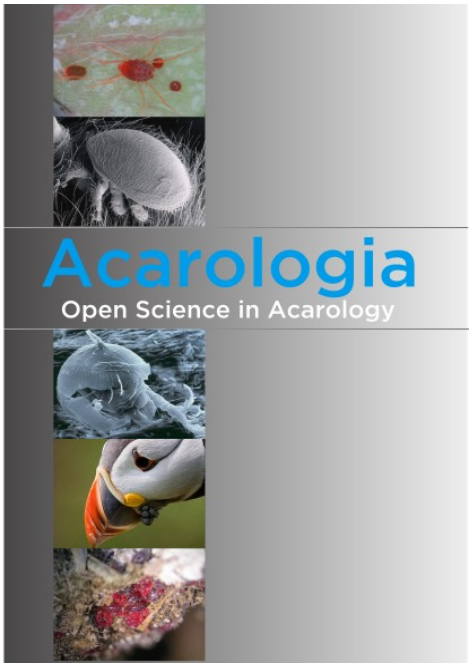

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REVISION OF THE GENUS *NEOSEIULELLA* MUMA (ACARI: PHYTOSEIIDAE). RE-DESCRIPTION OF SPECIES, SYNONYMY ASSESSMENT, BIOGEOGRAPHY, PLANT SUPPORTS AND KEY TO ADULT FEMALES

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ABSTRACT — Identification of species within the family Phytoseiidae is of primary importance for biological control programs. However, considerable disagreements between authors are often observed concerning the placement of species in genera. Moreover, considering the small number of available morphological characters and the poor knowledge of their reliability for species diagnostics, synonymies between several species could be questioned. This study aims to provide a taxonomic revision of a genus belonging to the sub-family Typhlodrominae: *Neoseiulella* Muma. Whereas the last revision of this genus (carried out in 1996) took into account 26 valid species, we propose now to include 47 species in the genus *Neoseiulella* based on type material observations. At first, three species (*Neoseiulella eiko*, *N. eleglidus* and *N. schusteri*) have been excluded from this genus, as their morphological attributes do not match the morphological characters which define the genus. Secondly, we also think that another species placed in the genus *Typhlodromus* (*Anthoseius*): *T.* (*A.*) *elisae*, has to be included in the genus *Neoseiulella*. Finally, several synonymies have been analysed and we conclude that: (i) *N. aceri* is a synonym of *N. squamiger* and provisionally of *N. aceris* (ii) *N. tiliarum* is a synonym of *N. formosa*, (iii) *N. transitans* is a synonym of *N. prunus,* and provisionally of *N. vollsella*, (iv) *N. manukae* is a synonym of *N. glenfieldensis* and (v) *Neoseiulella tuberculata*, *N. sexapori* and *N. arutunjani* are considered valid specific entities. A new synonymy between *Neoseiulella nesbitti* and *N. armidalensis* is also proposed. A standardised re-description of all the species of the genus is proposed and a key to the species for the adult females is provided. This study also gives an exhaustive compilation of all available information concerning the geographical distribution of species of *Neoseiulella* and their plant supports.

KEYWORDS — Taxonomy; morphology; identification; diagnoses

INTRODUCTION

Over the past fifty years, mites of the family Phytoseiidae Berlese (Acari: Mesostigmata) have been widely studied because of the ability of several species to control phytophagous mites and small insect pests in various crops worldwide (Kostiainen and Hoy 1996; McMurtry and Croft 1997). Taxonomy studies, especially those dealing with diagnosis, are thus of first importance to ensure biological control program successes. Furthermore, knowledge of Phytoseiidae diversity can open new insights for the control of new pests. Chant and McMurtry (1994, 2007) recognized 2,280 species of Phytoseiidae dispatched in three sub-families (Amblyseiinae, Phytoseiinae, and Typhlodrominae) and

84 genera. Species identification is mainly based on the morphological characters of females, as dorsal chaetotaxy, the shape and the setation of the ventral shields, the spermatheca shape, the setation of legs and the morphology and dentition of the chelicerae (Chant and McMurtry 2007). Identification of species is difficult, essentially because of the small number of available visible characters and of the poor knowledge on their reliability for species diagnostic. Thus, species validity (synonymy) is often questioned and disagreements between authors are noted in literature. Furthermore, as new taxa are discovered, as phylogenetic analyses are developped (Kanouh *et al.* 2010a), genera description and attributes could be modified, as well as the number of species belonging to them.

The aim of the present study is to provide an updated and complete revision of one genus belonging to the sub-family Typhlodrominae, tribe Typhlodromini: *Neoseiulella* Muma. The last revision of this genus carried out by Denmark and Rather in 1996 included 26 valid species, whereas in 2004, in the last world catalogue of the family Phytoseiidae, Moraes *et al.* reported 43 species, 35 being considered valid. In 2007, Chant and McMurtry in their world revision of the family have included 46 species and did not consider the previous synonymies. Furthermore, these latter authors did not take into account one additional species described in 2006. The genus *Neoseiulella* is thus currently assumed to include 46 species. However, doubts on some synonymies still exist as authors did not agree (Denmark and Rather 1984; Chant and Yoshida-Shaul 1989; Denmark and Rather 1996; Kolodochka 2009). The revision presently provides complete morphological descriptions of females based on the examination of type material and includes all the species reported in the genus *Neoseiulella*. Males are also described for some species for the first time. Moreorer, this paper presents an exhaustive compilation of all available information on geographical distribution of species of the genus and their plant supports. The present data set constitutes thus not only a taxonomic revision but also an actualised catalogue of the genus *Neoseiulella*.

The first part of the paper focuses on an historical review of the genus *Neoseiulella*. The morphological characters defining the genus *Neoseiulella*, and validity of species presently included in this genus are consequently analysed. Six cases of synonymy within this genus are then studied and discussed. Finally, redescriptions of the species that we consider valid, and a key to adult females, are provided.

HISTORICAL REVIEW OF THE GENUS *Neoseiulella*

A summary of the complex history of the genus *Neoseiulella* is given in the Table 1.

Neoseiulella tiliarum (Oudemans 1930), initially included in the genus *Typhlodromus* Scheuten, was the first species described within the genus *Neoseiulella*. Two other species were described later and also assigned to the genus *Typhlodromus*: *Neoseiulella nesbitti* (Womersley 1954) and *Neoseiulella aceri* (Collyer 1957).

In 1959, Chant proposed the *tiliarum* species group in the genus *Typhlodromus* and included in it these three species. He characterized this species group by the presence of 11 pairs of lateral setae on the dorsal shield, and three or four pairs of preanal setae on the ventrianal shield.

In 1961, Muma proposed two new genera, *Neoseiulella* including *N. nesbitti*, and *Typhloctonus* including *N. aceri* and *N. tiliarum*. These two genera differed by the number of setae on the sternal shield, and by the occurrence of the preanal seta JV3 and macrosetae on the leg IV.

In 1962, Wainstein proposed two new subgenera differentiated according to the number of preanal setae: *Nesbitteius* including *N. nesbitti* and *Kallistoseius* including *N. aceri* and *N. tiliarum*. At the same time, Pritchard and Baker (1962) included these three species in the genus *Typhlodromus* (*Seiulus*) Berlese. In 1966, Ehara also used the sub-genus *Typhlodromus* (*Seiulus*) to designate the *tiliarum* species group.

In 1972, Abbasova placed *N. tiliarum* and *N. aceri* in the genus *Seiulus*. In 1975, Tseng proposed a monotypic genus, *Shiehia*, for *Neoseiulella multispinosa* (Tseng). Wainstein (1977) adopted the genus

Typhloctonus proposed by Muma (1961) and divided it into three sub-genera: *Typhloctonus* (*Typhloctonus*), *T.* (*Neoseiulellus*) and *T.* (*Tasmanidromus*). Arutunjan (1977) and Kolodochka (1978) used the genus *Typhloctonus* for *Neoseiulella squamiger* (Wainstein), *N. formosa* (Wainstein) and *N. tuberculata* (Wainstein).

