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First Record of Two Nasal Mites Genus *Rhinonyssus* (Mesostigmata, Rhinonyssidae) Parasitizing Birds from Estonia

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Abstract: Rhinonyssids are obligate hematophagous mites that parasitize the nasal cavity of domestic and wilds birds worldwide. For the first time, two species of nasal mites of the genus *Rhinonyssus* from Estonia are described. One species of nasal mite, *Rhinonyssus pluvialis* Fain et Johnston, 1966, is described and illustrated based on material from *Pluvialis apricaria* Linnaeus, 1758 (Charadriiformes, Charadriidae). Another species of nasal mite, *Rhinonyssus tringae* Fain, 1963, is described and illustrated based on material from *Tringa glareola* Linnaeus, 1758 (Charadriiformes, Scolopacidae). The bird hosts were collected in Estonia, Puhato järv.

Keywords: endoparasite; Rhinonyssidae; Charadriiformes; wood sandpiper; golden plover

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1. Introduction

Mites of the family Rhinonyssidae Trouessart, 1895 (Parasitiformes: Mesostigmata, Gamasina), live in the nasal cavity and are endoparasites of birds. The mites of this family are known to parasitize almost all presently recognized orders of birds [1–6]. The world's rhinonissid fauna currently include more than 600 species, grouped into 16 genera instead of 11 genera [7,8]. Rhinonyssids appear to be transmitted directly from host to host when infested adult birds regurgitate food to their nestlings or during courtship behavior. Indirect transmission has been reported through water, perches, and other contaminated surfaces [9]. Investigations of rhinonyssids are important because of the direct damage they inflict to their hosts, which has been described as *Rhinonyssidosis avium* disease [10]. Host specificity of rhinonyssid genera is variable; some genera are constrained to one host family, while others have been observed in hosts from different orders [4,6,11–13].

The *Rhinonyssus* genus currently includes about 26 species. These mites are distributed across birds of the orders Anseriformes, Charadriiformes, Podicipediformes, and Sphenisciformes [4,12,14,15].

Strandtmann combined some species of the genus *Rhinonyssus* into three groups (A, B, and C) with the following criteria: group A: body elongated, sternal and anal shields absent, podosomal shield present, entire or split into fragments; group B: body short, rounded, oval, or egg-shaped, podosomal shield well developed, sternal shield present but usually significantly fragmented, anus located terminally or dorsally, anal shield absent, claws of tarsi I are angular in shape; group C: body oval or egg-shaped, podosomal shield well developed or partially split into fragments, no sternal shield but there is an anal shield [16].

In this study, one female mite of the species *Rhinonyssus tringae* Fain, 1963, belongs to group A, and five female mites and one male mite of the species *Rhinonyssus pluvialis* Fain et Johnston, 1966, belong to group B. In the most recent study, Gastal and colleagues describe a new species, *Rhinonyssus nenecoi*, from *Daption capense* (Procellariidae) and determine its morphological similarity to *Rhinonyssus pluvialis* [17].

2. Materials and Methods

In the collection of the Zoological Institute of the Russian Academy of Sciences, there are six mites of the species *Rhinonyssus pluvialis* Fain et Johnston, 1966, from *Pluvialis*

apricaria Linnaeus, 1758 (Charadriiformes, Charadriidae), and one female mite of the species *Rhinonyssus tringae* Fain, 1963, from *Tringa glareola* Linnaeus, 1758 (Charadriiformes, Scolopacidae). These specimens were collected in 1955 by M.M. Belopolskaya and identified by I. D. Dimov in 2024.

Species-level identifications were made using the identification keys [4,12] and descriptions from the primary literature [18,19]. The description of the species follows the modern format used for rhinonyssid mites [7]. All measurements are in micrometers. The chaetotaxy of idiosoma used in the present work is based on the system proposed by [4,20]. Abbreviations for terms and measurements provided in descriptions of species are adapted from [7,21]. The chaetotaxy of the tarsal complex and palpal complex is based on the system proposed by [22,23].

In-species descriptions are used, with the following abbreviations for standardly measured structures:

LB, length of body including palps; WID, width of idiosoma; LPS, length of podosomal shield; WPS, width of podosomal shield; LSS, length of sternal shield; WSS, width of sternal shield; LGS, length of genital shield; WGS, width of genital shield; LG, length of gnathosoma, ventral view, including palps; WG, width of gnathosoma; Lleg, length of leg, including coxa, excluding ambulacrum (LLeg I to LLeg IV).

