hemen hemen aynı olduğu tespit edildi. Ayrıca ortalama *Demodex* yoğunluğunun oküler şikâyetleri olan DD'li hastalarda SD'li hastalardan yaklaşık 5 kat daha fazla olduğu tespit edildi. Çalışmamızda bu yönde elde edilen bulgular silindirik dandrufflu hastalarda oküler semptomlar ile *Demodex* spp. yoğunluğu arasında pozitif

Tablo 12. Hasta ve kontrollerin demografik özellikleri ile *Demodex* spp. yoğunluğu arasındaki ilişki

	***Demodex* spp. Yoğunluğu [a]** **Ortalama (min – mak)**		
	Hastalar	**Kontroller**	**p**
Yaş (yıl)			
13 – 20	4,50 (1 – 8)	5,50 (1 – 16)	0,001 [b]
21 – 40	20,43 (2 – 86)	15,02 (1 – 105)	
41 – 60	31,41 (1 – 300)	40,56 (1 – 328)	
60 +	46,81 (1 – 646)	24,97 (1 – 187)	
Cinsiyet			
Kadın	33,02 (1 – 517)	21,62 (1 – 328)	> 0,05 [c]
Erkek	45,61 (1 – 646)	22,11 (1 – 187)	
Medeni Durum			
Bekar	29,41 (1 – 359)	10,64 (1 – 67)	0,001 [c]
Evli	39,39 (1 – 646)	27,86 (1 – 328)	
Öğrenim Durumu			
Okur-Yazar Değil	26,18 (1 – 151)	20,17 (2 – 104)	> 0,05 [b]
İlkokul / Ortaokul	45,13 (1 – 646)	21,85 (1 – 187)	
Lise	46,53 (1 – 300)	24,37 (1 – 328)	
Önlisans / Lisans	25,67 (1 – 86)	12,28 (1 – 45)	
Lisansüstü	4,00 (4 - 4)	49,83 (6 – 141)	

min: Minimum; **mak:** Maksimum
a: Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.
b: Kruskal-Wallis testi
c: Mann-Whitney U testi

bir korelasyon olduğunu göstermektedir. Ancak *Demodex* akarların sağlıklı bireylerde de bulunabilmesi ve hiçbir klinik semptoma neden olmamaları belirsizliğe yol açabilmektedir. Bu konuda birçok araştırmacı *Demodex* akarların delici ağız parçaları ile foliküler ve sebase epitel hücrelerini tahrip ettiği, deri bariyerini bozduğu ve folikül çevresinde lenfosittik infiltrat oluşturduğu, dermise penetre olduğunda akarın kitin iskeletine karşı immün yanıt oluşturulmasına neden olduğunu belirtmiş, immün sistemin baskılanması veya yetersiz olması durumunda (doğuştan veya sonradan) *Demodex* akarların sayıca artabileceğini ve fırsatçı patojen olabileceklerini bildirmiştir (Forton 2012; Forton vd., 2015; Aytekin vd., 2017; Zeytun ve Ölmez 2017). İmmün yanıtın oluşmasında insan lökosit antijenleri (HLA, human leucocyte antigen) haplotipleri, T ve B lenfositler ile doğal öldürücü hücreleri (NK, naturel killer) önemli role sahiptir. Demodikozis (*Demodex* enfestasyonu) ve HLA arasındaki ilişkinin araştırıldığı çalışmalarda, HLA-A2 haplotipinin demodikoziste koruyucu olduğu, bu fenotipe sahip bireylerin demodikozise karşı 3 kat daha fazla dirençli olduğu vurgulanmış, HLA-CW2 ve HLA-CW4 haplotipine sahip bireylerin ise demodikozis gelişmesine 5 kat daha fazla yatkın olduğu, bu bireylerde lenfosit ve NK apopitozundaki (programlı hücre ölümü) artışa bağlı olarak *Demodex* yoğunluğunun arttığı bildirilmiştir (Akilov ve Mumcuoğlu, 2003; Mumcuoğlu ve Akilov, 2005; Aytekin ve Göktay, 2015).

Dolayısı ile çalışmamızda bazı hastaların *Demodex* pozitif olmalarına rağmen asemptomatik olabilmeleri bu bireylerin genetik özellikleri ve sahip oldukları HLA haplotipleri ile ilgili olabilir. Çalışmada katılımcıların cilt biyofiziksel özellikleri dikkate alındığında, *Demodex* yoğunluğunun ortalama nem ve sıcaklık değeri düşük, ortalama pH değeri yüksek olan hasta ve kontrollerde daha fazla olduğu tespit edildi. Yapılan diğer çalışmalar bu çalışmada elde edilen bulguları desteklemektedir (Demirdağ vd., 2016; Tilki vd., 2017a, 2017b; Zeytun, 2017; Zeytun vd., 2017). Epidermisin en dış tabakasını oluşturan ve asidik bir pH'ya sahip olan *stratum corneum* (SC) mikroozganizmaların vücuda girişini engelleyen doğal bir bariyerdir. Ancak nem değerinin düşmesine bağlı olarak ciltte kuruma (kserozis) ve SC tabakasında incelme meydana gelebilmektedir (Raghallaigh vd., 2012). Çalışmada cilt nemi düşük, pH değeri yüksek olan katılımcılarda *Demodex* yoğunluğunun fazla olması SC'nin bariyer fonksiyonun bozulmasıyla ilgili olabilir.

