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A NEW SPECIES OF NALEPELLA KEIFER
(ACARINA: ERIOPHYOIDEA: PHYTOPTIDAE)
FROM ABIES IN DENMARK

by J. BOCZEK 1, S. HARDING 2, A. SHI1 & J. BRESCIANI2

(Accepté Novembre 2000)

NALAPELLA, ERIOPHYOIDEA, ABIES NORDMANNIANA

SUMMARY: Nalepella danica n. sp. found on Abies nordmanniana in Denmark is described. The species is a serious pest of Christmas trees, and notes on its occurrence, biology and damage of the needles are given.

NALAPELLA, ERIOPHYOIDEA, ABIES NORDMANNIANA

RÉSUMÉ: Cet article décrit et illustre une nouvelle espèce d'Eriophyoides, Nalepella danica n. sp., trouvée sur Abies nordmanniana au Danemark. L'espèce est un ravageur des sapins de Nordmann et des observations sur sa fréquence, sa biologie et les dégâts sur les aiguilles sont apportés.

INTRODUCTION

Eriophyoid mites of the genus Nalepella Keifer are commonly found as needle vagrants on conifers. The mites feed on the cell sap of the needles and some species have been reported to cause severe needle damages especially in nurseries and plantations (BOCZEK, 1962; EIDT, 1966; LÖYTTYNIEMI, 1969; MARSHALL & LINDQUIST, 1972; POSTNER, 1972; Hu & KRANTZ, 1991).

Abies nordmanniana (Steven) Spach is widely used as a Christmas tree in Europe. Since 1992, discolouration and loss of needles due to attack by eriophyoid mites have been of economic importance in Danish Christmas tree plantations (HARDING & JACOBSEN, 1995). So far, Nalepella shevtchenkoi Boczek has been identified from the plantations and the species has been considered the major cause of the injury (HARDING & BRESIANI, 1997). During biological investigations of N. shevtchenkoi in Denmark a new species of Nalepella was discovered in large numbers on the needles of A. nordmanniana and severe discolouration was recorded. A description of this new species is given below along with notes on its biology and occurrence.

MATERIAL AND METHODS

The morphology of the new species was investigated using phase contrast microscope and with scanning electron microscopy (JEOL-JSM 840) including cryo scanning attachment (Hexland CT 1000). Prior to light microscopy the mites were mounted in Heinze's medium. The measurements are based on study of 10 females, 10 males and few larvae and nymphs. All measurements are given in micrometers, the range of measurements in parentheses.

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**DESCRIPTION**

*Nalepella danica* Boczek, Harding & Shi n. sp. (Figs. 1, 2 and 3).

Female: 294 (247-303) long; 97 wide, 92 thick. (Fig. 1, Fig. 2A, Fig. 3A) Body fusiform, reddish-yellow in colour in life; immature stages white-whitish. Gnathosoma 43 long with antapical rostral seta 13 long. Chelicerae 47 long, slightly bent. Prodorsal shield 66 (65-70) long, 90 wide with lobe rounded anteriorly, with design of bell shape (Fig. 2B, Fig. 3C). Anterior shield seta 40 long, directed ahead, posterior scapular tubercles 10 long, thick, 50 apart; setae situated close to rear shield margin directed to the front. Dorsal setae 108 long directed up and ahead. Leg I 57 long; tibia 17 long with seta 9 long and solenidion 8 long; tarsus 8 long with solenidion 11 long, slightly knobbed; empodium 8 long, 7-rayed. Leg II 42 long; tibia 15 long; tarsus 9 long with solenidion 10 long, slightly knobbed; empodium 7 long (Fig. 2C, E, Fig. 3F). Coxae not touched, not forming sternum, smooth (Fig. 3B). First forecoxal tubercles 18 apart, setae 13 long; second tubercles 17 apart, setae 30 long; hindcoxal tubercles 40 apart, setae 48 long.

