New Record of Feather Mite, Neopteronyssus bilineatus Mironov, 2003 (Arachnida: Pteronyssidae), from a Grey-Capped Pygmy Woodpecker, Yungipicus canicapillus in Republic of Korea

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Abstract: This study intended to record a species of feather mite, Neopteronyssus bilineatus Mironov, 2003, (Arachnida: Pteronyssidae), from a grey-capped pygmy woodpecker, Yungipicus canicapillus (Blyth, 1845), in the Republic of Korea. Mite samples were collected from the flight feathers of a woodpecker, preserved directly in 95% ethyl alcohol, and then observed by a light microscope after specimen preparation. Morphology of Neopteronyssus bilineatus is distinguished from other pici group species by opisthosoma part with 2 longitudinal bends, tarsal seta riami 3 times longer than tarsus III in males, and 2 elongated hysteronotal plates extending beyond the level of setae e2 in females. In the present study, a species of feather mite, N. bilineatus, was newly recorded from Y. canicapillus in Korean fauna.

Key words: Neopteronyssus bilineatus, grey-capped pygmy woodpecker, feather mite, Korea
logical terminology and nomenclature of leg and idiosomal setae followed Gaud & Atyeo [29] and Norton [30]. All measurements were in micrometers (µm). The classification and scientific names of birds follow Gill et al. [31]. All examined specimens were deposited in the National Institute of Biological Resources (NIBR) with the specimen numbers NIBRIV 0001043151–0001043155.

Description of *Neopteronyssus bilineatus* Mironov, 2003

Male (*n* = 2): idiosoma 435-448 × 200-215 (length × width) in size (Fig. 1A). Hysterosoma 270 in length. Prodorsal shield triangular-shape occupying entire prodorum, weakly sclerotized, posterior margin straight, 139-150 in length along the midline, 145-150 in width of the posterior part (Fig. 2A). Setae *c2* filiform, 29-31 in length, the distance between setae *se* 70-71. Subhumeral setae *c3* lanceolate, 25-28 × 5.5-6. Distance between prodorsal and hysteronotal shields 1-6 in length along the midline. Hysteronotal shield anterior margin convex, weakly sclerotized, surface without ornamentation, greatest length 280-290, width at the level of anterior margin 150-155 (Fig. 2A). Bases between setae *d2* and *e2* with a pair of strongly sclerotized longitudinal sclerites, 80-87 in length. Opisthosomal lobes bluntly rounded; Setae *h2* and *h3* located on the posterior margin of these lobes. Setae *ps2* situated posterior to setae *f2*; setae *ps2* setiform. Dorsal measurements: *c2*: *d2* 100, *d2*: *e2* 110, *d2*: *gl* 37-67, *e2*: *h2* 48-49, *d1*: *d2* 52, *e1*: *gl* 5-6, *h2*: *h2* 46-49, *h3*: *h3* 35-36, *ps1*: *ps1* 19-22. Transventral sclerite absent, inner ends of epimerites IIIa shaped as an oblique T, epandrium absent (Fig. 2B). Genital apparatus 24-28 × 13-18, with genital setae *g* at the midlevel of this apparatus. Setae *3a* slightly located posterior to setae *4b*. Adanal shield irregular form, with the anterior end of the anal opening. Diameter of anal suckers 18-19. Ventral measurements: *3a*: *4a* 43-50, *ps3*: *ps3* 30, *ps3*: *h3* 50. Tarsus III 60 in length; setae *r* 3-3.5 times longer than this segment (Fig. 2C). Tarsus IV with 2 acute dorsobasal teeth.

Female (*n* = 3): idiosoma 490-510 × 195-208 (length × width) in size (Fig. 1B). Hysterosoma 320-355 in length. Prodorsal shield (Fig. 3A): Mostly shaped as in a male, length 150-155, width 145-158. Setae *c2* filiform, 32-34 in length; subhumeral setae *c3* lanceolate, 26-27 × 5-6. Paired anterior hysteronotal plates situated at the midlevel of hysterosoma, anterior mar-