Çalışmada demografik özellikler dikkate alındığında, literatürle uyumlu olarak yaş artışı ile birlikte *Demodex* pozitifliği ve yoğunluğunun arttığı belirlendi (Arıcı vd., 2005,

Tablo 13. Hasta ve kontrollerin kişisel bakım ve hijyen uygulamaları ile *Demodex* spp. pozitifliği arasındaki ilişki

	***Demodex* spp. Pozitifliği**		
	Hastalar	**Kontroller**	**P [a]**
Yüz Yıkama (Günlük)			
1 kez	26/26 (%100)	36/39 (%92,3)	
2 – 4 kez	63/70 (%90,0)	85/101 (%84,2)	0,011
5+	80/90 (%88,9)	31/43 (%72,1)	
Banyo Yapma (Haftalık)			
1 kez	50/52 (%96,2)	29/31 (%93,6)	
2 – 4 kez	99/106 (%93,4)	107/120 (%89,2)	< 0,001
5+	20/29 (%69,0)	16/31 (%51,6)	
Nemlendirici Krem			
Kullanmayan	108/111 (%97,3)	100/108 (%92,6)	< 0,001
Kullanan	61/75 (%81,3)	52/75 (%69,3)	
Kişisel Havlu			
Kullanmayan	104/108 (%96,3)	93/100 (%93,0)	< 0,001
Kullanan	65/77 (%84,4)	59/84 (%70,2)	
Sigara			
İçmeyen	99/114 (%86,8)	96/116 (%82,8)	0,027
İçen	70/72 (%97,2)	56/57 (%83,6)	

a: Ki-kare testi

İnceboz vd., 2009; de Venecia ve Siong, 2011; Aycan Kaya vd., 2012; Altınkurt vd., 2017; Kasetsuwan vd., 2017; Lopez-Ponce vd., 2017; Tilki vd., 2017b; Zeytun, 2017; Zeytun ve Ölmez, 2017; Zeytun vd., 2017). Bu durum yaşlıların genç bireylere göre daha zayıf bir bağışıklık sistemine sahip olmaları, sebum miktarının yaşla birlikte artması ve cilt onarımının yaşlı bireylerde zayıflaması ile açıklanabilir. Bununla birlikte, *Demodex* pozitifliği ve yoğunluğunun erkek katılımcılarda daha fazla olduğu tespit edildi. Literatürde *Demodex* pozitifliği ve yoğunluğunun erkeklerde daha fazla (Okyay vd., 2006, Durmaz vd., 2015, Tilki vd., 2017b; Zeytun vd., 2017), kadınlarda daha fazla (Özdemir vd., 2005, Aycan vd., 2007; Zeytun, 2017; Zeytun ve Ölmez, 2017) veya kadın ve erkeklerde eşit olduğunu bildiren çeşitli çalışmalar mevcuttur (Hana vd., 2004; Zhao vd., 2011). Ayrıca *Demodex* pozitifliği ve yoğunluğunun evli olan katılımcılarda daha fazla olduğu belirlendi. Bu durum, evli olanların daha ileri yaşlara sahip olmaları ile ilgili olabileceği düşünülmektedir.

Katılımcıların kişisel bakım ve hijyenik uygulamaları dikkate alındığında, günlük yüz yıkama ve haftalık banyo yapma sıklığının artması ile *Demodex* pozitifliği ve yoğunluğunun düştüğü belirlendi. Ayrıca nemlendirici krem kullanan, kişisel havlu kullanmayı tercih eden ve sigara kullanmayan katılımcılarda *Demodex* pozitifliği ve yoğunluğunun daha düşük olduğu tespit edildi. Bu konuda birçok araştırmacı kişisel bakım ve hijyenik uygulamaların *Demodex* enfastasyonu için önemli bir risk faktörü olduğunu belirtmiştir (Okyay vd., 2006; Zhao vd., 2011; Zeytun, 2017; Zeytun vd., 2017).

Sonuç

Erzincan'daki oküler dandrufflu hastalarda *Demodex* spp.'nin çok yaygın ve yoğun olduğu tespit edilmiştir. Silindirik dandrufflu hastalardan DD'li olanların SD'li olanlardan daha fazla *Demodex* akarlar ile enfeste olduğu, ayrıca DD'li hastalarda en yaygın oküler şikayetlerin kaşıntı ve yabancı cisim olduğu belirlenmiştir. Çalışmada elde edilen bulguların oküler dandrufflu ve blefaritli hastaların klinik değerlendirme sürecinde göz önünde bulundurulması yararlı olacaktır.