Opisthosoma evenly arched, of 15 (15-22) broad and wavy, smooth and at the rear 4 (4-8) narrow microtuberculate dorsal annuli and about 115 microtuberculate ventral annuli (Fig. 2A, Fig. 3A). Lateral setae 56 long, on 15th ventral annulus; first ventral setae 95 long on 40th; second ventral setae 70 long, on 62nd ventral annulus; third ventral setae 57 long, on 8th annulus from the rear. Accessory setae 5 long. Female genitalia between 15th and 16th ventral annulus, 24 long 30 wide; coverflap smooth; genital setae 30 long, tubercles 24 apart (Fig. 3B).

**MALE:** 230 long; prodorsal shield 62 long; opisthosoma of 17-19 wavy, broad, smooth and 4 narrow, microtuberculate dorsal and 92 ventral annuli; genitalia 26 wide; genital setae 10 long; tubercles 25 apart (Fig. 3E).

**NYMPH:** 172 long; prodorsal shield 40 long; opisthosoma of 57 microtuberculate dorsal annuli; genital setae 10 long, tubercles 10 apart.

**LARVA:** 70-80 long; prodorsal shield 23-27 long; opisthosoma of 55-58 microtuberculate rings; dorsal setae 9 (anterior) and 27 (posterior) long; chelicerae 25 long.

**EGG:** 44 × 53, oval.

**HOST PLANT:** *Abies nordmanniana* Steven (Spach) (Pinaceae). The mites were found as vagrants on the surfaces and undersides of the needles. The infested needles were discoloured by tiny rusty-bronze spots.

**TYPE MATERIAL:** Holotype female and 10 female paratypes, 1 male and 3 nymphs collected at Strandegaard, SE Zealand, Denmark, November 1996.
Fig. 2. *Nalepella danica* n. sp. A. — Lateral view, female. B. — Prodorsal shield. C. — Legs I and II showing solenidion and empodium. D. — Ventral view showing microtuberculate annuli. E. — Tibia without spines. Scales: A = 50 μm, B = 20 μm, C and E = 10 μm, D = 5 μm.
Fig. 3. — Nalepella danica n. sp. A. — Lateral view, female. B. — Anteroventral view of female showing genital region and coxae. C. — Anterodorsal view of female showing prodorsal shield and shield setae. D. — Female genital apodeme. E. — Genital region, male. F. — Legs I and II.
(S. HARDING, coll.). The type material has been deposited at the Department of Applied Entomology, Warsaw Agricultural University, Poland and Department of Ecology, The Royal Veterinary and Agricultural University, Denmark.

**DISCUSSION**

Until now 12 species of *Nalepella* have been described; of these only three — *N. triceras* Börner (Börner 1906) (Nalepa 1910), *N. ednae* Keifer and *N. shevtchenkoi* Boczek — have been found on *Abies* (BOCZEK, 1962, 1964, 1969; BOCZEK & CHYCZEWSKI, 1970; POSTNER, 1976; DENGLER, 1980). The new species is close to *N. triceras*, another needle vagrant documented to cause yellowing of needles of *Abies* sp. (POSTNER, 1972). The two species can, however, be distinguished by the appearance of the prodorsal shield which is rounded in *N. danica* but acuminate in *N. triceras*, by the number of dorsal annuli, the length of the chelicerae and the number of rays of the empodium (TABLE 1). In addition, *N. danica* is slightly longer than *N. triceras*.

It is also close to *N. shevtchenkoi* but it can be easily distinguished by opisthosoma structure, the appearance of tibiae and by prodorsal shield pattern (TABLE 2). *N. shevtchenkoi* (FIGS. 4 and 5) has an opisthosoma of about 50 microtuberculate dorsal annuli (FIG. 4A, FIG. 5A), tibiae with rows of ventral spines (FIG. 4C, FIG. 5B) and shield with numerous broken longitudinal short lines (FIG. 4A, FIG. 5C). In *N. danica*, opisthosoma proximally has 15-22 broad smooth dorsal annuli and 4-5 microtuberculate rings distally; tibiae and tarsi smooth ventrally and prodorsal shield with a pattern of bell shape.