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**Fig. 1.** *Neopteronyssus bilineatus* recovered from a grey-capped pygmy woodpecker, *Yungipicus canicapillus* in Korea. (A) Male. (B) Female. Scale bars = 0.2 mm.
gins extending to the level of setae c3, posterior margins extending beyond the level of setae e2, usually shaped as large longitudinal bends (severe variation in each individual), greatest length 150-190, greatest width 20-24 (Figs. 3A, 4); setae e1 lateral margins of this plates. Pygidial sclerites small longitudinal shaped, located near the bases of setae h2 and h3, greatest length 13-58, greatest width 8-14. External copulatory tube situated between setae h3, small finger-like. Dorsal measurements: c2: d2 103-113, d2: e2 113-138, d2: gl 82-120, e2: h3 81-90, d2: gl 82-120, h2: ps1 6-8, h2: h2 68-72, h3: h3 54-60. Epigynum semicircular, 63-65 long, 65-75 wide (Fig. 3B). Tarsi III and IV 31-33 and 35-36, respectively.

*Neopteronyssus bilineatus* was originally described by Mironov [25] based on specimens collected from *Y. canicapillus* (= *D. canicapillus*) in Thailand. In genus *Neopteronyssus*, males of group *pici* have common characteristics of opisthosomal lobes small rounded, transventral sclerite and epiandrium absent, tarsi IV with 2 small dorsobasal teeth, and females have the same features as unpaired or paired hysteronal shields situated at the midlevel of opisthosa and not extending to poster end of the body [25]. Among 5 species in the *pici* group, *N. bilineatus* is most similar to *N. koreanus* (Han et al., 2019) and *N. yungipicinus* (Mironov, 1987) regarding the external traits. However, *N. bilineatus* clearly differs from *N. koreanus*.
Fig. 3. *Neopteronyssus bilineatus*, female. (A) Dorsal view of idiosoma, hysterosoma with 2 hysteronotal sclerotized sclerites. (B) Ventral view of idiosoma. Scale bars = 0.1 mm.

Fig. 4. Variation of hysteronotal plates in females. (A) NiBRIV0001043154. (B) NiBRIV0001043155. Scale bars = 0.1 mm.
and *N. yungipicinus* by the following features: in males, the dorsal surface of opisthosoma has longitudinal sclerites, and setae *r* of tarsus III is 3 times longer than this segment; in females, the anterior margins of hysteronotal sclerotized bands extend to the level of setae *cp* and the posterior margins of these sclerites extend beyond the level setae *e2* [25]. In contrast, in males of *N. yungipicinus*, the posterior part of hysteronotal shield lacks ornamentation, and the length of seta *rIII* is 2.5 times shorter than the length of this tarsus; and in females, 2 elongated hysteronotal plates are situated between setae *d2* and *e2* [25,32]. In addition, hysteronotal shield in males of *N. koreanus* is weakly sclerotized without 2 longitudinal sclerites, and tarsal seta *rIII* is 1.5 times shorter than tarsus III; in females, pair of anterior hysteronotal plates are located at the level of setae *d1* and usually shaped as irregular rectangles (in few specimens, these plates fused by thin sclerite) [23].

In general, *N. bilineatus* found in Korea were morphologically consistent with the original description and illustrations of Mironov [25]. However, anterior margins of hysteronotal plates in Korean females did not stretch to the level of setae *d1*. Furthermore, hysteronotal plates of all Korean females are highly varied in length and shape. As the original description was based on 2 female samples, an explanation of individual variation was insufficient. Although females of *N. koreanus*, a closely related species, show variation in the anterior hysteronotal plates, there was no significant difference in the partial sequences of mitochondrial COI gene (cytochrome *c* oxidase subunit I) utilized for a DNA barcode [23]. Therefore, we considered this difference as an intraspecific variation in females of *N. bilineatus*. Accordingly, the hysteronotal plate length of female was not considered a suitable attribute to distinguish the species.

In this study, *N. bilineatus* was discovered for the first time in Korea. Although some species of feather mites in the genus *Neopteronyssus* share multiple hosts, most of them show host specificity [23,25]. Until now, *N. bilineatus* has been detected only in *Y. canicapillus*, distributed in Southeast Asia and Korea [33,34]. Therefore, identification of *N. bilineatus* was chiefly made by the morphological characteristics of mites, and the distribution of host and host specificity were additionally considered in this study.

Conclusively, it was confirmed for the first time that a species of feather mite, *N. bilineatus*, is indigenously infested in *Y. canicapillus* in Korea. Additional studies such as DNA barcoding and morphological comparison of specimens are needed to confirm the intraspecific variation of *N. bilineatus* from Southeast Asia.

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**CONFLICT OF INTEREST**

The authors declare that they have no conflict of interest with this article.

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