Demodex akarların özellikle blefarit, akne, rozase gibi dermatolojik ve oküler hastalıklardaki rolünün yanı sıra *Demodex* kontrolü sağlamaya yönelik kullanılan medikasyonlarla ilişkisinden, günümüzün önemli hastalıklarıyla olan bağlantılarına kadar çok çeşitli alanlarda çalışmalar yapıldığı, bu çalışmaların çoğunluğunun *Demodex* yaygınlığı ve yoğunluğunu belirlemeye yönelik epidemiyolojik çalışmalar olduğu anlaşılmaktadır. Ancak, bu çalışmalarda kirpik örneklemesi için aynı yöntem (epilasyon yöntemi) kullanılmış olsa da hangi göz kapaklarından (sağ göz, sol göz, alt kapak, üst kapak), hangi kirpiklerden (dandrufflu kirpik, sağlıklı kirpik veya rastgele) ve kaçar tane (ikişer, üçer, dörder tane gibi) alınacağına yönelik belirli bir standart kullanılmamıştır. Dolayısı ile çalışmalar arasındaki örneklem farklılıkları *Demodex* yaygınlığı ve yoğunluğu ile ilgili farklı sonuçların elde edilmesine yol açmış

Tablo 14. Hasta ve kontrollerin kişisel bakım ve hijyen uygulamaları ile *Demodex* spp. yoğunluğu arasındaki ilişki

	***Demodex* spp. Yoğunluğu** [a] **Ortalama (min – mak)**		
	Hastalar	**Kontroller**	**p**
Yüz Yıkama (Günlük)			
1 kez	112,73 (6 – 646)	45,44 (3 – 328)	
2 – 4 kez	39,52 (2 – 359)	18,16 (1 – 118)	< 0,001 [b]
5+	13,33 (1 – 51)	4,58 (1 – 9)	
Banyo Yapma (Haftalık)			
1 kez	77,14 (2 – 646)	46,52 (2 – 328)	
2 – 4 kez	24,35 (1 – 359)	17,93 (1 – 105)	< 0,001 [b]
5+	10,95 (1 – 37)	3,38 (1 – 19)	
Nemlendirici Krem			
Kullanmayan	47,42 (1 – 646)	26,69 (1 – 328)	< 0,001 [c]
Kullanan	22,39 (1 – 218)	12,56 (1 – 105)	
Kişisel Havlu			
Kullanmayan	51,29 (1 – 646)	25,88 (1 – 328)	0,006 [c]
Kullanan	17,74 (1 – 112)	15,51 (1 – 141)	
Sigara			
İçmeyen	27,37 (1 – 517)	15,23 (1 – 118)	0,008 [c]
İçen	53,96 (1 – 646)	33,21 (1 – 328)	

min: Minimum; **mak:** Maksimum
a: Sadece *Demodex* pozitif olan katılımcılar hesaplamaya katılmıştır.
b: Kruskal-Wallis testi
c: Mann-Whitney U testi

olabilir. Hâlbuki epidemiyolojik çalışmalarda örneklem alanının geniş tutulması *Demodex* yaygınlığı ve yoğunluğunun daha doğru tahmin edilebilmesine olanak sağlayabilecektir. Bununla birlikte yapılan çalışmaların çoğunluğunda *Demodex* türlerinin yaygınlığı ve yoğunluğu ayrı ayrı belirlenmemiş, parazit ya *Demodex* spp. olarak adlandırılmış ya da sadece *D. folliculorum* üzerinde durulmuştur.

Öneriler

Bu çalışmada elde edilen veriler, bir sonraki aşama olarak öngörülen tedavi kısmı ile desteklenilip değerlendirilebilir. Yine tedavi aşamasında katılımcıların cilt biyofiziksel özellikleri, kişisel bakım ve hijyen uygulamaları takip edilebilir. Yapılan literatür araştırmalarında görüldüğü üzere, tedavi çalışmalarında Çay ağacı yağının (TTO) 4-6 haftalık süreçte uygulanması ile *Demodex* oranında düşüş olsa da enfestasyonun tamamen ortadan kalkmadığı anlaşılmaktadır. Bu nedenle, tedavi sürecindeki Çay ağacı yağının yalın etkisinin yanında, kişisel bakım ve hijyen uygulamaları da takip edilerek, *Demodex* ile enfestasyon sürecine etkisi olup olmadığı ya da yeniden enfestasyon nüksedip etmediği, ediyorsa ne kadar sürede gerçekleştiği araştırılabilir.

Katılımcılar kısa, orta ve uzun vadede takibe alınarak, *Demodex*'in rolü ve etkileri daha detaylı belirlenebilir. Ayrıca tedavi aşamasında katılımcıların en yaygın oküler şikâyetlerden olan kaşıntı ve yabancı cisim hissinde değişim durumu takip edilebilir ve *Demodex* enfestasyonunun ortadan kalktığı durumlarda şikâyetlerinde doğru orantılı olarak azalıp azalmadığı gözlemlenebilir.

Bu çalışma, *Demodex* akarların oküler dandruffla olan ilişkisi üzerinedir. Yapılabilecek çalışmalar arasına *Demodex* akarların dâhili ve harici rahatsızlıklardaki rolünü konu edinen araştırmalar eklenebilir. Bu akarlarla doğrudan ya da dolaylı ilişkisi olan rahatsızlıklar üzerine çalışmalar yapılabilir.

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Acarological Studies
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SHORT NOTE

Two new records of the genus *Hydryphantes* (Acari: Hydrachnidia) for the Turkish Fauna

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ABSTRACT: Two species of the genus *Hydryphantes* Koch, 1841 collected from Bayburt and Bingöl Provinces, *Hydryphantes* (s.str.) *armentarius* Gerecke, 1996 and *H.* (s.str.) *fontinalis* Sokolow, 1936 are given as new records for the Turkish fauna.