In 1981, Beglyarov used *Typhloctonus* as a subgenus in the genus *Seiulus*. Athias-Henriot and Fauvel (1981) proposed a new genus, *Pegodromus*, including in it *Neoseiulella crassipilis* (Athias-Henriot and Fauvel) and *N. squamiger*. Then, Lehman (1982) proposed a new monotypic genus, *Heteroseiulus* for

TABLE 1: A summary of the complex history of the genus *Neoseiulella* Muma

Year	Combination of genera proposed by authors	Considered species of the genus *Neoseiulella*	Author
1930	*Typhlodromus*	*tiliarum*	Oudemans
1954	*Typhlodromus*	*nesbitti*	Womersley
1957	*Typhlodromus*	*aceri*	Collyer
1959	*tiliarum* group in the genus *Typhlodromus*	*nesbitti, aceri, tiliarum*	Chant
1961	I. *Neoseiulella*	I. nesbitti	Muma
	II. *Typhloctonus*	II. *tiliarum, aceri*	
1962	I. *Typhlodromus* (*Nesbitteius*) section *nesbitteius*	I. *nesbitti*	Wainstein
	II. *Typhlodromus* (*Nesbitteius*) section *Kallistoseius*	II. *aceri, tiliarum*	
1962	*Typhlodromus* (*Seiulus*)	*nesbitti, aceri, tiliarum*	Pritchard and Baker
1966	*Typhlodromus* (*Seiulus*)	*nesbitti, formosa, tuberculata*	Ehara
1972	*Seiulus*	*aceri, tiliarum*	Abbasova
1974	*Typhloctonus*	*vollsella*	Chaudhri *et al.*
1975	*Shiehia*	*multispinosa*	Tseng
1977	I. *Typhloctonus* (*Typhloctonus*)	I. *aceri, tiliarum*	Wainstein
	II. *Typhloctonus* (*Neoseiulellus*)	II. *nesbitti*	
	III. *Typhloctonus* (*Tasmanidromus*)	III. *cottieri*	
1977	*Typhloctonus*	*formosa, tuberculata, squamiger*	Arutunjan
1978	*Typhloctonus*	*formosa, squamiger*	Kolodochka
1981	*Seiulus* (*Typhloctonus*)	*aceri, arutunjani, tiliarum, tuberculata*	Beglyarov
1981	*Pegodromus*	*crassipilis, squamiger*	Athias-Henriot and Fauvel
1982	*Heteroseiulus*	*aceris*	Lehman
1984	*Heteroseiulus* = *Typhloctonus;* *Typhloctonus* ≠ *Neoseiulellus* ≠ *Tasmanidromus*	*aceri* = *aceris*	Denmark and Rather
1989	*Neoseiulella, Typhloctonus, Shiehia, Pegodromus* and *Heteroseiulus* = *Typhlodromus*	26 species in the *tiliarum* species group	Chant and Yoshida-Shaul
1994	*Neoseiulella*	*tiliarum* species group, *cottieri* species group	Chant and McMurtry
1996	I. *Neoseiulella* (*Neoseiulella*)	I. 9 species	Denmark and Rather
	II. *Neoseiulella* (*Typhloctona*) (*Pegodromus* ≠ *Neoseiulella*)	II. 17 species	
2004	*Neoseiulella*	43 species (35 valid)	Moraes *et al.*
2007	*Neoseiulella*	46 species	Chant and McMurtry
2009	*Typhloctonus*	*tiliarum* (type species)	Kolodochka

Neoseiulella aceris (Lehman).

In 1984, Denmark and Rather considered valid the three sub-genera within the genus *Typhloctonus* proposed by Wainstein (1977), *Typhloctonus*, *Neoseiulellus* and *Tasmanidromus*. They also synonymised *Heteroseiulus* (Lehman) and *Typhloctonus.*

In 1989, in their revision of the *tiliarum* group within the genus *Typhlodromus*, Chant and Yoshida-Shaul considered 26 species and synonymised the genera *Neoseiulella, Typhloctonus, Shiehia, Pegodromus*, and *Heteroseiulus*.

Then in 1994, in the revision of the sub-families Phytoseiinae and Typhlodrominae, Chant and McMurtry divided the genus *Neoseiulella* in two species groups: the *tiliarum* species group (JV3 present) and the *cottieri* species group (JV3 absent).

In 1996, Denmark and Rather revised the genus *Neoseiulella* and also divided it into two sub-genera with three or four pairs of preanal setae: JV1, JV2, JV3 (present: *N.* [*Neoseiulella*], / absent: *N.* [*Typhloctona*]) and ZV2. Then, Kolodochka (2009) used the genus *Typhloctonus* for the species of the genus *Neoseiulella* occurring in Ukraine.

Still today, the definition of the genus *Neoseiulella* is not thus very clear, and species of the genus *Neoseiulella* could be included in other genera or in different sub-genera, depending on the author's opinions. In the present revision, as Chant and McMurtry (1994, 2007), we considered the genera *Typhloctonus*, *Heteroseiulus, Pegodromus*, and *Shiehia* junior synonyms of the genus *Neoseiulella*.

DEFINITION OF THE GENUS *Neoseiulella* MUMA

Neoseiulella Muma 1961: 295; Denmark and Rather 1996: 44; Chant and McMurtry 1994: 247; Moraes *et al.* 2004: 290; Chant and McMurtry 2007: 145. *Typhloctonus* Muma 1961: 299; Chaudhri *et al.* 1974: 231; Denmark and Rather 1984: 163; Kolodochka 2009: 484; Omeri 2009: 9 (Type species: *Typhlodromus tiliarum* Oudemans 1930a: 51). *Typhlodromus* (*Nesbitteius*) section *Nesbitteius* Wainstein 1962: 23 (Type species: *Typhlodromus nesbitti* Womersley 1954: 179).*Typhlodromus* (*Nesbitteius*) section *Kallistoseius* Wainstein 1962: 23 (Type species: *Typhlodromus tiliarum* Oudemans 1930: 51). *Typhlodromus* (*Nesbitteius*) (Wainstein) Arutunjan 1970: 19. *Typhlodromus* (*Seiulus*) Berlese, Pritchard and Baker 1962: 212-213; Ehara 1966: 16. *Shiehia* Tseng 1975: 48 (Type species: *Shiehia multispinosa* Tseng 1975: 48). *Typhloctonus* (*Neoseiulellus*) Muma, Wainstein 1977: 1416. *Typhloctonus* (*Typhloctonus*) Muma, Wainstein 1977: 1416. *Typhloctonus* (*Tasmanidromus*) Wainstein 1977: 1416. (Type species: *Typhlodromus cottieri* Collyer 1964: 640). *Seiulus* (*Typhloctonus*) Muma, Beglyarov 1981: 19; Karg 1983: 322. *Pegodromus* Athias-Henriot and Fauvel 1981: 71 (Type species: *Pegodromus crassipilis* Athias-Henriot and Fauvel 1981: 73). *Heteroseiulus* Lehman 1982: 236 (Type species: *Heteroseiulus aceris* Lehman 1982: 236). *Neoseiulella* (*Neoseiulella*) Denmark and Rather 1996: 44. *Neoseiulella* (*Typhloctona*) Denmark and Rather 1996: 44.

Type species: *Typhlodromus nesbitti* Womersley 1954: 179, by original designation.

Three genera are included in the tribe Typhlodromini within the sub-family Typhlodrominae: *Neoseiulella, Typhlodromus* and *Typhloseiulus* Chant and McMurtry. The genus *Neoseiulella* differs from the genus *Typhlodromus* by having both Z1 and S5 present. It differs from the genus *Typhloseiulus* essentially by the ventrianal shield, which is reduced (only one seta, JV2, inserted on the ventrianal shield) in *Typhloseiulus* (Chant and McMurtry 1994, 2007). In the present study, we consider the species of the genus *Neoseiulella* to have the following attributes:

Adult female with moderate to large body dimensions, dorsal shield varying from 260 to 480 μm in length, and (160 to 310 μm) in width (at level of s4), and (140 to 260 μm) (at level of Z1).

