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RESEARCH ARTICLE

Occurrence of *Ophionyssus natricis* (Acari: Macronyssidae) on the captive corn snake, *Pantherophis guttatus*, (Squamata: Colubridae) in Turkey

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ABSTRACT: Exotic snakes may harbour numerous parasites and play an important role in the spreading of parasites. *Ophionyssus natricis* (Gervais) (Acari: Macronyssidae) has been found in natural conditions on a wide variety of snakes in Africa, but this mite has been distributed by exotic pet trade in various parts of the world. In the present study, *O. natricis* was reported on the captive corn snake, *Pantherophis guttatus* (L.) (Squamata: Colubridae), in Turkey, for the first time. Male and protonymph stage of *O. natricis* were also first time reported in Turkey. In addition, some setal variations in the pygidial shield of protonymphs were documented.

Keywords: Infestation, parasitic mites, pest animal, Reptilia.
Zoobank: http://zoobank.org/CC0C89B0-3B83-4FA1-A373-79519ED9CE66

INTRODUCTION

Both legal and illegal trade of numerous exotic species is constantly increasing throughout the world. This can be a serious global problem in biodiversity conservation and affecting entire ecosystems out of balance (Petrossian et al., 2016; Setiyani and Ahmadi, 2020). Also, the trade of exotic pets is responsible for the invasion of non-native species that are harming native species and ecosystems around the world. Reptiles have a big percentage in the exotic pet trade and over 35% of reptile species are traded on numerous online platforms (Marshall et al., 2020). Exotic snakes may harbor numerous ecto- and endoparasite and play an important role in the spreading of parasites (Pérez, 2009; Mendoza-Roldan et al., 2020).

The genus *Ophionyssus* Mégnin (Mesostigmata: Macronyssidae) is represented currently by 17 species in the world (Moraza et al., 2009). One of them, *Ophionyssus natricis* (Gervais) is naturally lizard and snake hosts in Africa (Till, 1957; Evans and Till, 1966), but it has been distributed by pet trade in various parts of the world (Miranda et al. 2017; Norval et al., 2020). Individual herpetocultures, especially, have a big risk due to the ability to spread fast of this mite from a single infested animal to others.

Ophionyssus natricis can cause several disorders like anemia, dehydration, and dermatitis (Wozniak and DeNardo, 2000). Several blood-borne infectious diseases in reptiles have been related to this mite and it is a mechanical vector of *Aeromonas hydrophila*, the causative agent of hemorrhagic disease in reptiles (Mitchell, 2007; Mendoza-Roldan et al., 2020). In addition, the presence of *Anaplasma* sp. and *Rickettsia* sp. in *O. natricis* has been documented (Reeves et al., 2006; Mendoza-Roldan et al., 2021). This mesostigmatid mite may also accidentally infest humans and even also can cause severe mite-associated dermatitis (Schultz, 1975; Amanatfard et al., 2014).

In this study, the presence of *O. natricis* on the captive corn snake, *Pantherophis guttatus* (L.), additionally male and protonymph stage of *O. natricis* were first time reported in Turkey. Besides, setal variations in the pygidial shield of protonymphs were documented.

MATERIALS AND METHODS

Mites were collected from the body surface of a captive corn snake by its owner in Tokat province and sent to the Parasitology Laboratory, Department of Biology, Tokat Gaziosmanpaşa University, Tokat, Turkey for species identification. Mites were cleared in 70% lactic acid and mounted on microscopic slides in the Hoyer medium. Mites were examined and photographed with microscopes (Olympus CX41, Leica DM4000), and they were identified based on keys and descriptions given by Evans and Till (1966) and Moraza et al. (2009). All specimens were deposited in the Parasitological Collection of the Parasitology Laboratory, Department of Biology, Tokat Gaziosmanpaşa University, Tokat, Turkey.

