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Walckenaeria furcillata (Menge, 1869) and *Walckenaeria lepida* (Kulczynski, 1885) in Finland (Araneae, Linyphiidae)

Timo Pajunen, Seppo Koponen, Michael I. Saaristo† & Risto A. Väisänen

Pajunen, T. & Väisänen, R. A., Finnish Museum of Natural History, Zoological Museum, P.O. Box 17 (P. Rautatiekatu 13), FI-00014, University of Helsinki, Finland. E-mail: timo.pajunen@helsinki.fi, risto.vaisanen@helsinki.fi
Saaristo, M. I. (1938–2008) & Koponen, S., Zoological Museum, University of Turku, FI-20014 Turku, Finland. E-mail: sepkopo@utu.fi

Walckenaeria furcillata (Menge, 1869) and *W. lepida* (Kulczynski, 1885) are reported from Finland. Their diagnostics with figures, and distributions and ecological requirements are given. Comparative drawings of genitalia for closely related *W. lepida* and *W. unicornis* O. P.-Cambridge, 1861 are presented. The identity of "*Pseudotigellinus"* subadults figured by Palmgren (1976) is discussed.

1. Introduction

The presence of *Walkenaeria furcillata* (Menge, 1869) in the Finnish spider fauna was not verified until 1993, when adult stages were found. Professor P. Palmgren found already in 1972 and 1975 two questionable subadult "*Pseudotigellinus*" specimens, which he considered to be not *W. furcillata (*sub *Tigellinus furcillatus),* due to the form of cephalic humps (Palmgren 1976).

The missing of *Walckenaeria lepida* (Kulczynski, 1885) from papers by P. Palmgren and his contemporaries was resulted by systematic misidentification of the species. *W. lepida* was determined for the first time from material collected in 1985. Because *W. lepida* is very similar to *Walckenaeria unicornis* O. P.-Cambridge, 1861 [*Cornicularia unicornis* (O. P.-Cambridge), Palmgren 1976], the collections of zoological museums of Helsinki and Turku universities were checked.

Many *W. lepida* specimens were found among *W. unicornis* and also a few among *Walckenaeria kochi* (O. P.-Cambridge, 1872) [*Cornicularia kochi* (O. P.-Cambridge), Palmgren 1976]. In this paper diagnostic differences of *W. lepida* compared with the relative species *W. unicornis* are clarified with figures.

2. Material and methods

This paper is based on the collections of the Zoological Museum of Finnish Museum of Natural History, University of Helsinki (MZH) and of the Zoological Museum, University of Turku (ZMUT). In addition, some recent records by a few arachnologists are included. The illustrations have been made by T. Pajunen. The claws of spiders were examined from intact specimens with stereomicroscope Leica S8APO. The resolution and magnification of the equipment were not quite sufficient for counting the teeth of the claws, and therefore the counts are given as estimates.

3. Results

3.1. *Walckenaeria furcillata*

Material:

Turku, Katariinanlaakso 670:323 (Finnish uniform grid coordinates), mixed forest, 16.6. 1980, 1 male, M. Saaristo leg., det. (ZMUT).

Tammela, Riihikallio 674:332, pine forest, 14.6.2000, 1 female, S. Koponen leg., det. (ZMUT).

Lammi, Evo, 6783:3399, pine dominated sapling, stony, 17.–30.5.1993, 1 male, pitfall trap, E10A, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Lammi, Evo, 6783:3399, pine dominated sapling, stony, 30.5.–13.6.1994, 2 females, pitfall trap, E10F, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Lammi, Evo, 6783:3399, pine dominated sapling, stony, 27.6–.11.7.1994, 4 males, pitfall trap, E10B, 1 male, pitfall trap, E9E, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Lammi, Evo, 6793:3399, pine dominated sapling, stony, 27.6.–11.7.1993, 1 male, pitfall trap, E9A, 1 female, window trap, E9C, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Lammi, Evo, 6793:3399, pine dominated sapling, stony, 25.7.–8.8.1994, 2 females, pitfall trap, E9D and E9F, 1 female, window trap, E10E, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Sulkava, Lohikoski, 6829:3593, spruce dominated forest, deep slope, 29.6.–13.7.1993, 1 male, pitfall trap, L5F, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Sulkava, Lohikoski, 6829:3599, pine dominated sapling, control, 15.–29.6.1994, 1 female, pitfall trap, L9F, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Sulkava, Lohikoski, 6829:3599, spruce dominated sapling, control, 15.–29.6.1994, 1 male, pitfall trap, L10E, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Sulkava, Lohikoski, 6829:3599, spruce dominated sapling, control, 13.–27.7.1994, 3 females, pitfall trap, L10A, L10B, S. Raivio, A. Ruuskanen and O. Viding leg. T. Pajunen det. (MZH).