Keywords: *Hydryphantes*, new record, Turkey, water mite.

The family Hydryphantidae Piersig, 1896 is a large and morphologically diverse group of water mites, with 329 species in 51 genera worldwide (Zhang et al., 2011). The family Hydryphantidae is represented with 38 species in 12 genera from Turkey (Erman et al., 2007, 2010; Özkan et al., 1988, 1994). Adults of the genus *Hydryphantes* live in a wide variety of habitats i.e. primarily in vernal temporary pools, permanent stagnant waters, lakes, pools of streams and riffles of cold streams (Smith, 2010; Di Sabatino et al., 2010).

Only 10 species of the genus *Hydryphantes* from Turkey are known: *Hydryphantes* (*Polyhydryphantes*) *flexuosus* (Koenike, 1895), *H.* (*Polyhydryphantes*) *karsensis* Aşçı and Özkan, 2001, *H.* (*Polyhydryphantes*) *octoporus* (Koenike, 1896), *H.* (s.str.) *baderi* Özkan, 1982, *H.* (s.str.) *crassipalpis* Koenike, 1914, *H.* (s.str.) *dispar* (Schaub, 1888), *H.* (s.str.) *parmulatus* Koenike, 1912, *H.* (s.str.) *ruber* (De Geer, 1778), *H.* (s.str.) *tenuipalpis* (Thon, 1899) and *H.* (s.str.) *yalvaci* Özkan, 1982 (Özkan, 1982; Erman et al., 2007, 2010; Boyacı and Gülle, 2014).
During a survey of the freshwater mite fauna of Bingöl and Bayburt Provinces of Turkey, some specimens of the Hydryphantidae, including two species new for the fauna of Turkey, were collected from the riffles of cold streams. With the two additional species, *Hydryphantes* (s.str.) *armentarius* Gerecke, 1996 and *H.* (s.str.) *fontinalis* Sokolow, 1936, totally 12 species have been reported from Turkey. This paper aims to describe this material and contribute to our knowledge of hydryphantid water mite distribution in Turkey.

During field work, water mites were collected by hand netting, sorted on the spot from the living material, conserved in Koenike's fluid, and dissected as described in literature (Gerecke et al., 2007).

The composition of the material is given as (males/females). All measurements are given in micrometers. The following abbreviations are used: dL = dorsal length; vL = ventral length; H = height; I-L-6 = leg 1, sixth segment (tarsus); L=length; P-3= palp segment 3; a.s.l. = above sea level; W=width.

Family: Hydryphantidae Piersig, 1896

Genus: *Hydryphantes* Koch, 1841

Hydryphantes (s.str.) *armentarius* Gerecke, 1996

Figure 1A-E

Material Examined: Bayburt Province, Kop Mountain, low-order streams, 40°02'19" N, 40°29'15" E, 2345 m a.s.l., 05.07.2017, (0/2). Bingöl Province, Solhan district, Şerafettin Mountains, low-order streams, 39°05'13" N, 40°57'48" E, 2430 m a.s.l., 18.08.2016, (0/4).

Female

Idiosoma L/W 1200/970; dorsal shield anterior margin slightly convex, posterior extentions short and stout, L/W 310/278 (Figs. 1A, B), gnathosoma vL 277, H 70, chelicera total L 293, cheliceral claw short and slightly curved (Fig. 1D), L 103; palp slender, P-1 and P-3 as long as high (Fig. 1C), total L 443, P-1-5 dL/H 60/62-110/76-62/70-175/48-36/20; P-4 L/H 3.6; genital field L/W 246/224.

Numbers of leg swimming setae: III-L-5, 1; IV-L-4, 2; IV-L-5, 2 (Fig. 1E). Legs dL I-L: 82-70-126-175-184-203 = 840, II-L: 98-90-142-211-238-250 = 1029, III-L: 112-98-140-223-248-282 = 1103, IV-L: 209-141-200-310-308-291 = 1459.

Distribution: Bosnia and Herzegovina, Bulgaria, Corsica, Greece, Italy, Macedonia and (Di Sabatino et al., 2009, 2010; Lyubomirova, 2017), Turkey (this study).

Hydryphantes (s.str.) *fontinalis* Sokolow, 1936

Figure 2A-E

Material Examined: Bingöl Province, Solhan district, Şerafettin Mountains, low-order streams, 39°05'13" N, 40°57'48" E, 2430 m a.s.l., 18.08.2016, (0/1).