RESULTS

A total of 134 mite specimens were collected from a captive female corn snake (Fig. 1). All mites were identified as *O. natricis* (115 females 1 male and 18 protonymphs). The female of *O. natricis* can be separated by the following combination of characters: (1) dorsal shield divided into a large anterior and minute pygidial shields (Fig. 2A), (2) podonotal shield with 10 pairs of setae, (3) two pairs of minute mesonotal scutellae, (4) pygidial shield without setae, (5) sternal shield ratio width/length: 2.5 (Fig. 2B), (6) anal shield pear-shaped with three setae (Fig. 2C), (7) peritreme extending to posterior margin of coxa II (Fig. 2D), (8) tritosternum with hyaline membrane; laciniae two times nearly longer than the base (Fig. 2E). The male of *O. natricis* can be separated by the following combination of characters: (1) holoventral shield absent, (2) ventral spur on femur III absent, (3) sternogenital shield with

Figure 1. The corn snake, *Pantherophis guttatus* (L.), female.

2 pairs of setae (*st1*, *st2*), (4) femora III and IV without modified ventral setae, (5) dorsal shield with 17 pairs of setae. Unfortunately, the male specimen could not be photographed because the specimen folded during the mounting process. The protonymph of *O. natricis* can be separated by the following combination of characters: (1) podonotal shield bearing 11 pairs of setae (Fig. 3A); (2) two pairs of minute mesonotal scutellae; (3) pygidial shield with 3 pairs of setae (*J4*, *Z4*, *Z5*) (Fig. 3B), (4) setae *Z5* three times longer than of *J4*, (5) setae *Z4* two times longer than of *J4*, (6) setae *z2* on podonotal shield, (7) anal shield pear-shaped with three setae.

DISCUSSION

Acariasis, an infestation of ticks and mites, is a great and nuisance problem for both wild and captive reptiles. When ticks and mites were detected on a snake, these parasites should be promptly eradicated. Several tick species and more than 250 mite species were naturally parasitized on reptiles (Fitzgerald and Vera, 2006; Guglielmone et al., 2014). The ticks can be manually removed from snakes using tweezers or forceps; however, other parasitic mites should be treated with several chemical agents by veterinarians. To remove mites from the reptiles, topical ivermectin (0.2 mg/kg) was recommended three times at two-week intervals (Wozniak and DeNardo, 2000). Permethrin spray (0.5%) was advised to elimination of mites from the cage (Mitchell, 2007). After permethrin application, we recommended that the peat should be changed and the cage should be washed with lukewarm water to remove possible toxic effects of permethrin.

Acariasis cases in both wild and captive reptiles are rarely reported in Turkey. Three tick species (Ixodida, Ixodidae), *Haemaphysalis sulcata* Canestrini and Fanzago, *Hyalomma aegyptium* (L.), *Ixodes ricinus* (L.), infesting some wild reptiles have been only documented in Turkey (Bursali et al., 2012; Keskin et al., 2013), whereas several chigger mite species were reported from some wild reptiles (Kepka, 1962, 1966; Kalúz, 2011; Stekolnikov and Daniel, 2012). In addition, *Hirstiella* sp. (Prostigmata, Pterygosomatidae), was reported from green iguanas (*Iguana iguana* (L.)) in Turkey (Gazyağcı et al., 2011; Altınok-Yipel, 2014).

In the present study, *O. natricis* on the captive corn snake, *P. guttatus,* were reported in Turkey for the first time. In addition, male and protonymph stage of *O. natricis* were first time reported in Turkey. The corn snake, *P. guttatus*, is a non-venomous and unaggressive snake species native to the south-eastern United States. Many of its bites occur when the snake is intentionally molested. The corn snakes are highly adaptive, living in the forest, semi-desert, and grassland habitats, and even populating urban areas. They have also widely different color morphs such as orangish-brown with black-bordered orange, red, or brownish blotches. Therefore, *P. guttatus* is a very popular pet and has been distributed to many parts of the world for the pet trade (Fisher and Csurhes, 2009; Fonseca et al., 2014; McFadden et al., 2017; Alves et al., 2019; Kubiak, 2020).