Sääminki, Lohikoski, 683:359, sapling, 13.–30.6.1994, 1 male, pitfall trap, P. Siitonen leg. T. Pajunen det. (MZH).

Sääminki, Lohikoski, 683:360, old forest, 13.–30.6.1994, 1 male, pitfall trap, P. Siitonen leg. T. Pajunen det. (MZH).

Pyhäselkä, 692:365, 28.6–7.7.2006, birch forest, 5 males and 1 female, 1.8–9.8.2006, 5 females and 1 male, pitfall trap. J. Petrelius leg., S. Leppänen det.

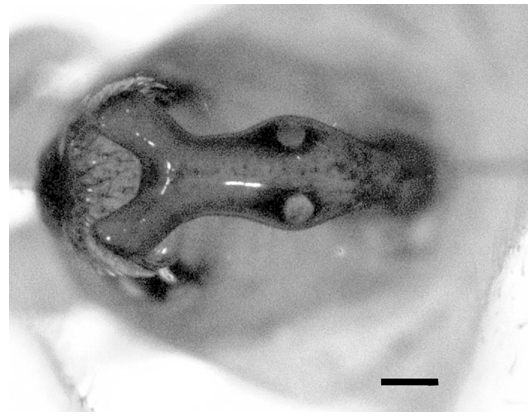

Fig. 1. *Walckenaeria furcillata*, male, cephalic area from above. Scale in all figures 0,1 mm. Photo Timo Pajunen.

Eno, Pirttivaara, Härkälössä, 6955:3617, edge of field, dense vegetation, 12.6.–23.7.2008, 1 male and 1 female, pitfall trap, S. Koponen, K. Nygrén and T. Pajunen leg., T. Pajunen det. (MZH).

Kontiolahti, Kuusojankangas, 6963:3655, warm and dry, less than ten years old pine sapling, 1.7.–17.7.2008, 1 male, pitfall trap, T. Saikkonen leg., det.

Eno, 6972:3660, rich, young birch stand, near the edge of the field closing up with growing trees, surrounded with mature pine and spruce forests, 1.7.–17.7.2008, 1 male and 1 female, pitfall trap, T. Saikkonen leg., det.

Mustasaari, Björkögrunden, 7042: 3203, *Calluna-Empetrum* heath, 5.6.–11.8.2008, 2 males, 2 females, 11.8.–8.9.2008, 2 juveniles, N. Fritzén, J. Haldin ja A. Törnroos leg., N. Fritzén det.

Mustasaari, Valassaaret, 7050:3204, *Calluna-Empetrum* heath, 8.7.2007, 1 male, sieving, I. Österblad leg., det.

Mustasaari, Valassaaret, 7050: 3204, *Calluna-Empetrum* heath, three different sites, 5.6.–15.7.2008, 20 males, 10 females, 15.7.– 11.8.2008, 2 males, 6 females, 11.8.–8.9.2008, 2 juveniles, N. Fritzén, J. Haldin ja A. Törnroos leg., N. Fritzén det.

Diagnosis. Adult male is easily recognized by its bifurcate long horn on cephalic area (Fig. 1) and

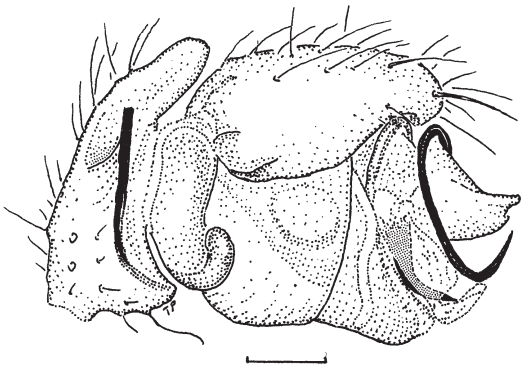

Fig. 2. *Walckenaeria furcillata*, male, pedipalp, ectal side.