Dorsal shield — Absence of z6 together with the presence of z3, s6, Z1 and S5 (Chant and McMurtry 1994, 2007). In some species, both or one of the sublateral setae r3 and R1 are inserted on the dorsal shield, but usually they are situated on the interscutal membrane. The dorsal shield bears usually 19 pairs of setae: **j1**, **j3**, **j4**, **j5**, **j6**, **J2**, **J5**, **s4**, **s6**, **S2**, **S4**, **S5, z2**, **z3**, **z4**, **z5**, **Z1**, **Z4**, **Z5**; dorsal setal pattern 12A: 9B (Chant and McMurtry 1994). Setae J1

is present on three species (*N. aceri* but not visible on the drawing Fig 1, *N. montforti*, *N. myopori*); Chant and Yoshida-Shaul (1989) considered its presence as an "aberration" that does not affect the placement of such species. Usually, dorsal setae are smooth and Z4 and Z5 slightly serrated; but in some species all dorsal and sub-lateral setae are serrated. Dorsal shield bears one to seven pairs of solenostomes: gd1 (posterolateral to j3), gd2 (posteromediad to j4-z4), gd4 (posterolateral to s4), gd5 (posteromediad to z5), gd6 (anteromediad to Z1), gd8 (anterior to Z4), gd9 (anterior to S5). The peritreme is short in few species (extending to level of z4, z2 or between z2-j3), but is usually long (extending to level of j1, j3, or between j1-j3). It has a stippled surface, except for *N. elongata* (Ferragut and Pena-Estevez), that has a peritreme with an anterior surface striate. This latter characteristic is also found in the species of the genus *Typhloseiulus* but *N. elongata* differs from these species by the shape of the ventrianal shield (reduced in *Typhloseiulus*, not reduced in *N. elongata*) and the nature of dorsal setae (thorn-like in *Typhloseiulus*, simple in *N. elongata*).

Ventral shields — The female caudoventral pattern is JV: ZV; JV-3/ ZV; JV-3, 4/ ZV (Chant and McMurtry 1994). Sternal shield (35 to 95 μm long; 50 to 100 μm wide, at level of ST2), is smooth with two or three pairs of setae (ST1, ST2, ST3) and two pairs of poroids. A pair of metasternal setae (ST4) is inserted on separate platelets with a pair of small poroids. Genital shield smooth (95 to 170 μm long; 40 to 90 μm wide, at level of ST5), except for *N. crassipilis* that has genital shield distinctly reticulated. Three, four or six elongate platelets (for some authors genital sigilla in three pairs maximum) are situated between genital and ventrianal shields. For some species, these latter platelets or genital sigilla are fold under the genital shield. Ventrianal shield smooth, faintly striate, or reticulated (75 to 165 μm long; 45 to 170 μm wide, at level of ZV2), with three or four pairs of preanal setae: JV1, JV2, JV3 (present/ absent) and ZV2, usually with a pair of solenostomes *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4, and JV5) are situated on the integument surrounding the ventrianal shield. The caudoventral seta JV4 is absent for one species, *N. oleariae* (Collyer). This absence is also found in the species of the tribes Typhloseiopsini and Metaseiulini in the sub-family Typhlodrominae (Chant and McMurtry 1994). However, *N. oleariae* differs from these species by the presence of both Z1 and S4. The primary metapodal plate or inguinal sigilla for some authors (18 to 40 μm long; 2 to 11 μm wide) is elongate. The secondary metapodal plate (or inguinal sigilla) is of about 1/3 as long as the primary one. Some poroids surround the ventrianal shield.

Spermatheca — The cervix (2 to 16 μm long) has a cup- or U-shaped type, with atrium nodular to indistinct.

Chelicera — One to 13 teeth, without or usually with a *pilus dentilis*, are observed on the fixed digit of the chelicera. The movable digit (20 to 60 long) is edentate in some species but usually with 1 to 4 teeth.

Legs — The chaetotactic formulae of femorae, genuae, tibiae of legs I to IV are constant except for genu of leg II: femur I: 2-5/3-2; femur II: 2-5/2-1; femur III: 1-3/1-1; femur IV: 1-3/1-1; genu I: 2-2/1, 2/1-2; genu II: variable (see below); genu III: 1-2/1, 2/0-1; genu IV: 1-2/1, 2/0-1; tibia I: 2-2/1, 2/1-2; tibia II: 1-1/1, 2/1-1; tibia III: 1-1/1, 2/1-1; tibia IV: 1-1/1, 2/0-1. Except for *Neoseiulella carmeli* (Rivnay and Swirski) in which the genu II bears six setae (1-2/0, 2/0-1), the genu II bears seven (2/0-1, 2-2/0) or eight (2-2/1, 2/0-1) setae. In some species, one or two macrosetae are present on the leg III, but usually no macroseta is observed on the legs I-III. In some species, macroseta is also absent on the leg IV, but usually leg IV bears at least one macroseta.

MATERIAL AND METHODS

Type materials of the species of the genus *Neoseiulella* have been examined (whenever possible) and measured with a phase and differential interference contrasts microscope (Leica DMLB, Leica Microsystèmes SAS, Rueil-Malmaison, France) (40x magnification). All the measurements are given in micrometers (μm) and all measurements were performed with Perfect Image v. 7.6 software (Clara Vision). When more than one specimen was measured, mean and ranges (minimum – maximum)

TABLE 2: Morphological characteristics of *Neoseiulella celtis* (after Denmark and Rather 1996); *N. compta* (after Chant and Yoshida-Shaul 1989); *N. multispinosa* (after Tseng 1975); *N. vollsella* (after Denmark and Rather 1984)

	N. celtis	*N. compta*	*N. multispinosa*	*N. vollsella*
Dorsal Shield length	369	286	313	326
Dorsal Shield width (at s4)	185	?	176	286
Dorsal Shield width (at Z1)	?	156	?	?
Dorsal Shield reticulation	reticulated	reticulated	reticulated	reticulated
j1 length	20	12	12.5	18
j3 length	25	13	12.5	21
j4 length	16	10	7.5	13
j5 length	17	10	7.5	16
j6 length	20	13	7.5	16
J2 length	25	13	7.5	18
J5 length	11	6	14	8
z2 length	19	9	12.5	18
z3 length	24	11	12.5	21
z4 length	22	12	12.5	21
z5 length	17	10	7.5	16
Z1 length	20	13	10	23
Z4 length	20	16	20	26
Z5 length	47	17	15	39
s4 length	24	10	12.5	26
s6 length	28	12	12.5	18
S2 length	32	12	12.5	26
S4 length	32	15	12.5	26
S5 length	26	17	15	18
r3 length	28	11	10.5	23
R1 length	25	11	12.5	18
gd1 presence	absent	absent	?	?
gd2 presence	absent	absent	?	?
gd4 presence	absent	absent	?	?
gd5 presence	absent	absent	?	?
gd6 presence	absent	absent	?	?
gd8 presence	absent	present	?	?
gd9 presence	present	absent	?	?
Sternal Shield length	?	?	67	?
Sternal Shield width	?	?	57.5	?
ST3 on/off Sternal Shield	on	?	on	on
Genital Shield width	?	?	?	?
Ventrianal Shield length	?	84	100	?
Ventrianal Shield width	?	77	111	?
Ventrianal Shield reticulation	smooth	smooth	reticulated	smooth

Measurements values of the different parts of the body are expressed in micrometers (μm).

TABLE 2: Continued.

	N. celtis	*N. compta*	*N. multispinosa*	*N. vollsella*
JV3 presence/absence	present	present	present	present
Solenostomes / ventrianal shield	present	present	present	present
JV5 length	?	11	?	?
Primary metapodal plate length	?	?	37	?
Numbers of teeth on the fixed digit	6	4	4	7
pilus dentilis presence/absence	0	1	?	?
Numbers of teeth of movable digit dentation	2	0	0	2
Movable digit length	?	15	?	?
Numbers of setae/ genu II	7	?	?	?
Macrosetae on genu IV (length)	absent	absent	absent	present (16)
Macrosetae on tibia I (length)	absent	absent	absent	present (16)
Macrosetae on basitarsus IV (length)	present (41)	absent	absent	present (31)
Peritreme level	j1	j1	j1	j1
Spermatheca shaped	cup-shaped	?	cup-shaped	?

Measurements values of the different parts of the body are expressed in micrometers (μm).

were provided. The kind of material (holotype, paratype, syntype, lectotype and/or paralectotype) and the institution or the museum where this material is deposited are provided in the redescription of each species. Setal nomenclature used in this paper follows Lindquist and Evans (1965) as adapted by Rowell *et al.* (1978) for the Phytoseiidae, with modifications for the caudal region as given by Lindquist (1994). Idiosomal gland nomenclature follows Athias-Henriot (1975) and Swirski *et al.* (1998).