Ophionyssus natricis is one of the most problematic parasites infested captive snakes and has been reported from numerous native and captive reptiles and lizards in many countries of the world (Yunker, 1956; Till, 1957; Miranda et al., 2017; Norval et al., 2020). However, we have

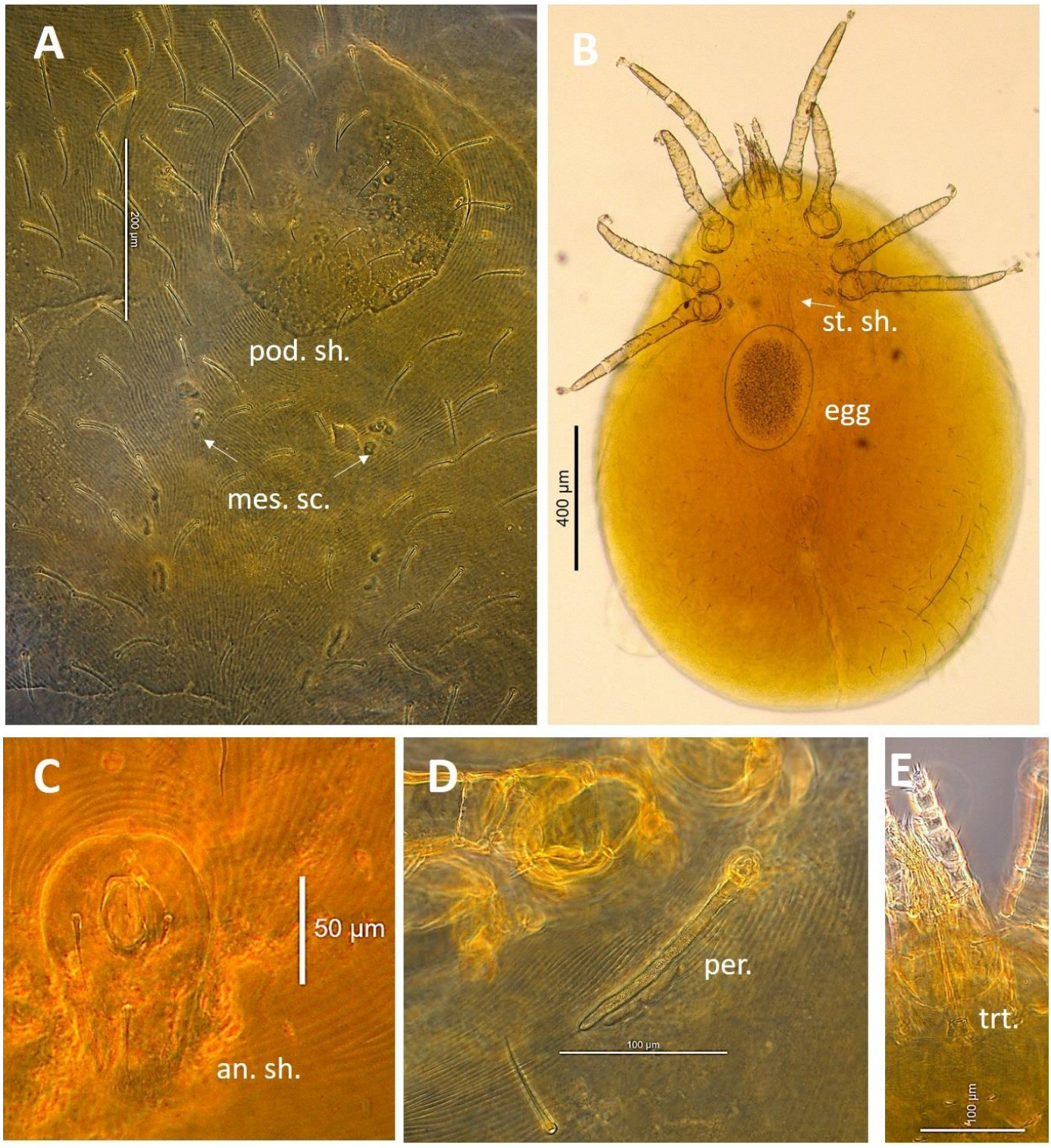

Figure 2. *Ophionyssus natricis* (female) **A.** Podonotal shield (pod. sh.) and mesonotal scutellae (mes. sc.), **B.** Sternal shield (st. sh.), **C.** Anal shield (an. sh.), **D.** Peritreme (per.), **E.** Tritosternum (trt).