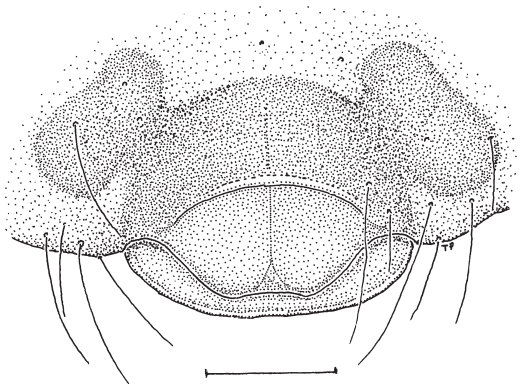

Fig. 3. *Walckenaeria furcillata*, female, epigyne.

pedipalp (Fig. 2). Adult females differ from other species by the structure of epigyne (Fig. 3, see also e.g. Nentwig et al. 2003).

Measurements of a randomly chosen male: cephalothorax 1.12 mm, femur I 0.9 mm, patella I 0.28 mm, tibia I 0.86 mm, metatarsus I 0.78 mm, tarsus I 0.5 mm. Trichobothrium on metatarsus I 0.56. Claws of the first leg have about five teeth. Viewing the claws with stereomicroscope, we could not confirm, whether there was an additional small tooth or not.

Distribution. The species has been found from Southern Finland only, up to about 63° 30'N. *W. furcillata* is widely spread over Europe, including European Russia and is found in Sweden but not in Norway (van Helsdingen 2007).

Habitat. *W. furcillata* has been found in Finland in dry heath and in different kind of forests, varying from drier and moister young forests to older forests, both coniferous and deciduous. Most specimens have been dwelling on the ground and a few have been caught from branches of trees with window traps. According to Nentwig et al. (2003) the species is thermophilous and has no special demands of its habitat.

Phenology. Adults can be found during the whole summer from May to August. Males seem to be active earlier in the summer whereas females occur also in later part of summer.

3.1.1. "Pseudotigellinus" sp.

Material:

Mäntyharju, 21.5.1972, south end of Räävelinlampi, on a tuft of grass, sunny precipice, subadult/young male, P. Palmgren leg., det. (MZH).

Mäntyharju, Mäkelä, 28.9.1975, very dry meadow, subadult/young male, P. Palmgren leg., det. (MZH).

Palmgren (1976: figs. 21:31–32) presented two "*Pseudotigellinus*" subadult/young males from Mäntyharju, southern Finland. One was found in May 1972 on a tuft of grass, at a sunny precipice and the other in September 1975 at a very dry meadow. Both have two prominent protuberances on the cephalic area. Posterior median eyes are positioned on the dorsolateral side of these protuberances. Both individuals are in the same stage of life and same size. Length of cephalothorax is about 0.8 mm. The position of the trichobothrium on metatarsus I is 0.54 (measured from the latter specimen). It differs from the measure given by Palmgren (1976: 0.67). Claws of first leg bear about five teeth each. Of these specimens Palmgren says that they cannot be *Walckenaeria furcillata,* due to the form of cephalic humps. Wunderlich (1979) proposed that these "*Pseudotigellinus*"-subadults could belong to the species *Walckenaeria vilbastae*, Wunderlich 1979.

We consider Palmgren's "*Pseudotigellinus*" subadults to be *W. furcillata* subadults. Humps on the head could be the two projections of the developing horn, which will later diverge from cephalothorax. This is still only speculative, because the preadult stages of *W. furcillata*-male are

not yet known. The position of trichobothria on metatarsus and the number of teeth on claws are similar in adult *W. furcillata* and the two "*Pseudotigellinus*"-specimens.