The type materials of 41 species were examined. Despite repeated requests, it has been impossible to borrow the type materials of the four following species: *N. celtis* (Denmark and Rather) from India, *N. compta* (Corpuz-Raros) from Philippines, *N. multispinosa* (Tseng) from Taiwan, and *N. vollsella* (Chaudhri, Akbar and Rasool) from Pakistan. Detailed characteristics of these latter species were thus taken from the original descriptions and re-descriptions (Table 2). All other species were redescribed, even for synonyms in order to have objective arguments based on the real observation and study of morphological characters. This was done in order to establish synonymies on scientific bases and not on claimed bases.

Data on the geographical distribution and plant supports were mainly obtained from the world catalogue of the family Phytoseiidae (Moraes *et al.* 1986, 2004), from the original descriptions and from all the other publications reporting species of the genus *Neoseiulella*.

RESULTS

The result section is divided in five parts. The first part presents species that have been eliminated from the genus and those newly included. The second part presents a discussion on synonymies emphasized in literature. The third section deals with new suspected synonymies. The fourth part provides a re-description of the species we consider valid. Lastly, a key for female identification is proposed in the fifth part.

1. The species considered as belonging to the genus Neoseiulella

Are all the species presently known as Neoseiulella included into this genus?

Among the 46 species presently considered, three have been excluded from the genus *Neoseiulella*, as

their attributes do not fit the morphological characters defining it. These species are *N. schusteri*, *N. eiko* and *N. eleglidus*.

(i). Neoseiulella schusteri (Youssef and El-Brollosy)

Typhlodromus schusteri Youssef and El-Brollosy *in* Zaher 1986: 129.

Neoseiulella schusteri (Youssef and El-Brollosy) Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147.

This species was not included in the genus *Neoseiulella* in the previous revisions of Chant and Yoshida-shaul (1989) and Denmark and Rather (1984, 1996). However, it was considered a member of the genus *Neoseiulella* in the last world catalogue of the family Phytoseiidae (Moraes *et al.* 2004), and then in the revision of the family (Chant and McMurtry 2007). As it has been impossible to borrow and thus to observe the type specimens (deposited in Plant Protection Department, Faculty of Agriculture, Cairo University, Egypt), an attentive examination of the dorsal chaetotaxy of the female, based on the original description, was carried out. We observe that the dorsal seta z3 is absent. This latter character with the presence of nine pairs of lateral setae on the dorsal shield (j3, z2, z4, s4, s6, S2, S4, S5, Z5) keys to the species *Cydnoseius negevi* (Swirski and Amitai), tribe Galendromimini (sub-family Typhlodrominae). El-Brollosy (personal comm. 2008) confirmed that *N. schusteri* had been misidentified, and that it is a junior synonym of *C. negevi*.

(ii). Neoseiulella eleglidus (Tseng)

Typhlodromus (*Typhlodromus*) *eleglidus* Tseng 1983: 64-66. *Typhlodromus eleglidus* (Tseng) Wu *et al.* 1991: 82. *Neoseiulella eleglidus* (Tseng) Moraes *et al.* 2004: 293; Chant and McMurtry 2007: 147.

This species was not included in the genus *Neoseiulella* in the revisions of Chant and Yoshida-shaul (1989) and Denmark and Rather (1984, 1996). However, it was included in the genus *Neoseiulella* in the last world catalogue (Moraes *et al.* 2004), and then in the revision of the family (Chant and McMurtry 2007). It has been impossible to borrow and thus to observe the type specimens (deposited in Plant Quarantine Laboratory, Tainan Branch, Bureau of Commodity Inspection and Quarantine, Tainan, Taiwan). However, the original description of this species shows 18 pairs of setae on the dorsal shield (j1, j3, j4, j5, j6, J2, J5, z2, z3, z4, z5, Z4, Z5, s4, s6, S2, S4, S5) and 2 sub-lateral setae (r3 and R1). Because of the absence of seta Z1 and presence of seta S5, this dorsal setal pattern (12A: 8B) keys to the genus *Typhlodromus* (*Anthoseius*) De Leon (tribe Typhlodromini, sub-family Typhlodrominae).

(iii). Neoseiulella eiko Walter

Neoseiulella eiko Walter 1997: 335; Moraes *et al.* 2004: 293; Chant and McMurtry 2007: 147.

The examination of the type materials of this species shows that Z1 is absent, and Z2 is present. These two characters with the presence of z3, s6 and S5, and the absence of z6 clearly constitute a new dorsal chaetotaxic pattern within the family Phytoseiidae. We therefore propose species to be included in a new genus in the tribe Typhlodromini (sub-family Typhlodrominae). The description of this new genus will be on the scope of another publication. Material examined. The female holotype and three female paratypes, collected by Walter (1995) on leaves of rainforest trees near the Boulders (Babinda, Queensland, Australia). Type materials are deposited in the UQIC, Department of Entomology, University of Queensland, St Lucia, Australia.

Are there species currently placed in other genera that in fact belong to the genus Neoseiulella?

Working on the genus *Typhlodromus* (*Anthoseius*), we observed that the species *Typhlodromus* (*Anthoseius*) *elisae* (Schicha and McMurtry 1986) might be included in the genus *Neoseiulella.* Schicha and McMurtry (1986), when described this species in the genus *Typhlodromus*, stated the absence of S5 on the dorsal shield. Furthermore, they drew nine pairs of ventrianal setae (4 preanals and 5 caudoventrals) whereas Phytoseiidae only could have eight (Chant and McMurtry 2007). As no species of Phytoseiidae presently described have the combination of characters beared by *T.* (*A.*) *elisae*: absence of S5, presence of both Z1 and S2, and five pairs of caudoventral setae, one of the hypotheses to explain such an

aberration would be that one of the caudoventral setae might correspond to the seta S5. If S5 is effectively present, *T.* (*A.*) *elisae* would key to the genus *Neoseiulella*. Chant and Yoshida-Shaul (1989) also considered this hypothesis as they thought that S5 might be present (despite the poor conditions of the holotype). They thus included this later species in the *tiliarum* group. However, Denmark and Rather (1996) did not agree with this hypothesis, and consequently, excluded it from the genus *Neoseiulella*. This species was then cited in the sub-genus *Typhlodromus* (*Anthoseius*) De Leon in the world catalogue of the family Phytoseiidae (Moraes *et al*. 2004) and in the last revision of the family (Chant and McMurtry 2007). However, the examination of the holotype (Figure 1) clearly shows that S2 and Z1 (in the original description) are both present. This species thus does not belong to the genus *Typhlodromus* (*Anthoseius*) but to the genus *Neoseiulella*.

The questionements concerning *T.* (*A.*) *elisae* should alert us on the fact that in the literature other similar cases could exist, i.e. species placed in genera but clearly not belonging to them. In a further work, it would be worth to check for this.

Neoseiulella elisae (Schicha and McMurtry) (Figure 1)

Typhlodromus elisae Schicha and McMurtry 1986: 177; Chant and Yoshida-Shaul 1989: 1023-1024; Schicha 1987: 152, 154. *Typhlodromus* (*Anthoseius*) *elisae* Schicha and McMurtry Moraes, 2004: 322.

Adult female (Figure 1a – d)

Dorsal shield (Figure 1a) — Dorsal shield strongly reticulated, more heavily sclerotized on dorsocentral area of the shield: length 485; width 300 (at level of s4 and at level of Z1). Three pairs of solenostomes: gd5, gd8, and gd9 and 1 pair of poroids clearly visible. Sub-lateral setae (r3 and R1) on the lateral margin. Bearing 19 pairs of setae, all dorsal and sub-lateral setae smooth: j1 22; j3 33; j4 18; j5 28; j6 42; J2 55; J5 18; z2 25; z3 25; z4 30; z5 30; Z1 43; Z4 60; Z5 55; s4 43; s6 50; S2 63; S4 55; S5 50; sub-lateral setae r3 38 and R1 40. Peritreme extending anteriorly to level of j1.