Paratypes are deposited in the Zoological Institute of the Russian Academy of Sciences collection in St. Petersburg, Russia, with accession numbers (RASP 10–13).

3. Results

Taxonomy

The genus *Rhinonyssus* Trouessart, 1894: 723; Vitzthum, 1935: 568; Strandtmann, 1951: 129; Fain, 1957: 42; Domrow, 1969: 324; Pence, 1975: 6; Butenko, 1984: 15; Kaneko et al., 1978: 147; Dimov, 2020: 108.

Somatericola Tragardh, 1904: 28.

Type species: *Rhinonyssus coniventris* Trouessart, 1894.

Diagnosis: Mites with generally rounded idiosome, length 430–970. Podosomal shield present. Opisthosomal and pygidial shields absent. Stigmata without peritrems, located dorsolaterally. Mesosomal shields present or absent. Poststigmal shield absent. Gnathosoma is located terminally. Deutosternal denticles absent. Tritosturnum absent. Genital shield present. Anal shield present or strongly reduced. Anus located on ventral or dorsal side of opisthosoma. Aspero present or absent. Convexities and spines on coxae absent.

Rhinonyssus pluvialis Fain et Johnston, 1966

Fain et Johnston, 1966. Bull. Soc. R. Zool. Anvers, 38: 27; Pence, 1975: 39; Butenko, 1984: 37.

Female (based on 5 paratypes): LB—548–561; WID—322–331; LPS—272–281; WPS—245–248; LSS—41–45; WSS—47–59; LGS—71–77; WGS—69–72; LG—83–90; WG—75–78; LCH—38–40; WCH—14–15; Lleg I—365–401; Lleg II—323–329; LlegIII—331–339; Lleg IV—366–379.

Dorsum: (Figure 1) Small elliptical-shaped mites with a podosomal shield (PS) strongly sclerotized, rhomb-shaped and without setae. Mesosomal shields (MS) of irregular shape located posterior to podosomal shield. Soft cuticle of dorsal idiosoma without setae. Stigmata (Stg) without peritremes, located dorsolaterally. Anus (An) located dorsally, flanked by a pair of paranal setae (PA). Aspero absent. Anal shield and postanal seta are absent.

Venter: (Figure 2) Anterior part of the sternal shield (SS) is sclerotized, with two pairs of shorts sternal setae on its surface (St1, 2); one pair of sternal setae (St3) situated posterior to this shield or on the border of the shield, sternal formula (St1 = St2 = St3). Genital shield (GS) is large, sclerotized, without genital setae. Soft cuticle on ventral opisthosoma with one pair of long setae Jv2.

Gnathosoma inserted ventrally.

Legs: all legs six-segmented. Coxal formula 2-2-2-1.

Tarsal receptor complex (Figure 3) (topography and types of sensilla): two chemo-mechanoreceptor sensilla with apical pore (up), four olfactory porous single-cavity sensilla (sw), and three chemoreceptor sensilla with peripheral cavities (dw).

Palpal receptor complex (Figure 4) (topography and types of sensilla): one pair of big tactile sensilla with apical pore (np), three double-walled with apical pore sensilla (dw-up), and four single-walled with apical pore sensilla (sw-up).

Larva, nymphs: unknown.

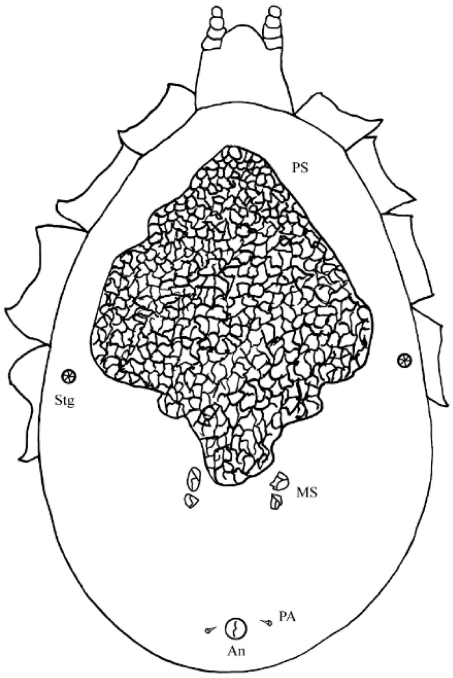

Figure 1. *Rhinonyssus pluvialis* female dorsum.