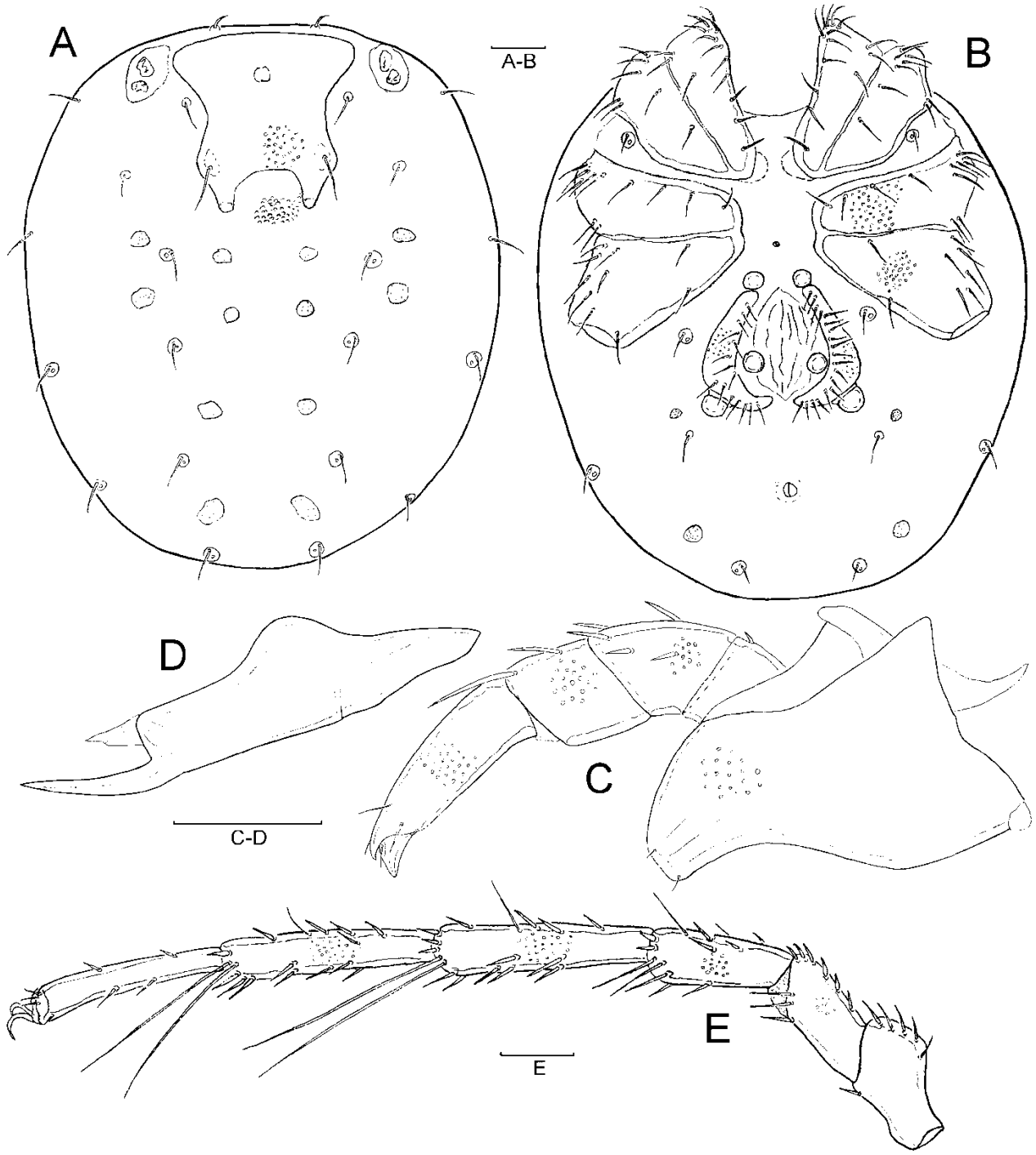

Figure 1. *Hydryphantes* (s.str.) *armentarius* (Female) – A) Idiosoma, dorsal view, B) Idiosoma, ventral view, C) Gnathosoma and palp, D) Chelicera, E = IV-L (Scale bars = 100 µm).

Female

Idiosoma L/W 1174/998, dorsal shield anterior margin convex, posterior extension short and stout, L/W 375/380 (Figs. 2A, B). Ventral margin of gnathosoma weakly curved, rostrum not distinctly set off, mouth opening small, vL 298. Palp total L 486, P-1-5 dL/H 90/77-126/85-70/89-160/51-40/26 (Fig. 2C). Chelicera claw fine, long and straight (Fig. 2D), total L 490, claw L 238, H 91 (basal segment/claw ratio 1.06); genital field L/W 276/300.

Numbers of leg swimming setae: II-L-5, 5; III-L-4, 4; III-L-5, 7; IV-L-4, 3; IV-L-5, 5 (Fig. 2E). Legs dL I-L: 97-92-140-219-260-304 = 1112, II-L: 113-110-160-266-318-346 = 1313, III-L: 120-118-162-275-330-351 = 1356, IV-L: 235-160-213-351-380-356 = 1685.

Distribution: NE Russia, Italian Alps (Di Sabatino et al., 2010). New record for the Turkish fauna.