Ventral shields (Figure 1b) — Sternal shield lightly reticulated, 70 long and 50 wide (at level of ST2), with three pairs of setae (ST1, ST2 and ST3) and two pairs of small solenostomes. The fourth pairs, the metasternal setae (ST4) on separate platelets. A pair of small pores accompanying ST4. Genital shield lightly reticulated, 145 long and 70 wide (at level of ST5). Four elongate platelets or genital sigilla separating the genital and ventrianal shields not discernible on the specimen examined. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular, distinctly reticulated throughout, 143 long and 133 wide (at level of ZV2), with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of small circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 50 long, smooth.

Spermatheca (Figure 1c) — Cervix 20 long, cone-shaped.

Chelicera — Not visible.

Legs (Figure 1d) — Measurements of legs: leg I 356; leg II 270; leg III 288; leg IV 388. Seven setae (2-2/0, 2/0-1) on the genu II. Legs much shorter than the dorsal shield and macrosetae only on leg IV, SgeIV: 13, Sti IV: 40 with tip tapered, St IV: 28.

Material examined — The female holotype deposited in the New South Wales Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Forest Road, Orange NSW 2800, Australia.

Adult male — The male of this species is unknown.

Previous reports — *N. elisae* is only known from Western Australia on *Eucalyptus* sp. (Myrtaceae).

We thus consider 44 valid species in the genus *Neoseiulella* in the followings parts of this paper.

2. Are the synonyms previously suspected valid or not?

Six synonymies (including 15 species) have been advanced by different authors (Denmark and Rather 1984; Chant and Yoshida-Shaul 1989; Denmark and Rather 1996; Moraes *et al.* 2004; Kolodochka 2009). In the present paper, we will

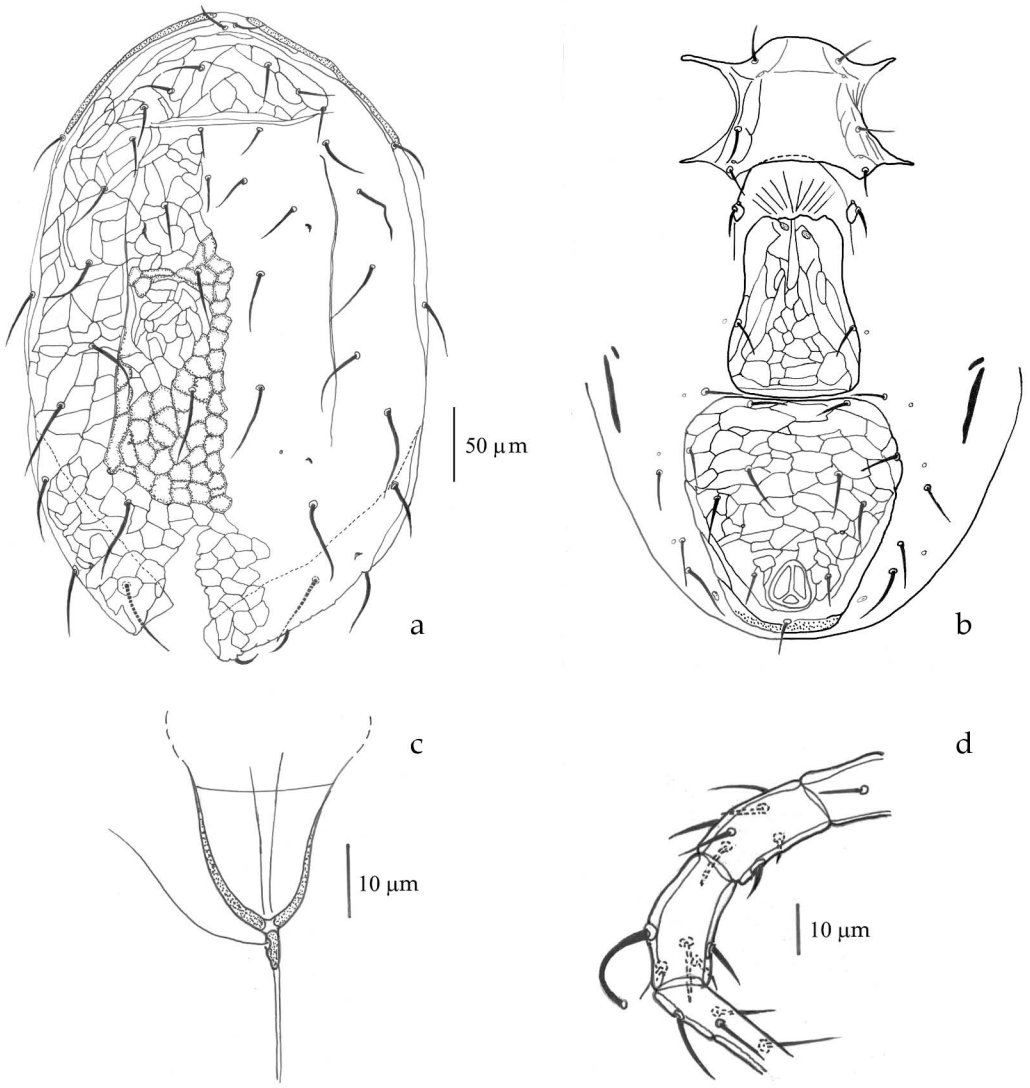

FIGURE 1: *Neoseiulella elisae* (Schicha and McMurtry). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

only focus on five of them, as it has been impossible to borrow and examine the type materials of *Neoseiulella compta*, *N. multispinosa*, and *N. vollsella* despite repeated requests during three years. For each synonymy, we present a complete description of the species based on the type materials.

(i). Neoseiulella aceri (Collyer), *N. squamiger* (Wainstein) and *N. aceris* (Lehman)

Neoseiulella squamiger was assumed to be a tentative junior synonym of *N. aceri* by Livshitz and Kuznetsov (1972) and Kolodochka (1986, 2009). Based on the examination of type materials, Denmark and Rather (1984, 1996) considered *N. aceri* to be different from both *N. squamiger* and *N. aceris*, and proposed that *N. aceris* as a junior synonym of *N. squamiger,* whereas Chant and Yoshida-Shaul (1989) considered that *N. aceri* was a senior synonym of both *N. squamiger* and *N. aceris*.

Neoseiulella aceri (Collyer) (Figure 2)

Typhlodromus aceri Collyer 1957: 199-200; Chant 1958: 626; Hirschmann 1962: 12; Livshitz and Kuznetsov 1972: 20; Chant and Yoshida-Shaul 1989: 1013. *Typhlodromus* (*Typhlodromus*) *aceri* (Collyer) Chant 1959: 65; Westerboer and Bernhard 1963: 565-568. *Typhloctonus aceri* (Collyer) Muma 1961: 299; Denmark and Rather 1984: 166-167; Kolodochka 1986: 30-31; Moraes *et al.* 1986: 232; Kolodochka 2009: 486-487. *Typhlodromus* (*Nesbitteius*) *aceri* (Collyer) Wainstein 1962: 23. *Seiulus aceri* (Collyer) Abbasova 1972: 22; Karg and Edland 1987: 387; Steeghs *et al.* 1993: 24. *Seiulus* (*Typhloctonus*) *aceri* (Collyer) Beglyarov 1981: 19. *Neoseiulella* (*Typhloctona*) *aceri* (Collyer) Denmark and Rather 1996: 60. *Neoseiulella aceri* (Collyer) Moraes *et al.* 2004: 290; Chant and McMurtry 2007: 147.

Adult female (Figure 2a – d)

Dorsal shield (Figure 2a) — Dorsal shield distinctly reticulated throughout: length 318 (312 – 326), width 170 (166 – 174) (at level of s4) and 201 (198 – 207) (at level of Z1). Five pairs of small solenostomes on the dorsal shield: gd1, gd2, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all serrated: j1 16 (15 – 17); j3 26 (25 – 26); j4 18 (17 – 18); j5 18 (17 – 18); j6 24 (23 – 25); J2 31 (30 – 31); J5 14 (13 – 14); z2 21 (20 – 22); z3 26; z4 27; z5 16 (15 – 16); Z1 30 (28 – 31); Z4 35; Z5 38 (37 – 39); s4 31; s6 31 (30 – 31); S2 31; S4 26 (25 – 26); S5 14 (13 – 15); sub-lateral setae r3 21 (20 – 21) and R1 20. A pair of dorsal setae J1 (32) on one of the syntype females examined. Peritreme extending anteriorly to the level of j3 or between z2-j3.