currently very limited information on the presence and the prevalence of *O. natricis* infestations on the native and captive snakes and lizards in Turkey. To date, there are only two reports on the presence of *O. natricis* from captive snakes. The first report of *O. natricis* in Turkey was given by Kurtdede et al., (2009). They collected more than a hundred female specimens of *O. natricis* from *Boa constrictor* L. Afterward, Dik (2012) documented presence of *O. natricis* in a captive dice snake, *Natrix tessellata* (Laurenti) based on six female specimens. Apart from these studies, a Ph.D. dissertation about the ectoparasitic mites on some wild lizards of Turkey was compiled by Jabbarpour (2016), and three *Ophionyssus* species (*Ophionyssus saurarum* (Oudemans), *O. natricis*, and *Ophionyssus* sp.) were reported in this study; but, this dissertation, unfortunately, has not been published in a journal, yet.

On the other hand, the patterns of chaetotaxy are typically considered constant within a species, but intraspecific variation in chaetotaxy have been reported in some mites (Głowska and Skoracki, 2009; Seniczak et al., 2012; Bingül et al., 2017, 2018). The variations may lead to some

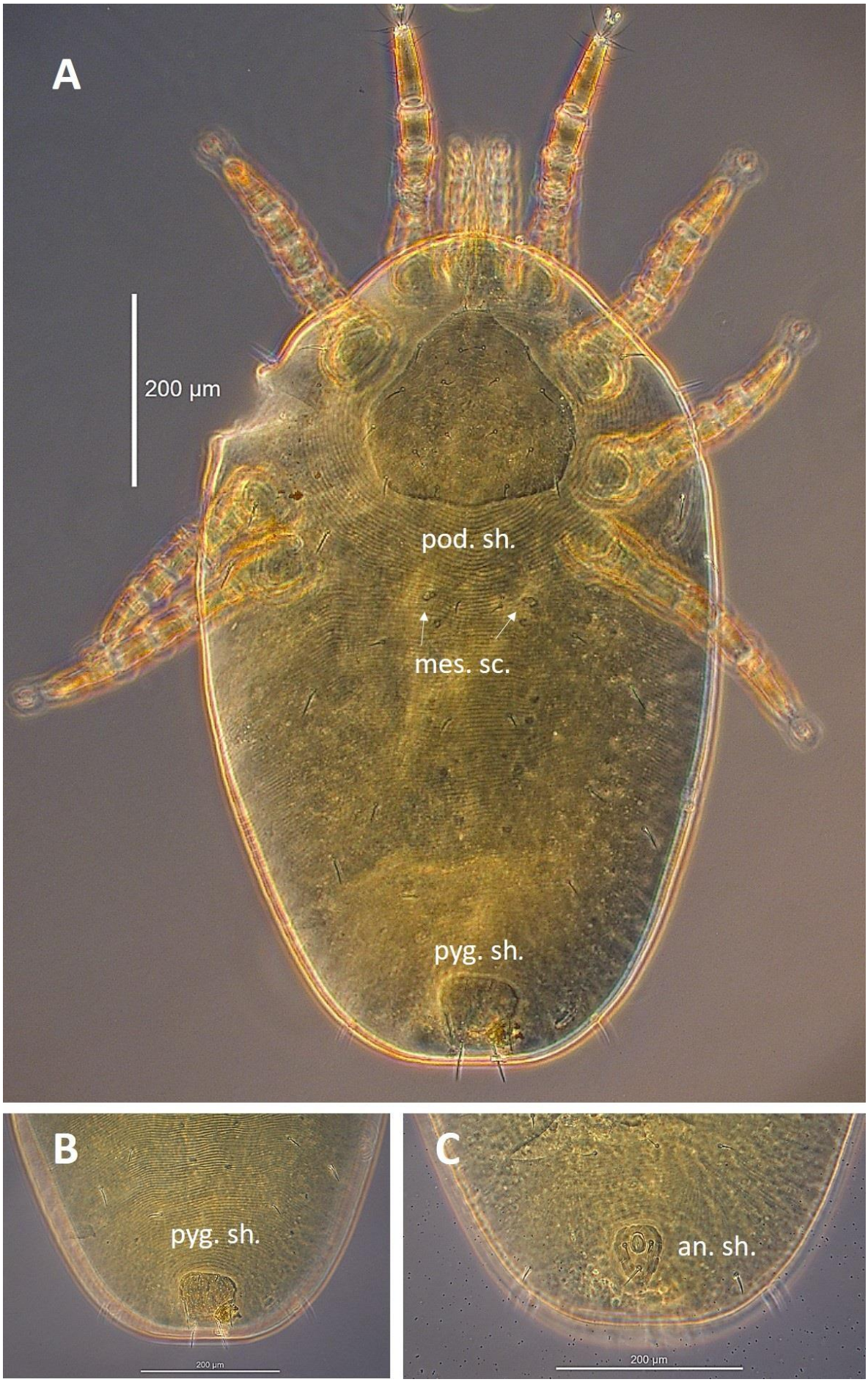

Figure 3. *Ophionyssus natricis* (protonymph) **A.** Podonotal shield (pod. sh.) and mesonotal scutellae (mes. sc.), **B.** Pygidial shield (pyg. sh.), **C.** Anal shield (an. sh.).