3.2. *Walckenaeria lepida*

Material:

Hanko, Tvärminne by, 664:328, spruce swamp forest, under loose bark, 11.7.1965, 1 female, P. Palmgren leg. T. Pajunen det. (MZH)

Vantaa, Sotunki, Kelopolku, junipers in a conifer forest, 66871:33988 (sample 407-N), 21.5. 2006, 2 females. R. A. Väisänen leg. T. Pajunen det. (MZH)

Elimäki, Kukonoja, junipers in a barren conifer forest, 67450:34749 (397-G), 7.9.2005, 1 male and 1 female. R. A. Väisänen leg. T. Pajunen det. (MZH)

Nastola, 675:334, June 1909, 1 male, A. J. Siltala leg. T. Pajunen det. (MZH)

Lauritsala, 677:335. 16.5.1948, 1 male, W. Hackman leg. T. Pajunen det. (MZH)

Mäntyharju, Tuoksuuniemi, junipers in a mixed forest, 68092:34753 (396-G), 7.9.2005, 1 male. R. A. Väisänen leg. T. Pajunen det. (MZH)

Ylöjärvi, 683:331, juniper, 6.9.1967, 1 male, I. Mäkisalo leg. (ZMUT)

Ruovesi, Musturi, 686:336, spruce dominated primeval forest, 20.–25.6.1985, 1 female, 26.–31.5.1985, 4 males, summer 1990, 3 males and 1 female, summer 1991, 1 male, pitfall trap, Y. Haila, E. Halme, J. Niemelä, T. Pajunen, P. Punttila and H. Tukia leg. T. Pajunen det. (MZH)

Ruovesi, Susimäki 6863:3354, mature spruce dominated managed forest, 1990, 2 males, Susimäki 6864:3354, 14.5.–25.6.1990, 1 male, pitfall trap, T. Pajunen leg, det. (MZH)

Ikaalinen, Seitseminen National Park, 687:331, 14–20 years old mixed forest, June–July 1991, 1 male, pitfall trap, T. Pajunen, P. Punttila and H. Tukia leg. T. Pajunen det. (MZH)

Ikaalinen ja Kuru, Seitseminen National Park, Multiharju, 6872:3311, spruce dominated primeval forest, 3.–13.6.1986. 1 female, 17.7. 1985, 1 female, 3.–10.6.1985, 1 male, pitfall trap, Y. Haila, E. Halme, J. Niemelä and T. Pajunen leg. T. Pajunen det. (MZH)

Ilomantsi, Parppeila, 695:370, *Picea*, 13.6.1967, 1 female, P. T. Lehtinen leg. (ZMUT)

Lieksa, Patvinsuo, Lahnasuo, 700:368, 13.7.1988, 1 female, I. Rutanen leg. T. Pajunen det. (MZH)

Kuhmo, Honkavaara, RA 22.3.IV, 7090:3633, pine dominated primeval forest. 0–2 m above ground, 11.–25.7.1994, 1 female, window trap, RA 12.3.II, 7091:3632, pine dominated primeval forest. 0–2 m above ground, 13.–27.6.1994, 1 male, window trap, P. Siitonen, K. Kyllönen, M. Malinen and M. Romppanen leg. T. Pajunen det. (MZH)

Vaala, Säräisniemi, 714:348, 16.6.1909, 1 female, Vuorentaus leg. T. Pajunen det. (MZH)

Pyhäjoki, Parhalahti, junipers in a rich deciduous forest, 71606:33694 (423-E), 1.8.2006, 1 adult male and 1 subadult male. R. A. Väisänen leg. T. Pajunen det. (MZH)

Simo, Simoskanoja, junipers in a barren spruce forest, 73068:34223 (389-G), 7.9.2004, 1 male and 1 female. R. A. Väisänen leg. T. Pajunen det. (MZH)

Rovaniemi, Salmijärvi, Lapin metsämuseo (enclosure of the Forest Museum of Lapland), junipers in a pine forest, 73767:34450 (211-H), 30.9.2000, 1 female; (415-I), 8.6.2007, 1 female. R. A. Väisänen leg. T. Pajunen det. (MZH)

Kemijärvi, Isokylä, junipers in a rich birch forest, 73977:35259 (417-D), 26.6.2006, 1 male and 1 female, R. A. Väisänen leg., T. Pajunen det. (MZH)

Utsjoki, Kevo, 774:350, June 1972, 2 males, S. Koponen leg. (ZMUT)

Russia: USSR, Murmansk (Lt), Lotta River 50 km E of Finnish/Russian border, 9.8.1967, 1 male, M. Meinander leg., T. Pajunen det. (MZH)

Diagnosis. The males of *Walckenaeria lepida* can be distinguished from the males of *Walckenaeria unicornis* by the tibial apophysis of pedipalp (Figs. 4 and 5). Lateral apophysis of *W. lepida* is strongly curved and pointing downwards, whereas apophysis of *W. unicornis* is less curved and points forward (Figs. 6 and 7).