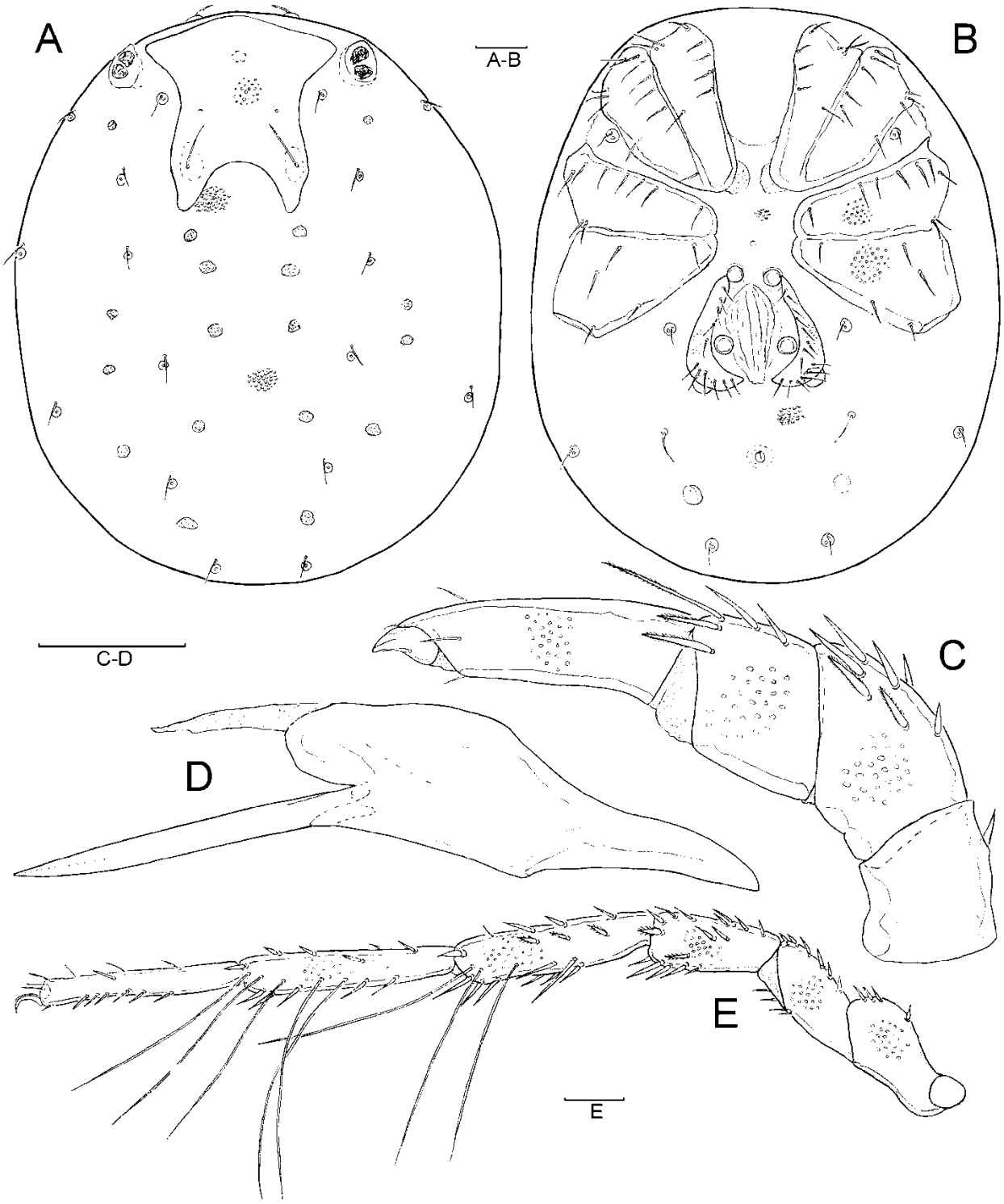

Figure 2. *Hydryphantes* (s.str.) *fontinalis* (Female) – A) Idiosoma, dorsal view, B) Idiosoma, ventral view, C) Palp, medial view, D) Chelicera, E) IV-L (Scale bars = 100 µm).

The specimens collected from Bayburt and Bingöl Provinces of Turkey, agree with *Hydryphantes* (s.str.) *armentarius* Gerecke, 1996 by the presence of a rather slender palp, reduced swimming setae, slightly convex anterior margin, short posterior extensions, short and curved cheliceral claw. Similar species *H.* (s.str.) *baderi* Özkan, 1982 and *H.* (s.str.) *yalvaci* Özkan, 1982 differs from *Hydryphantes* (s.str.) *armentarius* by having reduced swimming setae and characteristic blade-like claw (Özkan, 1982; Di Sabatino et al., 2010).

The other firstly recorded species *H.* (s.str.) *fontinalis* Sokolow, 1936 can be easly distinguished from *H*. (s.str.) *baderi* by the presence of a shorter blade-like cheliceral claw and a few more swimming seta numbers (in *H. baderi* basal segment/claw ratio 0.8, swimming seta numbers IV-L-3, 1; IV-L-4, 3; IV-L-5, 6). *H*. (s.str.) *yalvaci* Özkan, 1982 differs from *H.* (s.str.) *fontinalis* in complete reduction of swimming setae (Di Sabatino et al., 2010). One female specimen collected from Bingol province completely agrees with *H*. (s.str.) *fontinalis,* a species known

from Russia and Italy, due to the blade-like cheliceral claw and reduced swimming setae.