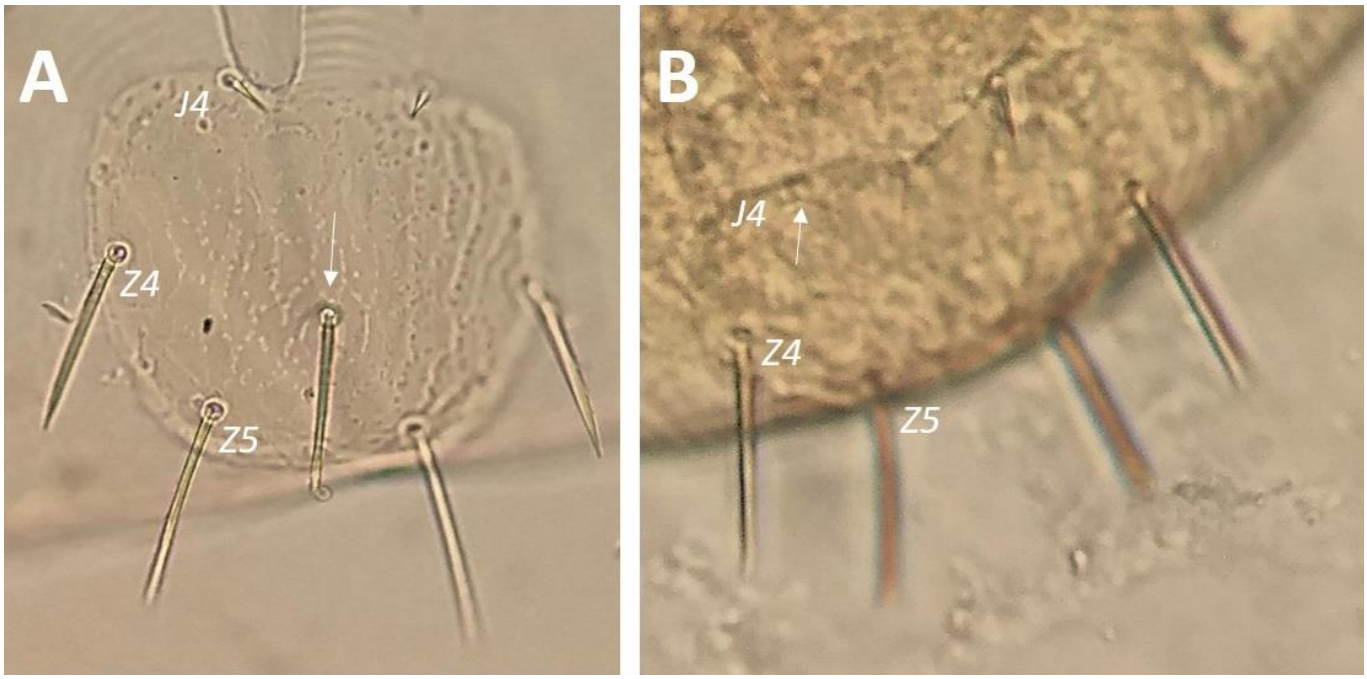

Figure 4. *Ophionyssus natricis* (protonymh), numerical variations in the pygidial setae **A.** Additional seta, **B.** Absence of left seta *J4*.

problems with species identification, and even cause taxonomic mistakes. In the present study, setal variations in the pygidial shield of two protonymphs were detected. An addition seta is found in one specimen in its pygidial shield (Fig. 4A), while left seta *J4* was absent in the pygidial shield of the other specimen (Fig. 4B). To the best of our knowledge, such a variation was detected in the protonymphs of *O. natricis* for the first time.

Consequently, ectoparasitic mites associations of both captive and wild reptiles have been poorly studied and studied and understood in Turkey. Therefore, future studies should be focused on the ectoparasitic mites associations of both captive and wild reptiles in Turkey.

Statement of ethics approval

Not applicable.

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Conflict of interest

The author declares that there is no conflict of interest regarding the publication of this paper.

REFERENCES

Altınok-Yipel, F. 2014. The infestation of ectoparasites (*Hirstiella* spp.) treatment with ivermectin solition in a green iguana: case report. Kocatepe Veterinary Journal, 7: 85-87. doi: 10.5578/kvj.7349