Females can be identified by the structure of the epigyne. The edges of the central area of the epigyne of *W. lepida* are always convex (Fig. 8). The edges of *W. unicornis* are concave or parallel

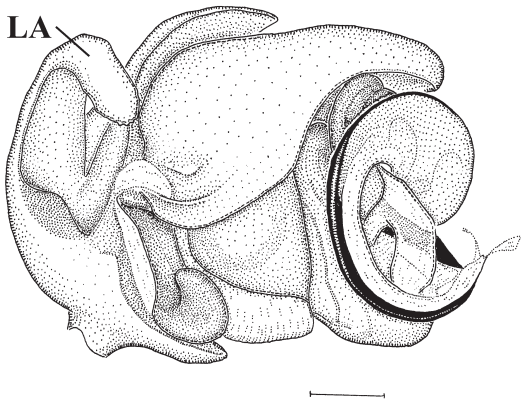

Fig. 4. *Walckenaeria lepida*, male, pedipalp, ectal side. LA lateral apophysis. Hairs excluded (Figs 4–11).

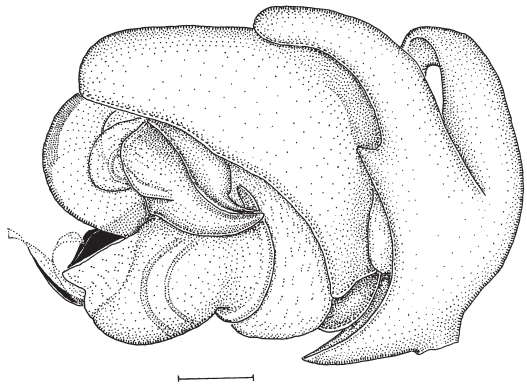

Fig. 5. *Walckenaeria lepida*, male, pedipalp, mesal side.

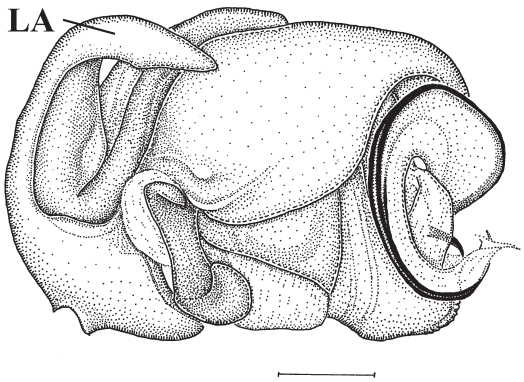

Fig. 6. *Walckenaeria unicornis*, male, pedipalp, ectal side. LA lateral apophysis.

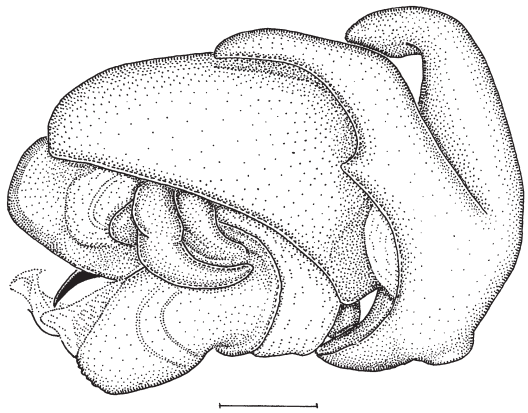

Fig. 7. *Walckenaeria unicornis*, male, pedipalp, mesal side.

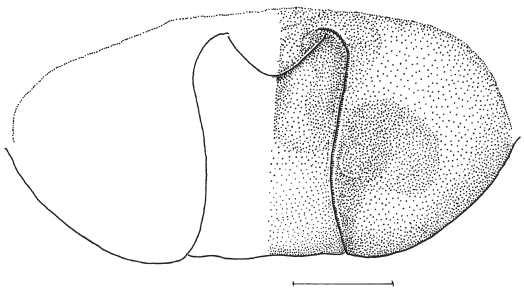

Fig. 8. *Walckenaeria lepida*, female, epigyne.