Ventral shields (Figure 2b) — Sternal shield 37 (34 – 40) long and 53 (51 – 58) wide (at level of ST2), is smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids (posterior to ST1; anterior to ST3). The pair of sternal setae ST3 on an elongate projection of the sternal shield. A pair of metasternal setae (ST4) on separate platelets with a pair of small poroids. Genital shield 126 (118 – 132) long and 60 (58 – 61) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped, 99 (96 – 101) long and 83 (82 – 86) wide (at level of ZV2), distinctly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of solenostomes *gv3* posterior to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 14 (13 – 14) long, smooth. Primary metapodal plate or inguinal sigillum 30 (26 – 31) long and 3 (2 – 4) wide.

Spermatheca (Figure 2c) — Cervix 4 (3 – 5) long, cup-shaped, with an enlarged atrium.

Chelicera (Figure 2d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 22 (20 – 23) long, edentate. Legs. Measurements of legs: leg I 225 (210 – 231); leg II 204 (190 – 222); leg III 212 (190 – 225); leg IV 249 (233 – 270). Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs. Material examined. Four female syntypes deposited in the British Museum of Natural History = BMNH, Cromwell Road, London, UK.

Adult male (Figure 2e, f)

Described by Collyer (1957), Chant (1958) and Denmark and Rather (1984, 1996). Dorsal shield chaetotaxy similar to the female. Ventrianal shield

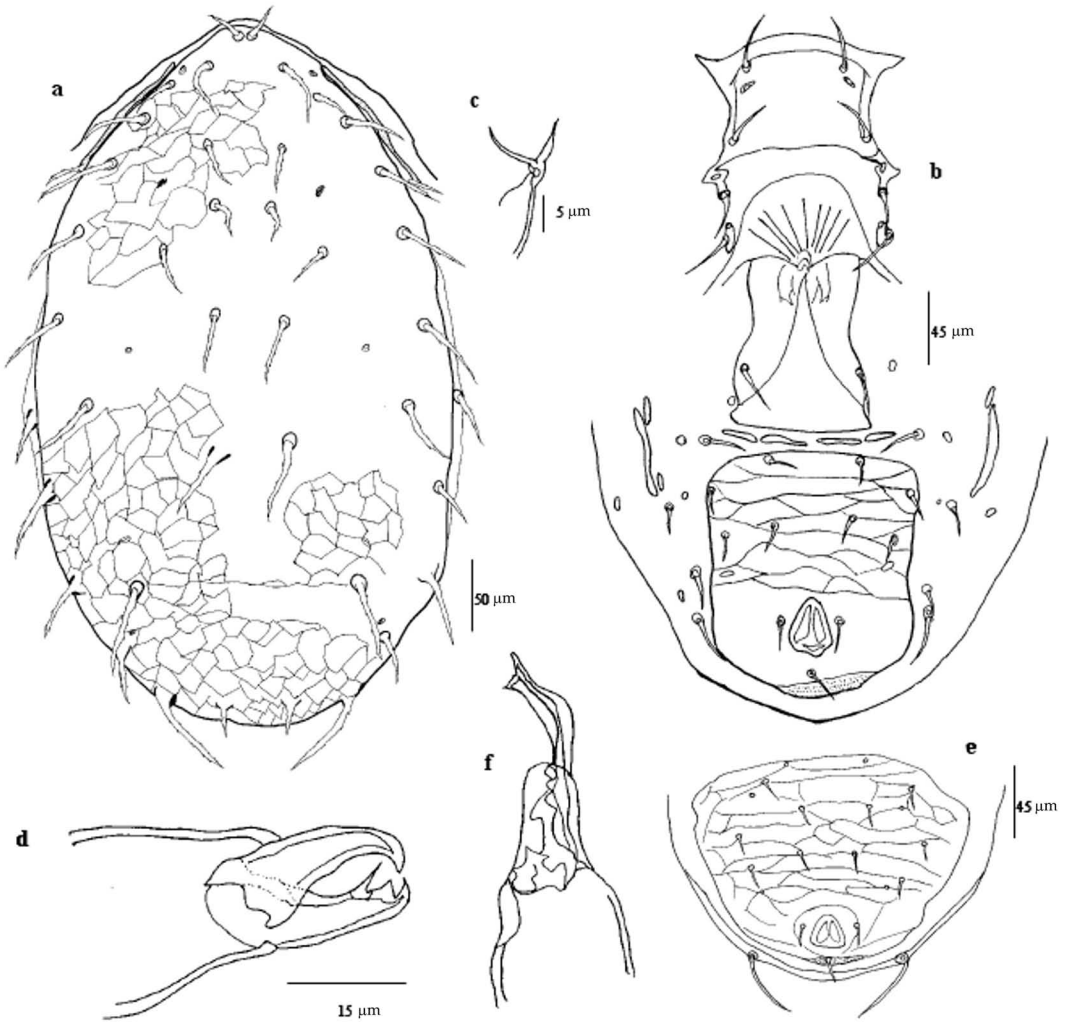

FIGURE 2: *Neoseiulella aceri* (Collyer). Female (syntype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (syntype): e – ventrianal shield; f – spermatodactyl.

97 long and 138 wide, distinctly reticulated and with five pairs of preanal setae and three pairs of poroids. Spermatodactyl with a terminal foot, and with a non-enlarged toe. This description is based on one male syntype.

Previous reports — *N. aceri* is only known from the West-Palaearctic and Nearctic areas. However, its occurrence in the Nearctic area (three records) might be due to an introduction. Countries from which this species is reported are: Azerbaijan (Abbasova 1972); Belgium (André 1986); Croatia (Tixier *et al.* 2010); Czech Republic (Kabicek 2003; Kabicek and Rehakova 2004; Kabicek 2005, 2010;); England (Collyer 1957); Finland (Tuovinen and Rokx 1991; Tuovinen 1993); France (Chant and Yoshida-Shaul 1989); Germany (Balder *et al.* 1999); Hungary (Szabo 1980; Ripka 1998, 2006); Italy (Ragusa and Paoletti 1985; Duso *et al.* 1993, 2004); Moldova (Beglyarov and Malov 1977); Norway (Karg and Edland 1987); Sweden (Steephs *et al.* 1993); Turkey (Cobanoglu 1996, 2000); Ukraine (Livshitz and Kuznetsov 1972; Akimov *et al.* 2007; Kolodochka and Omeri 2007; Kolodochka 2009); USA (Chant 1959b; Chant and

Yoshida-Shaul 1989; Congdon 2002).

Neoseiulella aceri was collected from a wide range of plant supports: *Acer campestre* L., *A. macrophyllum* Pursh, *A. platanoides* L., *A. pseudoplatanus* L., *Acer* sp. (Aceraceae); *Aesculus hippocastanum* L. (Hippocastanaceae); *Alnus incana* (L.) Moench, *Carpinus betulus* L., *Corylus avellana* L. (Betulaceae); *Juglans regia* L. (Juglandaceae); *Juniperus sabina* L. (Cupressaceae); *Morus alba* L. (Moraceae); *Prunus* (*Cerasus*) sp., *Prunus armeniaca* L., *Prunus* sp., *Rubus* sp. (Rosaceae); *Quercus ilex* L. (Fagaceae); *Trifolium pratense* L. (Fabaceae); *Zelkova* sp. (Ulmaceae).

Neoseiulella squamiger (Wainstein) (Figure 3)

Typhlodromus squamiger Wainstein 1960: 689-690; Chant and Yoshida-Shaul 1989: 1013. *Typhlodromus* (*Nesbitteius*) *squamiger* (Wainstein) Arutunjan 1970: 19. *Typhloctonus squamiger* (Wainstein) Wainstein 1973: 176; Chaudhri *et al.* 1974, 231; Kolodochka 1974a: 27; Arutunjan 1977: 55; Kolodochka 1978: 50-51; Denmark and Rather 1984: 173-174; Moraes *et al.* 1986: 233. *Pegodromus squamiger* (Wainstein) Athias-Henriot and Fauvel 1981: 74. *Neoseiulella* (*Typhloctona*) *squamiger* (Wainstein) Denmark and Rather 1996: 61-62. *Neoseiulella squamiger* (Wainstein) Moraes *et al.* 2004: 291; Chant and McMurtry 2007: 147.