Alves, R.R.N., de Araújo, B.M.C., da Silva Policarpo, I., Pereira, H.M., Borges, A.K.M., da Silva Vieira, W.L. and Vasconcellos, A. 2019. Keeping reptiles as pets in Brazil: Ethnozoological and conservation aspects. Journal for Nature Conservation, 49: 9-21. doi: 10.1016/j.jnc.2019.02.002

Amanatfard, E., Youssefi, M.R. and Barimani, A. 2014. Human dermatitis caused by *Ophionyssus natricis*, a snake mite. Iranian Journal of Parasitology, 9: 594-596.

Bingül, M., Doğan, S. and Doğan, S. 2017. Morphological abnormalities in some stigmaeid species of *Eustigmaeus*, *Stigmaeus* and *Storchia* (Acari: Raphignathoidea: Stigmaeidae). Systematic and Applied Acarology, 22: 2119-2126. doi: 10.11158/saa.22.12.7

Bingül, M., Doğan, S. and Doğan, S. 2018. Asymmetric variations in some species of the genus *Raphignathus* Dugès (Acari: Raphignathidae). Trakya University Journal of Natural Sciences, 19: 55-58. doi: 10.23902/trkjnat.334190

Bursali, A., Keskin, A. and Tekin, S. 2012. A review of the ticks (Acari: Ixodida) of Turkey: Species diversity, hosts and geographical distribution. Experimental and Applied Acarology, 57: 91-104. doi: 10.1007/s10493-012-9530-4

Dik, B. 2012. The first case of *Ophionyssus natricis* (Gervais, 1844) on a sea snake (*Natrix tessellata*, Laurente 1768) (Reptilia: Squamata: Colubridae) in Turkey. Türkiye Parazitoloji Dergisi, 36: 112-115. doi: 10.5152/tpd.2012.27

Evans, G.O. and Till, W.M. 1966. Studies on the British Dermanyssidae (Acari: Mesostigmata). Part II Classification. Bulletin of the British Museum (Natural History) Zoology, 14: 107-370.