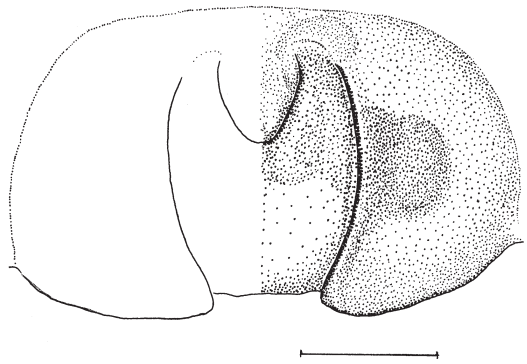

Fig. 9. *Walckenaeria unicornis*, female, epigyne.

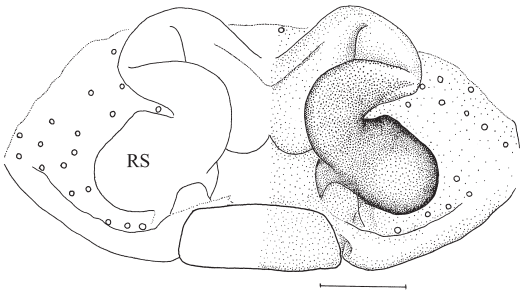

Fig. 10. *Walckenaeria lepida*, female, vulva, RS reseptacula seminis.

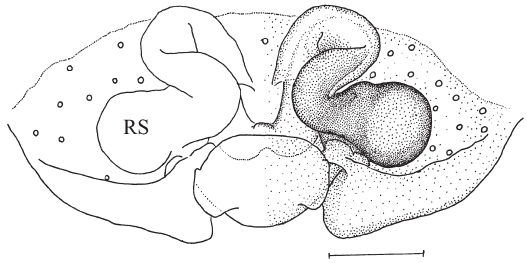

Fig.11. *Walckenaeria unicornis*, female, vulva, RS reseptacula seminis.

(Fig. 9). Differences in vulva structure are shown in Figures 10 and 11. The reseptacula seminis of *W. lepida* are a bit elongated compared to the round ones of *W. unicornis*.

W. lepida is slightly bigger than *W. unicornis*. Cephalothorax of *W. lepida* males 1.02 mm (0.97–1.04 mm, eight males measured), *W. lepida* females 1.12 mm (1.07–1.20 mm, seven females), while the cephalothorax of *W. unicornis* male is 0.90 mm (0.80–0.97 mm) and female 0.98 mm (0.94–1.03 mm), measured from a sample of ten specimens of both sexes.

Distribution. *Walckenaeria lepida* seems to be distributed over the whole Finland except the south-west part. The species has been described from Kamchatka (Kulczynski 1885) and it is widely spread in Russian Siberia, Ural Mountains being the western border (Eskov 1994). Here it is reported also from the Russian Kola peninsula (Murmansk area). It has also been found in Alaska, Canada and northern parts of USA (Millidge 1983). *W. lepida* has a Holarctic (nemoral-boreal) distribution (Marusik 1993; Marusik & Koponen 2005), but it has not yet been found in Sweden, Norway and West-Europe (van Helsdingen 2007).

Habitat. 76 samples containing 100–500 spiders were taken by beating at the height of 0.3 to 2 m from junipers (*Juniperus communis*) in Finland during the years 2000–2008. *W. lepida* occurred in eight (11%) of these; six males and seven females were found. In those eight samples, other spider species that occurred together with *W. lepida* in at least half of the samples were *Pityohyphantes phrygianus* (C. L. Koch, 1836) (in 8 samples), *Clubiona subsultans* Thorell, 1875 (6), *Theridion varians* Hahn, 1833 (6), *Theridion ohlerti* Thorell, 1870 (5). *Dolomedes fimbriatus* (Clerck, 1757) (5), *Drapetisca socialis* (Sundevall, 1833) (5), *Neriene peltata* (Wider, 1834) (5), *Araneus diadematus* Clerck, 1757 (4), *Entelecara congenera* (O. P.-Cambridge, 1879) (4), *Episinus angulatus* (Blackwall, 1836) (4), *Kaestneria dorsalis* (Wider, 1834) (4), *Tetragnatha dearmata* Thorell, 1873 (4) and *Xysticus audax* (Schrank, 1803) (4).