Adult female (Figure 3a – d)

Dorsal shield (Figure 3a) — Dorsal shield distinctly reticulated throughout: 342 long, 184 (at level of s4) and 210 (at level of Z1). Five pairs of small solenostomes on the dorsal shield: gd1, gd2, gd6, gd8, and gd9 and no poroid visible. Sub-lateral setae r3 on the lateral margin and R1 on the dorsal shield. Dorsal shield bearing 20 pairs of setae (R1 on dorsal shield) all serrated: j1 14; j3 20; j4 17; j5 16; j6 21; J2 29; J5 13; z2 20; z3 25; z4 28; z5 15; Z1 28; Z4 35; Z5 42; s4 29; s6 30; S2 34; S4 27; S5 17; sublateral setae r3 20 and R1 20. Peritreme extending anteriorly to the level of j3.

Ventral shields (Figure 3b) — Sternal shield 37 long and 53 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids (posterior to ST1; anterior to ST3). ST3 on an elongate projection of the sternal shield. A pair of metasternal setae (ST4) on separate platelets with a pair of small poroids. Genital shield 130 long and 60 wide (at level of ST5), smooth. Four elongate platelets or sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped 103 long and 86 wide (at level of ZV2), distinctly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of solenostomes *gv3* posterior to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 17 long, smooth. Primary metapodal plate or inguinal sigillum 30 long and 3 wide.

Spermatheca (Figure 3c) — Cervix 4 long, cup-shaped, with an enlarged atrium.

Chelicera (Figure 3d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 25 long, is edentate.

Legs — Measurements of legs: leg I 227; leg II 209; leg III 211; leg IV 239. Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female holotype deposited in the ASU, Institute of Zoology, Academy of Sciences, Kiev, Ukraine.

Adult male (Figure 3e, f) Described by Denmark and Rather (1984, 1996).

Dorsal shield chaetotaxy is similar to the female. Ventrianal shield 103 long and 142 wide, distinctly reticulated and with five pairs of preanal setae and three pairs of poroids. Spermatodactyl with a terminal foot, and a slightly enlarged toe.

This description is based on one of the male specimens of our collection (Montpellier SupAgro collection, UMR CBGP), collected in Kiev (Ukraine) on Norway maple (*Acer platanoides* L.).

Previous reports — *N. squamiger* is only known from the West-Palearctic area. Countries from which this species is reported are: Armenia (Arutunjan 1970, 1971); Croatia (Tixier *et al.* 2010); Greece (Papadoulis and Emmanouel 1990); Hungary (Bozai 1996, 1997; Ripka 1998, 2006); Moldova (Wainstein 1960, 1973); Ukraine (Kolodochka 1973,

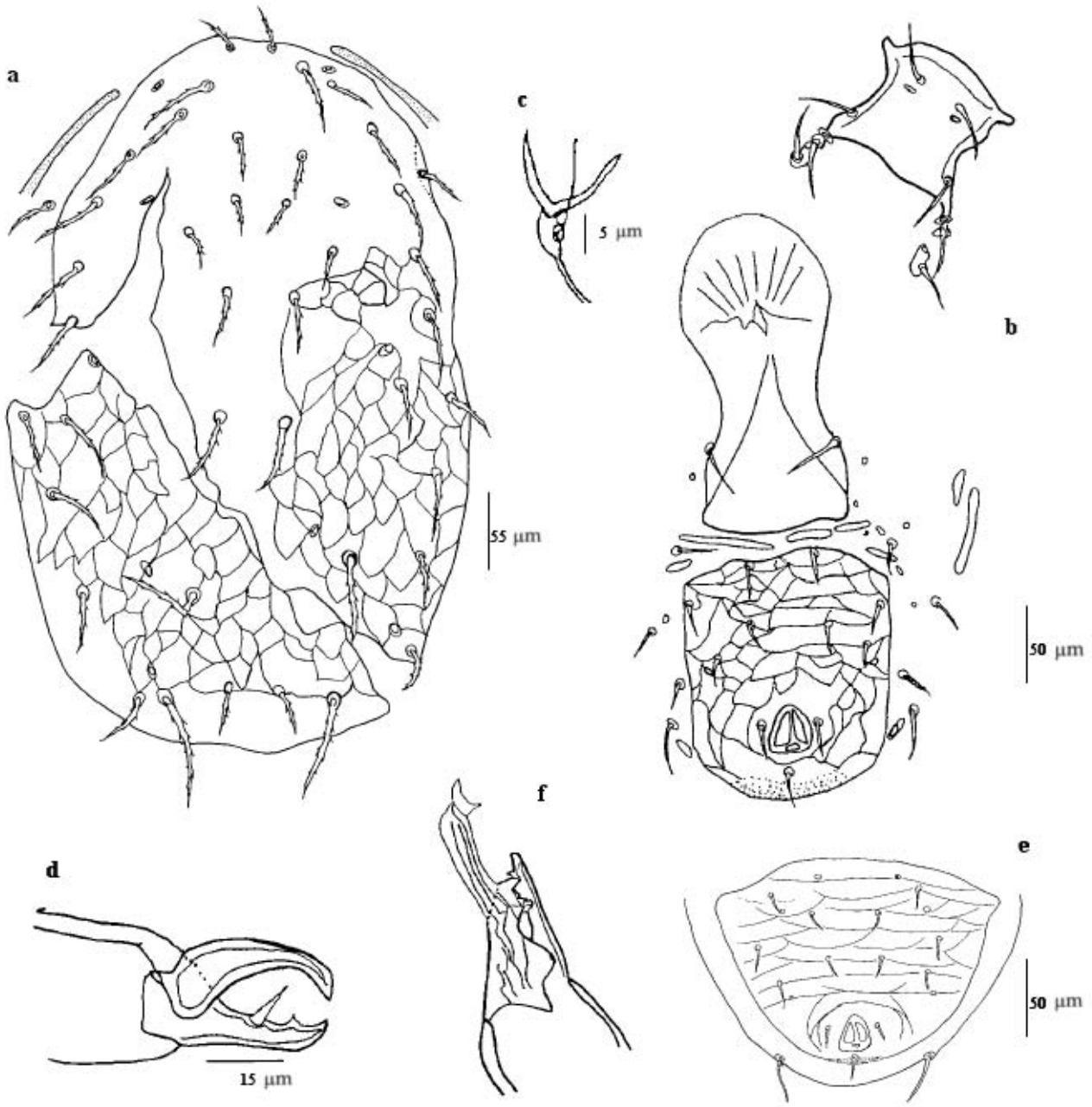

FIGURE 3: *Neoseiulella squamiger* (Wainstein). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (collection): e – ventrianal shield; f – spermatodactyl.

1974b, 1978). Plant supports on which *N. squamiger* was collected are: *Acer campestre*, *A. platanoides*, *Acer* sp. (Aceraceae); *Carpinus betulus*, *Corylus avellana*, *Ostrya carpinifolia* Scopoli (Betulaceae); *Cornus* sp. (Cornaceae); *Fraxinus ornus* L. (Oleaceae); *J. regia* (Juglandaceae); *Picea* sp. (Pinaceae); *Prunus* (*Cerasus*) sp., *Prunus* sp. (Rosaceae).

Neoseiulella aceris (Lehman) (Figure 4)

Heteroseiulus aceris Lehman 1982: 236, 283. *Neoseiulella aceris* (Lehman) Moraes *et al.* 2004: 291; Chant and McMurtry 2007: 147.

Adult female (Figure 4a – d)

Dorsal shield (Figure 4a) — Dorsal shield distinctly reticulated throughout: length 318, width 180 (at level of s4) and 210 (at level of Z1). One pair of solenostomes gd9 on the dorsal shield; other solenostomes, if present, not discernible because of the bad conditions of the specimen examined. No poroid visible. Sub-lateral setae r3 on the lateral margin, R1 on the dorsal shield. Dorsal shield bearing 20 pairs of setae (R1 on dorsal shield), serrated: j1 17; j3 25; j4 18; j5 18; j6 23; J2 36; J5 13; z2 19; z3 25; z4 29; z5 18; Z1 32; Z4 35; Z5 41; s4 32; s6 33; S2 35; S4 28; S5 17; sub-lateral setae r3 21 and R1 23. Peritreme extending anteriorly to the level of j3.