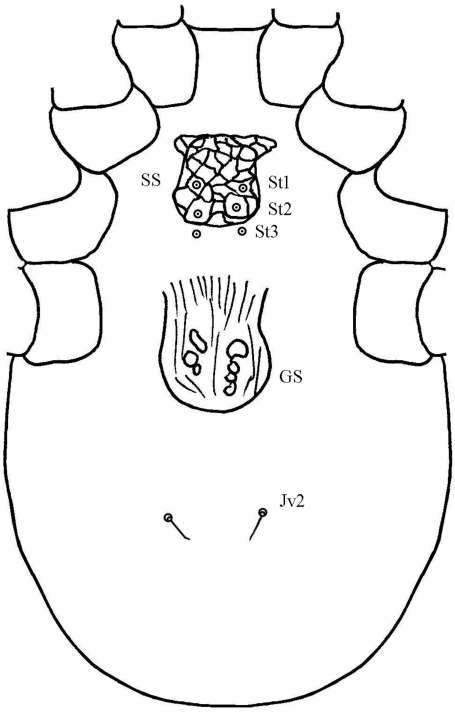

Figure 2. *Rhinonyssus pluvialis* female venter.

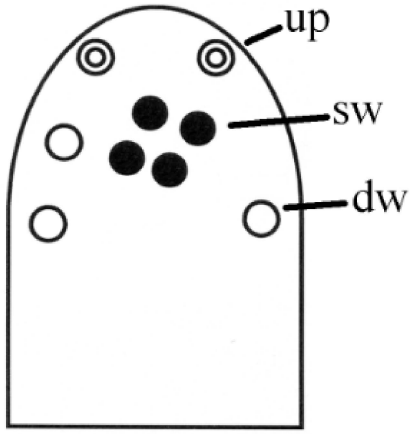

Figure 3. *Rhinonyssus pluvialis* female tarsal receptor complex.

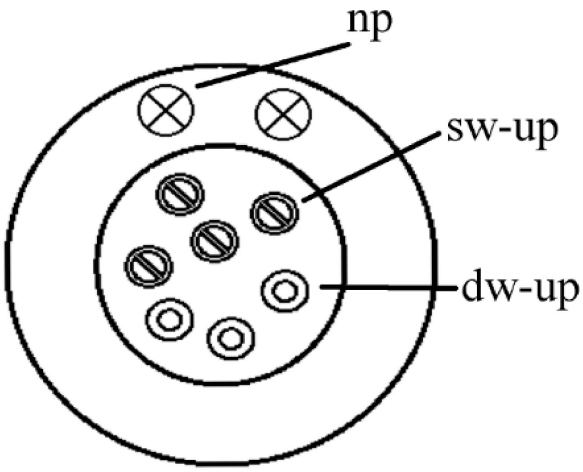

Figure 4. *Rhinonyssus pluvialis* female palpal receptor complex.

Male (based on 1 paratype): LB—537; WID—315; LPS—269; WPS—238; LSS—42; WSS—46; WG—69; LCH—35; WCH—13; Lleg I—369; Lleg II—331; LlegIII—337; Lleg IV—368.

Dorsum: Podosomal shield strongly sclerotized, rhomb-shaped and without setae. Mesosomal shields of located posterior to podosomal shield. Dorsal idiosoma without setae. Stigmata without peritremes, located dorsolaterally. Anus located dorsally, flanked by a pair of paranal setae. Aspero absent. Anal shield and postanal seta are absent.

Venter: Sternal shield is sclerotized, with three pairs of shorts setae on its surface. Behind the sternal shield there is a round and sclerotized shield. Cuticle on ventral opisthosoma with one pair of long setae.

Gnathosoma inserted ventrally.

Legs: All legs six-segmented.

Type materials: Five female paratypes and one male (RASP 10–12), from *Pluvialis apricaria* Linnaeus, 1758 (Charadriiformes, Charadriidae). Location: Estonia, Puhato järv (59°10′02″ N 27°41′18″ E). Date: 17 August 1955. Collected by M. M. Belopolskaya.

Rhinonyssus tringae Fain, 1963.

Fain, 1963 Bull. Ann. Soc. Roy. Entom. Belg 99 (3): 96; Butenko, 1984: 31.

Female. LB-920; WID–760; LGS-256; WGS-85; LG-188; WG-95; Lleg I—935; Lleg II 784; Lleg III—733; Lleg IV—890.

Dorsum: (Figure 5) Podosomal shield (PS) wings shape connected in front. Stigma (Stg) without peritrem, located dorsolaterally at the level of coxae IV. On the dorsal opisthosoma the setae cannot be seen.