W. lepida was thus fairly common in juniper bushes and occurred in the south boreal, mid-boreal and north boreal vegetation zones. Bonity of forests varied from poor to rich and the dominating tree of the forests also varied greatly, being pine, spruce or deciduous trees. On the basis of the Finnish bush samples *W. lepida* is a generalist species, which belongs to juniper bush fauna in the boreal zone during the whole non-frost season.

Also the other samples in collections proves *W. lepida* to be a generalist species, which lives in ground layer, in bushes and at the lower branches of trees in different types and ages of forests.

Phenology. Adults can be found all the summer from May to September. Whole year sampling in 1985–1986 with pitfall traps at Musturi primeval forest, where many specimens were found, yielded in no records in winter months (Pajunen et al., unpublished data). Thus the species seems not to be active in winter.

4. Discussion

We consider Palmgren's "*Pseudotigellinus*" subadults to be *Walckenaeria furcillata* and not *W. vilbasteae* (contrary to Wunderlich 1979). Our opinion is based on the position of trichobothria and the number of teeth on claws; the cephalic humps could perhaps develop to a bifurcate horn.

Both *W. furcillata* and *W. lepida* seem to have a

tendency to increasing numbers recently, which is indicated for the latter species by its frequency in the sampling conducted in junipers. Apparently the lack of sampling is one primary reason why there are so few records of *W. lepida* as we know that there are also quite old records of the species. Although the species is not common, it can be found with reasonable effort now, when the biology of it is better known. The habitat requirements seem to be wider than those of the closely related *W. unicornis*, which prefers moister and more open habitats.

Also the climatic conditions might have been favourable to the species in recent years or decades.

Acknowledgements. We wish to thank Niclas Fritzén for discussions and data of his observations. Likewise we are grateful to Sanna Leppänen, Teemu Saikkonen and Ika Österblad, who provided their observations of *W. furcillata*. We also thank Kaarlo Nygrén for help in the field.

Walckenaeria furcillata **(Menge, 1869) ja *W. lepida*** **(Kulczynski, 1885) Suomessa (Araneae, Linyphiidae)**

Suomessa on kolmen viime vuosikymmenen aikana havaittu kaksi uutta *Walckenaeria*-hämähäkkilajia, *W. furcillata* ja *W. lepida*, (Araneae, Linyphiidae). Näitä lajeja ei ole vielä esitelty suomalaisessa määrityskirjallisuudessa, joten niiden esiintymisestä Suomessa tähän mennessä kertynyt tieto ja tunnistamisessa käytettävät tuntomerkit on koottu tähän.

Walckenaeria furcillata -hämähäkin kuuluminen Suomen lajistoon varmistui 1993, kun lajin aikuisia yksilöitä löydettiin. Laji on todennäköisesti elänyt täällä aiemminkin, sillä professori P. Palmgrenin 1972 ja 1975 keräämät arvoitukselliset, nuoret ”*Pseudotigellinus*”-yksilöt osoittautunevat myös tämän lajin edustajiksi. Hämähäkkien nuoruusvaiheilla ei ole yhtä selkeitä lajituntomerkkejä kuin aikuisilla, mikä selittää määritysongelmat. *W. furcillata* esiintyy Etelä-Suomen alueella ja näyttää yleistyvän nyt 2000-luvulla, mikä saattaa viitata ilmaston lämpenemiseen. Laji on lämmössä viihtyvä, mutta ei ole erityisen valikoiva ympäristönsä suhteen. Sitä on löydetty kuivilta kanervakankailta ja monenlaisista metsistä.

Walckenaeria lepida määritettiin Suomesta ensimmäisen kerran 1985. Samalla huomattiin, että lajia oli aiemminkin kerätty, mutta yksilöt järjestelmällisesti määritetty toisiin lajeihin kuuluviksi. Tämäkin laji näyttää vähitellen yleistyvän. *W. lepida* on levinnyt ympäri pohjoisen pallonpuoliskon; havaintoja on Pohjois-Amerikasta, Kanadasta, Siperiasta Venäjällä sekä Suomesta, ei kuitenkaan vielä Ruotsista ja Norjasta. Laji esiintyy koko Suomessa lounaisinta osaa lukuun ottamatta. Myös *W. lepida* on melko vaatimaton ympäristön suhteen. Sitä tavataan maassa, pensaissa sekä ainakin matalalla puiden oksilla eri-ikäisissä metsissä.

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