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SHORT NOTE

New occurrence of the mite genus *Columbicheyla* Thewke and Enns (Acari, Cheyletidae) in Turkey

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ABSTRACT: The genus *Columbicheyla* Thewke and Enns included the family Cheyletidae is characterized by presence of propodosomal and hysterosomal shields on idiosoma, presence of eyes, dorsolateral and humeral setae fan-like, dorsocentral setae squamate, palp tarsus with two comb-like setae and one sickle-like seta, palp claw edentate, all legs with claws. The genus comprises two species *viz. Columbicheyla bicirci* Lin and Zhang and *C. macroflabellata* Thewke and Enns. Here we present the new record of *Columbicheyla macroflabellata* for the fauna of Turkey. This is the first occurrence of the genus *Columbicheyla* from Turkey.

Keywords: *Columbicheyla*, fauna, mite, new record, predator.

Members of the family Cheyletidae are mainly free-living predators, and have a worldwide distribution, comprising about 500 described species in 77 genera (Fuangarworn and Lekprayoon, 2010; Zhang et al., 2011; Doğan et al., 2011). By now, three species have been described in the genus *viz. Columbicheyla bicirci* Lin and Zhang, *C. macroflabellata* Thewke and Enns and *C. nindota* (Corpuz-Raros). *C. nindota* was considered as synonym of *C. macroflabellata* by Fain and Bochkov (2001). The genus *Columbicheyla* Thewke and Enns was not represented in Turkey, and this paper reports the presence of this genus in Turkey with *C. macroflabellata*, based on the specimens collected from moss and soil.

The specimens were extracted in Berlese funnels from moss and soil samples collected from Çıkrıkdüzü highland and Zigana gate, Gümüşhane, and from Pülümür Valley, Tunceli. Mites were mounted on microscope slides in Hoyer's medium using the standard method (Walter and Krantz, 2009). Measurements were given in micrometers (µm) by using Leica Application Suite (LAS) Software Version 3.8. Mean values were given first and the range is given parenthetically. Specimens examined were deposited in the collection of the Acarology Laboratory of Erzincan Binali Yıldırım University, Turkey. The terminology used was based on Kethley (1990).

Columbicheyla macroflabellata Thewke and Enns, 1972

Female (n=3)

Body ovoid, length (excluding gnathosoma) 212 (201-225), width 173 (168-183).

Dorsum (Figs 1-2) – Covered by two large shields. Dorsal body setae heteromorphic, laterals fanlike, medians kidney-shaped. Propodosomal shield with faint punctuations, trapezoidal, 87 (85-92) long and 145 (142-151) width, and with four pairs of lateral and one pair of median setae. One pair of eyes on antero-lateral side on the shield. Humeral setae situated laterally, and similar to lateral setae on the shields. Length of hysterosomal shield 108 (104-110), width 152 (147-160) µm, with faint punctuations and with six pairs of lateral and two pairs of median setae. Hysterosomal medians and laterals in the same shape as the propodosomal medians and laterals. Lengths and distances of dorsal setae as follows: *vi* 23 (22-23), *ve* 18 (16-19), *sci* 15 (15-16), *sce* 14 (13-15), c_2 22 (20-25), d_2 14 (13-15), e_2 14 (14-16), f_2 14 (14-16), h_1 8 (7-8), h_2 12 (11-13), h_3 13 (11-14), *vi-vi* 45 (42-47), *ve-ve* 77 (75-79), *vi-ve* 13 (11-15), *sci-sci* 98 (96-100), *ve-sci* 14 (14-15), *sce-sce* 117 (117-118), *sci-sce* 17 (15-19), c_2-c_2 155 (143-167), d_2-d_2 127 (124-130), e_2-e_2 109 (106-112), d_2-e_2 26 (24-27), f_2-f_2 85 (81-87), h_1-h_1 13 (10-16), h_2-h_2 41 (34-53), h_1-h_2 14 (10-17), h_3-h_3 66 (60-75).

Venter – Venter finely striate; intercoxal setae *1a, 3a, 4a* and *4c* short. Ano-genital region with two pairs of aggenital ($ag_{1,2}$), two pairs of genital ($g_{1,2}$) and three pairs pseudanal (ps_{1-3}) setae; ps_1 fanlike others setaceous. Lengths and distance of these setae: *1a* 5 (3-7), *3a* 4 (3-6), *4a* 5 (3-8), *1a-1a* 14 (11-16), *3a-3a* 21 (14-27), *4a-4a* 32 (31-32).

Legs – Leg I 134 (127-138), leg II 94 (92-97), leg III 109 (99-117), leg IV 116 (110-121). Chaetotaxy of leg segments as follows: coxae 2–1–2–2, trochanters 1–1–2–1, femora 2–2–2–1, genua 2–2–2–2, tibiae 5–4–4–4, tarsi 8(+1 ω)–7–7–7.

Gnathosoma – Length of gnathosoma 63 (61-64), width 57 (56-58). Rostrum conical, with two pairs of adoral setae ($or_{1,2}$). Protegmen emarginated, dorsal surface punctuated as tegmen. Peritremes with five segments on each side. Dimension and distance between subcapitular setae, *n* 8 (7-9), *n–n* 11(10-11). Palps short and thick. Palp tarsus

with two comb-like setae and one sickle-like seta. Palp claws edentate. Palp tibiae with one board fan-like dorsal seta and one board fan-like ventral seta near outer edge of segment. Palp genu with one board, fan-like dorsal seta near outer edge of the segment. Palp femur with one board fan-like dorsal seta near outer edge of segment.