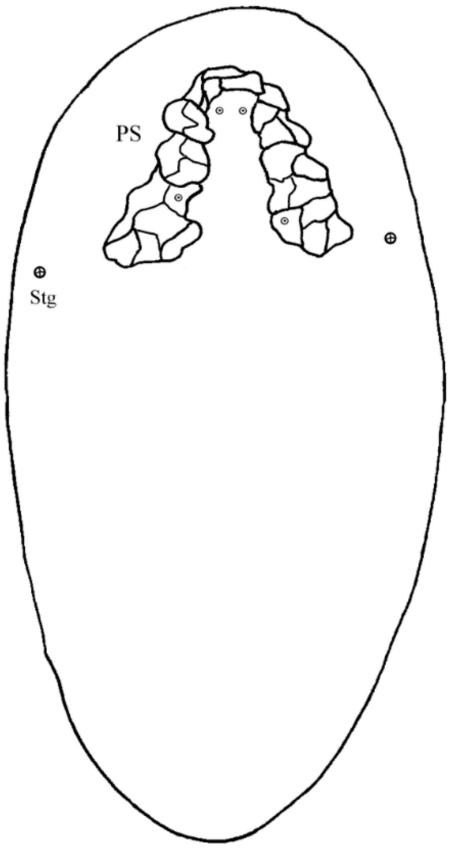

Figure 5. *Rhinonyssus tringae* female dorsum.

Venter: (Figure 6) Sternal shield absent. Three pairs of short sternal setae (St1-3), sternal formula (St1 = St2 = St3). Genital shield elongated. Genital setae absent. On the ventral side of opisthosoma seven short setae (Jv1-4). Anal shield absent. The anus is ventral. Aspero absent.

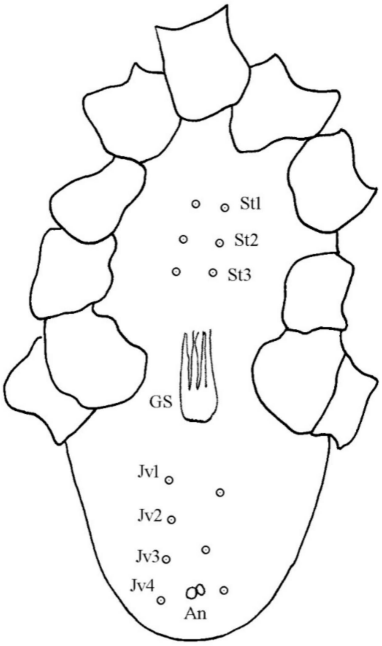

Figure 6. *Rhinonyssus tringae* female venter.

Gnathosoma: inserted ventrally.

Chaetotaxy of legs: coxae: 2-2-2-1.

Tarsal receptor complex (Figure 7) (topography and types of sensilla): two chemo-mechanoreceptor sensilla with apical pore (up), four olfactory porous single-cavity sensilla (sw), and four chemoreceptor sensilla with peripheral cavities (dw).

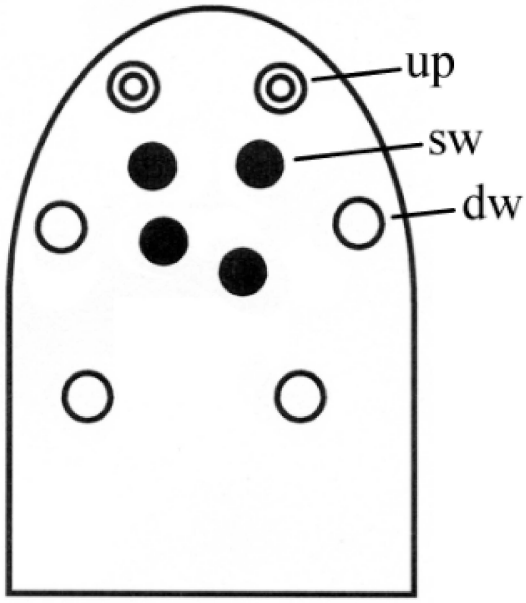

Figure 7. *Rhinonyssus tringae* female tarsal receptor complex.

Palpal receptor complex (Figure 8) (topography and types of sensilla): one pair of big and two pairs of short tactile sensilla with apical pore (np), three double-walled with apical pore sensilla (dw-up), and two single-walled with apical pore sensilla (sw-up).