*N. danica* has been found in large numbers in Christmas tree plantations of *A. nordmanniana* at several localities in Denmark. The species has occurred alone or together with *N. shevtchenkoi*. Severe needle damages have been observed on both cases. The injury of the foliage is recognized as a rusty bronze discolouration due to dense spots of tiny chloroses, the symptoms developing some time after the feeding activity of the mites. Heavy attacks may result in defoliation. So far, adults and nymphs of this species appear to prevail during late summer and autumn. In both species eggs overwinter on needles. However, singular feeding and egg-laying mites were

<table>
<thead>
<tr>
<th>Character</th>
<th><em>N. danica</em></th>
<th><em>N. triceras</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prodorsal shield lobe</td>
<td>rounded</td>
<td>acuminate</td>
</tr>
<tr>
<td>Dorsal annuli</td>
<td>15-22</td>
<td>16-21</td>
</tr>
<tr>
<td>Chelicerae</td>
<td>47 long</td>
<td>70 long</td>
</tr>
<tr>
<td>Empodium</td>
<td>7-rayed</td>
<td>5-6 rayed</td>
</tr>
</tbody>
</table>

**TABLE 1:** Comparison of morphological characters of *Nalepella danica* n.sp. and *N. triceras* (Börner). Measurements in µm.

<table>
<thead>
<tr>
<th>CHARACTERS</th>
<th><em>N. danica</em></th>
<th><em>N. shevtchenkoi</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>length of body</td>
<td>90-108</td>
</tr>
<tr>
<td>---</td>
<td>length of shield</td>
<td>15</td>
</tr>
<tr>
<td>---</td>
<td>length of shield</td>
<td>70</td>
</tr>
<tr>
<td>---</td>
<td>length of shield</td>
<td>33-40</td>
</tr>
<tr>
<td>---</td>
<td>female</td>
<td>145-240</td>
</tr>
<tr>
<td>---</td>
<td>length of body</td>
<td>15-22 broad, smooth</td>
</tr>
<tr>
<td>---</td>
<td>no of dorsal annuli</td>
<td>4-5 microtuberculate</td>
</tr>
<tr>
<td>---</td>
<td>tibiae</td>
<td>smooth</td>
</tr>
<tr>
<td>---</td>
<td>prodorsal shield</td>
<td>bell-shaped with</td>
</tr>
<tr>
<td>---</td>
<td>length of scapular</td>
<td>longitudinal lines</td>
</tr>
<tr>
<td>---</td>
<td>shield setae</td>
<td>50-65</td>
</tr>
<tr>
<td>---</td>
<td>male</td>
<td>47</td>
</tr>
<tr>
<td>---</td>
<td>length of scapular</td>
<td>16 broad, smooth</td>
</tr>
<tr>
<td>---</td>
<td>setae</td>
<td>4 narrow, microtuberculate</td>
</tr>
<tr>
<td>---</td>
<td>prodorsal shield</td>
<td>bell-shaped with</td>
</tr>
<tr>
<td>---</td>
<td>pattern</td>
<td>longitudinal lines</td>
</tr>
</tbody>
</table>

**TABLE 2:** Comparison of differing characters of *Nalepella danica* n.sp. and *N. shevtchenkoi* Boczek. Measurements in µm.
Fig. 4. — Nalepella shevchenkoi Boczek. A. — Female and egg on needle surface. B. — Lateral view of female carrying egg. C. — Leg with solenidion, 7-rayed empodium, and tibial spines. Scales: A and B = 50 μm, C = 10 μm.
Fig. 5. — Nalepella shertchenkoi Bocz. A. — Lateral view, female. B. — Legs I and II. C. — Prodorsal shield with broken longitudinal short lines and shield setae.
found as late as in January in Denmark. Eggs transferred to room temperatures hatch in 4-5 days. Eggs are found as aggregates on the needles, mainly close to their bases. Larvae, nymphs and adults feed both on upper and lower needle surfaces.

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