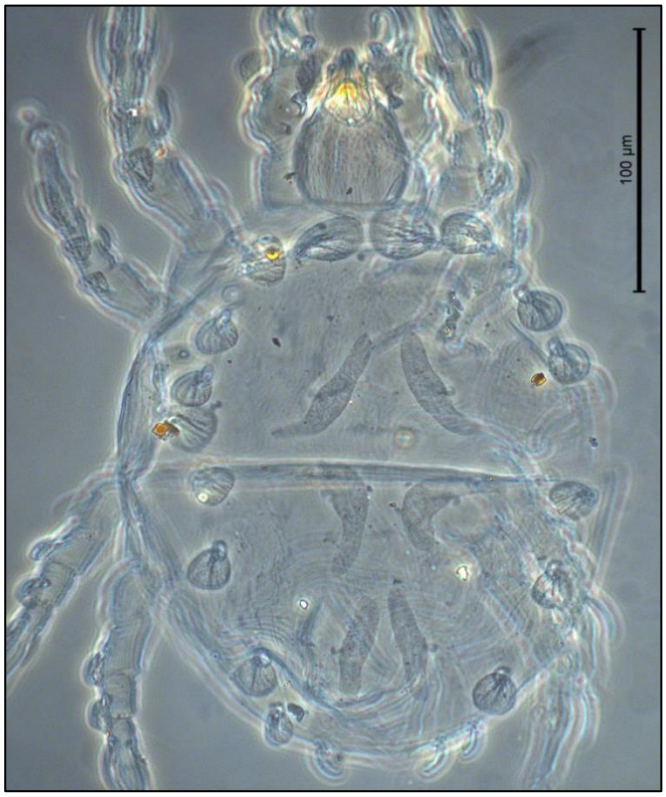

Figure 1. Phase-contrast micrograph of *Columbicheyla macroflabellata* (Female) – General view dorsally

Material examined

One female from soil under stone, Zigana gate, Gümüşhane, TURKEY, 40°38'17"N 39°22'04"E, 2050 m a.s.l., 6 October 2013; one female from moss, Çıkrıkdüzü highland, Gümüşhane, TURKEY, 40°39'58"N 38°59'52''E, 1994 m a.s.l., 12 October 2013; one female from soil from molehill, near to Seyithan Bridge, Pülümür Valley, Tunceli, TURKEY, 39°11'26.5''N 39°42'19.0''E, 988 m a.s.l., 11 November 2018, coll. S. Doğan.

This species was only known in China, Malaysia, the Philippines and USA (Thewke and Enns, 1972; Corpuz-Raros, 1988, 1998; Lin and Zhang, 1997, 2000; Fain and Bochkov, 2001; Xia, 2010). This rarely collected species has not been previously reported from Turkey, but now it is also part of the mite fauna of Turkey. This discrete distribution of the uncommon species cannot be explained by no performing much works on this group.

Columbicheyla macroflabellata was collected from Chinese calabrian pine bark, Chinese sweetgum bark, hickory bark and leaf litter (Thewke & Enns, 1972; Corpuz-Raros, 1988, 1998; Lin and Zhang, 1997). The Turkish specimens were found in soil and moss. This shows that habitat preference of the species is wide.

Thewke and Enns (1972) stated two setae on femur IV whereas Lin and Zhang (1997) and Corpuz-Raros (1988, 1998) mentioned one seta on femur IV. In the Turkish specimens femur IV bears one seta, and they resemble the other specimens of this species in the other features.

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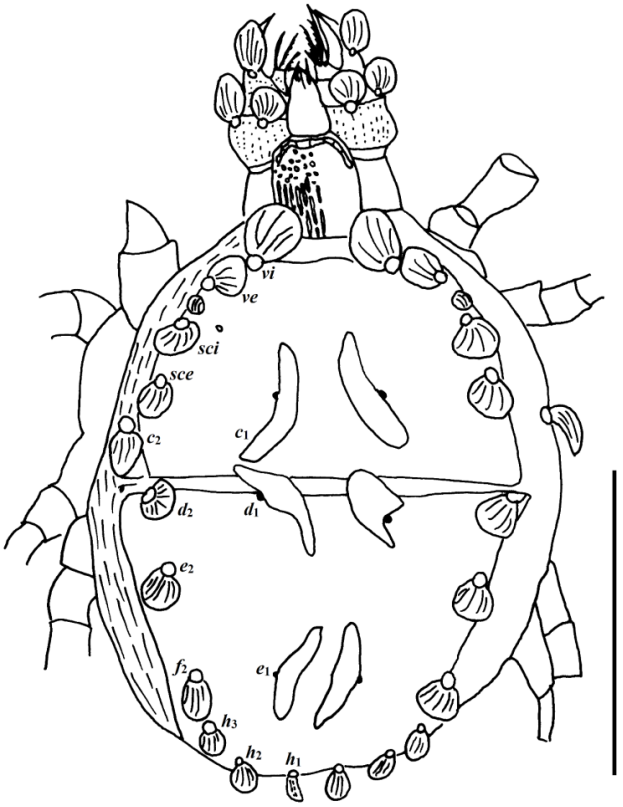

Figure 2. *Columbicheyla macroflabellata* (Female) – Dorsum. Scale 100 µm

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