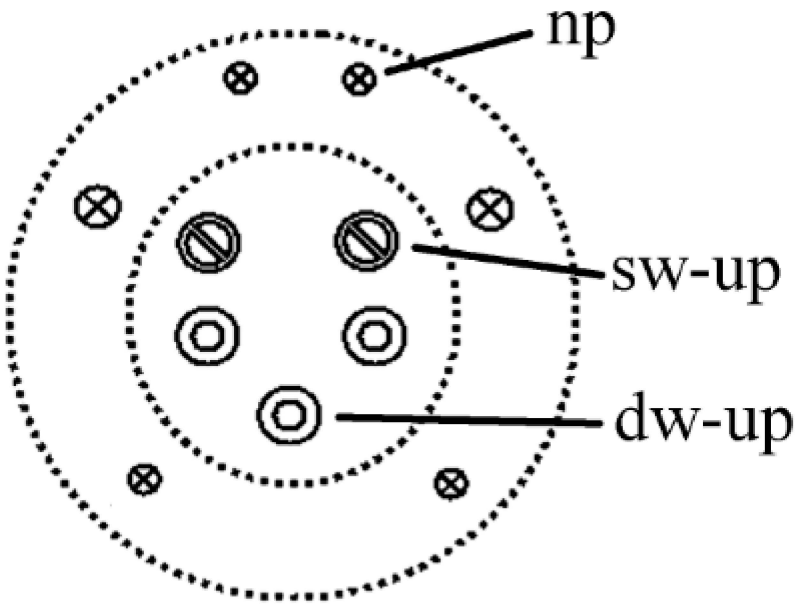

Figure 8. *Rhinonyssus tringae* female palpal receptor complex.

Male, larva, nymphs: unknown.

Type materials: One female paratype (RASP 13), from *Tringa glareola* Linnaeus, 1758 (Charadriiformes, Scolopacidae). Location: Estonia, Puhato järv (59°10′02″ N 27°41′18″ E). Date: 17 August 1955. Collected by M. M. Belopolskaya.

4. Discussion

In America, the species *Rhinonyssus pluvialis* was found and described in *Pluvialis dominica* (Müller, 1776) (Charadriiformes, Charadriidae). In this study, for the first time, the same species of mite is described from Europe (Estonia): *Pluvialis apricaria* Linnaeus, 1758 (Charadriiformes, Charadriidae). *Pluvialis dominica* lives in the Arctic tundra of Northern Canada and Alaska. For the winter, it migrates to South America. *Pluvialis apricaria* spans from Iceland and Great Britain to central Siberia, bordering the Arctic tundra in the north, wintering in the British Isles and coasts of Western and Southern Europe. *Rhinonyssus tringae* is known from Africa and Russia (Omsk region) via *Tringa glareola* Linnaeus, 1758 (Charadriiformes, Scolopacidae). Now, for the first time, it is described from Estonia. Based on the taxonomic groupings of birds included in the host range of the parasites, *Rhinonyssus pluvialis* and *Rhinonyssus tringae* are monoxenous [6].

The classification of the family Rhinonyssidae has always been based on the morphometry of the mites found. However, many of the morphological characteristics that have been used for discriminatory purposes are based on characteristics that gradually change among closely related species, with great variability observed in groups of species that are taxonomically and ecologically close. This eventually leads to ambiguous identifications, as well as groupings of species that may be closely related [24]. The small size, the great difficulty of identifying the huge number of morphologically similar species, the lack of adequate descriptions and illustration of the species, and the disagreement among acarologists regarding the discriminatory morphological features necessary for identifying genera and species may explain the high number of synonymies published by different authors [25].

Throughout the period of study of the Rhinonyssidae, the principles governing the construction of their natural system have undergone significant changes. These changes have often required a complete revision of the supra-specific classification, with the most difficult aspect being the development of criteria for determining the ranks of genera and subfamilies, such as the morphology of the chelicerae. During the 20th century, in the systematics of these mites, such characteristics as the shape and size of the shields of the idiosoma, the presence of one or two fingers of chelicerae, the presence of the tritosternum, and the chetotaxy of the body began to be used. All of these data explain the complexity of delimiting species and determining discriminatory traits in groups of closely related species of the family Rhinonyssidae, and further morphological and molecular studies are needed to establish the statuses of species and subspecies within this group [15,26]. In this regard, scientists are conducting serious molecular studies of the taxonomic diversity of the Rhinonyssidae family. Regarding the genus *Rhinonyssus*, in 2023, some species of this genus were molecularly examined. In this study, numerous mite specimens were found and examined, and their morphological characteristics allowed for them to be included in the species *Rhinonyssus echinipes*, *R. neglectus*, and *R. tringae*. These three species have few morphological differences [26].

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