Fisher, P. and Csurhes, S. 2009. Pest animal risk assessment American corn snake *Elaphe guttata*. Queensland Primary Industries and Fisheries, Brisbane, Australia, 15 pp.

Fitzgerald, K.T. and Vera, R. 2006. Acariasis. In: Reptile medicine and surgery. Mader, D.R. (Ed). Elsevier, Saint Louis, USA, 720-738.

Fonseca, É., Marques, R. and Tinôco, M.S. 2014. New records of *Pantherophis guttatus* (Squamata: Colubridae) in the state of Bahia, an alien species to Brazil. Salamandra, 50: 241-244.

Gazyağcı, S., Aktaş, M.S. and Sarı, B. 2011. The first record of the mite (*Hirstiella* sp.) on a green iguana from Turkey and its therapy with fipronil-a case report. Veterinarski Arhiv, 81: 793-797.

Głowska, E. and Skoracki, M. 2009. Anomalous chaetotaxy in the quill mites *Torotrogla merulae* Skoracki et al., 2000 (Acari, Prostigmata, Syringophilidae). Acta Parasitologica, 54: 364-367.
doi: 10.2478/s11686-009-0046-y

Guglielmone, A.A., Apanaskevich, D.A., Estrada-Peña, A., Robbins, R.G., Petney, T.N. and Horak, I.G. 2014. The hard ticks of the world: (Acari: Ixodida: Ixodidae). Springer, Dordrecht, The Netherlands, 738 pp.

Jabbarpour, S. 2016. Ectoparasit living mites on some lizard which distributed in Turkey (Arachnida: Acarina). PhD Dissertation. Department of Biology, Graduate School of Natural and Applied Science, Ege University, İzmir, Turkey, 158 pp. (In Turkish)

Kalúz, S. 2011. Two new chigger mites of the genus *Lacertacarus* (Acari: Prostigmata, Trombiculidae). Zootaxa, 2922: 15-26.
doi: 10.11646/zootaxa.2922.1.2

Kepka, O. 1962. Trombiculidae (Acari) aus der Türkei. Zeitschrift für Parasitenkunde, 21: 273-289.
doi: 10.1007/BF00261369

Kepka, O. 1966. Trombiculidae (Acari) aus der Türkei. II. Zeitschrift für Parasitenkunde, 27: 43-63.
doi: 10.1007/BF00261217

Keskin, A., Bursali, A., Kumlutas, Y., Ilgaz, C. and Tekin, S. 2013. Parasitism of immature stages of *Haemaphysalis sulcata* (Acari: Ixodidae) on some reptiles in Turkey. Journal of Parasitology, 99: 752-755.
doi: 10.1645/13-187.1

Kubiak, M. 2020. Corn Snakes. In: Handbook of exotic pet medicine. Kubiak, M. (Ed.). John Wiley and Sons Ltd, New Jersey, USA, 283-304.

Kurtdede, A., Haydardedeoğlu, A.E. and Kar, S. 2009. Bir *Boa constrictur* [sic]'da *Ophionyssus natricis* enfeksiyonu ve sağaltımı. Kafkas Üniversitesi Veteriner Fakültesi Dergisi, 15: 323.
doi: 10.9775/kvfd.2008.98-E

Marshall, B.M., Strine, C. and Hughes, A.C. 2020. Thousands of reptile species threatened by under-regulated global trade. Nature Communications, 11: 4738.
doi: 10.1038/s41467-020-18523-4

McFadden, M.S., Topham, P. and Harlow, P.S. 2017. A ticking time bomb: Is the illegal pet trade a pathway for the establishment of corn snake (*Elaphe guttata*) populations in Australia? Australian Zoologist, 38: 499-504.
doi: 10.7882/AZ.2017.006

Mendoza-Roldan, J.A., Modry, D. and Otranto, D. 2020. Zoonotic parasites of reptiles: a crawling threat. Trends in Parasitology, 36: 677-687.
doi: 10.1016/j.pt.2020.04.014

Mendoza-Roldan, J.A., Ribeiro, S.R., Castilho-Onofrio, V., Marcili, A., Simonato, B.B., Latrofa, M.S., Benelli, G., Otranto, D., and Barros-Battesti, D.M. 2021. Molecular detection of vector-borne agents in ectoparasites and reptiles from Brazil. Ticks and Tick-borne Diseases, 12: 101585.
doi: 10.1016/j.ttbdis.2020.101585

Miranda, R.J., Cleghorn, J.E., Bermúdez, S.E. and Perotti, M.A. 2017. Occurrence of the mite *Ophionyssus natricis* (Acari: Macronyssidae) on captive snakes from Panama. Acarologia, 57: 365-368.
doi: 10.1051/acarologia/20164161

Mitchell, M.A. 2007. Parasites of reptiles. In: Flynn's parasites of laboratory animals. Baker, D.G. (Ed). Blackwell Publishing, Iowa, USA, 177-216.

Moraza, M.L., Irwin, N.R., Godinho, R., Baird, S.J.E. and Bellocq, J.G. 2009. A new species of *Ophionyssus* Mégnin (Acari: Mesostigmata: Macronyssidae) parasitic on *Lacerta schreiberi* Bedriaga (Reptilia: Lacertidae) from the Iberian Peninsula, and a world key to species. Zootaxa, 2007: 58-68.
doi: 10.11646/zootaxa.2007.1.3

Norval, G., Halliday, B., Sih, A., Sharrad, R.D. and Gardner, M.G. 2020. Occurrence of the introduced snake mite, *Ophionyssus natricis* (Gervais, 1844), in the wild in Australia. Acarologia, 60: 559-565.
doi: 10.24349/acarologia/20204385

Pérez, J.M. 2009. Parasites, pests, and pets in a global world: new perspectives and challenges. Journal of Exotic Pet Medicine, 18: 248-253.
doi: 10.1053/j.jepm.2009.09.003

Petrossian, G.A., Pires, S.F. and van Uhm, D.P. 2016. An overview of seized illegal wildlife entering the United States. Global Crime, 17: 181-201.
doi: 10.1080/17440572.2016.1152548

Reeves, W.K., Dowling, A.P. and Dasch, G.A. 2006. Rickettsial agents from parasitic Dermanyssoidea (Acari: Mesostigmata). Experimental snd Applied Acarology, 38: 181-188.

doi:10.1007/s10493-006-0007-1

Schultz, H. 1975. Human infestation by *Ophionyssus natricis* snake mite. British Journal of Dermatology, 93: 695-697.
doi: 10.1111/j.1365-2133.1975.tb05120.x

Seniczak, S., Ayyıldız, N. and Seniczak, A. 2012. Setal losses in the dorsal hysterosoma of Plateremaeoidea (Acari: Oribatida) in the light of ontogenetic studies. Journal of Natural History, 46: 411-451.
doi: 10.1080/00222933.2011.640464

Setiyani, A.D. and Ahmadi, M.A. 2020. An overview of illegal parrot trade in Maluku and North Maluku Provinces. Forest and Society, 4: 48-60.
doi: 10.24259/fs.v4i1.7316

Stekolnikov, A. and Daniel, M. 2012. Chigger mites (Acari: Trombiculidae) of Turkey. Zootaxa, 3216: 1-104.
doi: 10.11646/zootaxa.3216.1.1

Till, W.M. 1957. Mesostigmatic mites living as parasites of reptiles in the Ethiopian region (Acarina: Laelaptidae). Journal of the Entomological Society of Southern Africa, 20: 120-143.

Wozniak, E.J. and DeNardo, D.F. 2000. The biology, clinical significance and control of the common snake mite, *Ophionyssus natricis*, in captive reptiles. Journal of Herpetological Medicine and Surgery, 10: 4-10.
doi: 10.5818/1529-9651-10.3.4

Yunker, C.E. 1956. Studies on the snake mite, *Ophionyssus natricis*, in Nature. Science, 124: 979-980.
doi: 10.1126/science.124.3229.979

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