Ventral shields (Figure 4b) — Sternal shield 40 long and 61 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids (posterior to ST1; anterior to ST3). ST3 inserted on an elongate projection of the sternal shield. A pair of metasternal setae (ST4) inserted on separate platelets with a pair of small poroids. Genital shield 132 long and 54 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield subquadrate-shaped, 97 long and 82 wide (at level of ZV2), reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of solenostomes *gv3* posterior to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 15 long, smooth. Primary metapodal plate or inguinal sigillum 33 long and 2 wide.

Spermatheca (Figure 4c) — Cervix 4 long, cup-shaped, with an enlarged atrium.

Chelicera (Figure 4d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 27 long, edentate.

Legs — Measurements of legs: leg I 245; leg II 214; leg III 211; leg IV 270. Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female holotype deposited in the collection of the Florida, Department of Agriculture and Consumer Services, USA.

*Adult male*Described by Lehman (1982). It has been impossible to borrow the male type specimen of this species.

Previous reports: N. aceris is only known from Pennsylvania (USA; Nearctic area). Plant supports on which this species was collected are: *A. platanoides* (Aceraceae); *Aesculus hippocastanum* (Hippocastanaceae); *Ilex crenata 'rotundifolia'* Thunb. (Aquifoliaceae); *Juniperus virginiana* L. (Cupressaceae); *Pinus sylvestris* L., *Tsuga canadensis* (L.) Carrière (Pinaceae); *Taxus umbraculifera* (Siebold ex Endl.) Ravenscroft var. *hicksii* (Hort. ex Rehder) Spjut (Taxaceae).

The examination of the type materials of *N. aceri, N. squamiger* and *N. aceris* shows similar measurements. However, *N. aceri* differs from both *N. squamiger* and *N. aceris* by the position of the sub-lateral seta R1. Recent molecular experiments (Kanouh *et al.* 2010) showed that the position of sub-lateral seta (R1) is not a valid diagnostic criteria to distinguish between these species and that *N. squamiger* and *N. aceri* are synonyms (Kanouh *et al.* 2010). This agrees with the conclusions of Chant and Yoshida-Shaul (1989) and Kolodochka (1986). On the other hand, only one pair of solenostomes (gd9) is observed on *N. aceris*, whereas five pairs (gd1, gd2, gd6, gd8, gd9) are observed on *N. aceri* and *N. squamiger*. Lehman (1982) drew three pairs of solenostomes (gd2, gd6, gd8) that we did not observe on the specimen examined. As some authors have shown the importance of such characters for species differentiation (Chant and Yoshida-

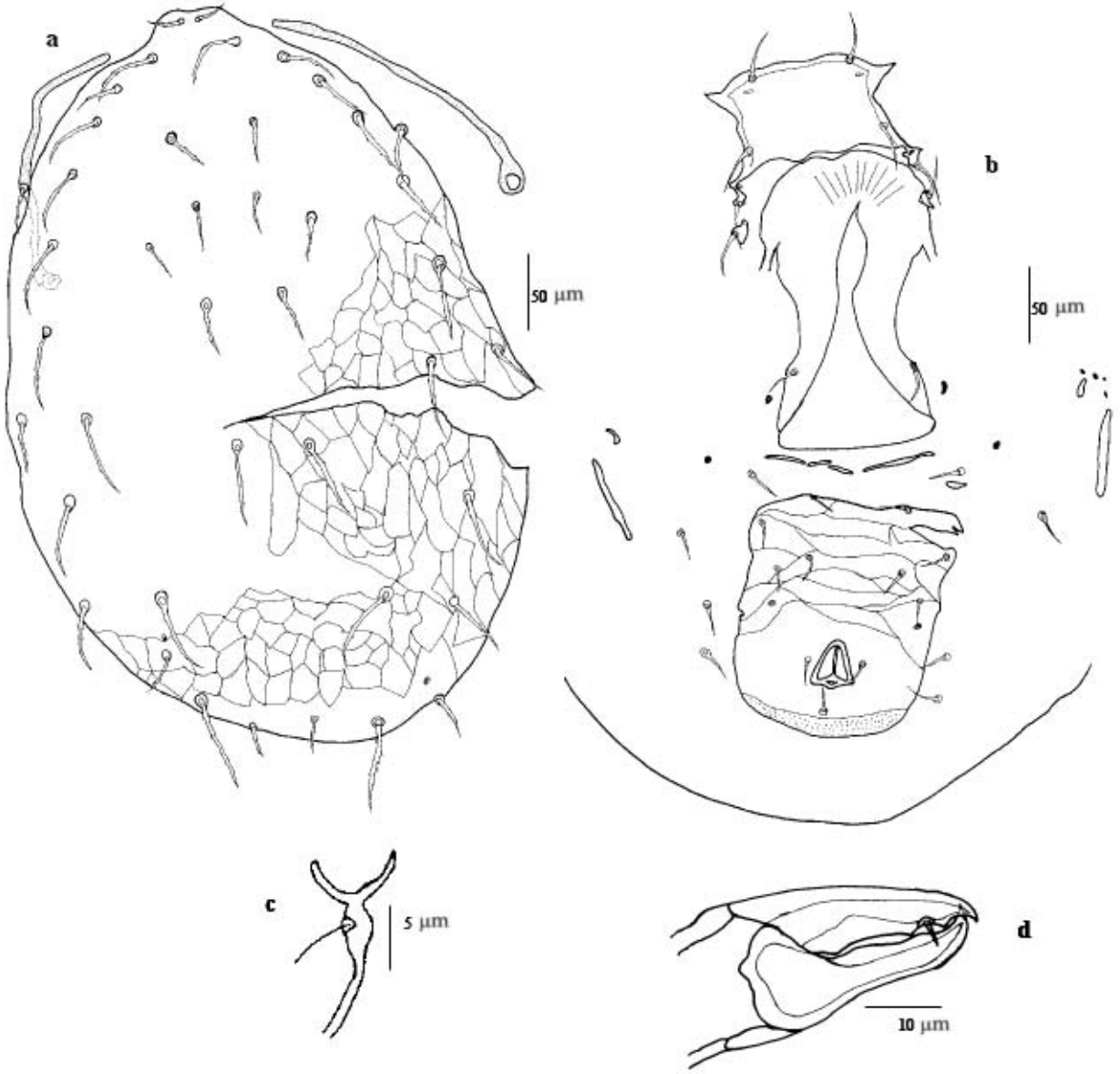

FIGURE 4: *Neoseiulella aceris* (Lehman). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

Shaul 1987; Ragusa and Tsolakis 1994; Tixier *et al*. 2006a, b), but as we do not know if this reliability is universal for species diagnostic, the synonymy of *N. aceris* and *N. aceri / N. squamiger* is still questioned. Examination of other female paratypes of *N. aceris*, as well as molecular analyses or cross breedings, would thus be required.

We thus consider that *N. aceri* is a senior synonym of *N. squamiger*, and we propose, at this time, that *N. aceris* as a provisional junior synonym of *N. aceri*.

(ii). Neoseiulella tiliarum (Oudemans) and *N. formosa* (Wainstein)

Neoseiulella tiliarum was suggested as a senior synonym of *N. formosa* by Chant (1959b). Hirschman (1962) then considered these two species as valid. Denmark and Rather (1984) mentionned *N. tiliarum* in their revision of the genus *Typhloctonus*, but not *N. formosa.* Then, based on a morphlogical comparaison of type materials, Kolodochka (1986), Chant and Yoshida-Shaul (1989), Denmark and Rather (1996) and Kolodochka (2009) concluded that these two species are synonyms.

Neoseiulella tiliarum (Oudemans) (Figure 5)

Typhlodromus tiliarum Oudemans 1930: 51-52; Chant 1958: 622. *Typhlodromus* (*Typhlodromus*) *tiliarum* (Oudemans) Chant 1959: 65. *Typhloctonus tiliarum* (Oudemans) Muma 1961: 299; Denmark and Rather 1984: 165; Kolodochka 1986: 26-27; Moraes *et al.* 1986: 233; Kolodochka 2009: 485-486. *Typhlodromus* (*Nesbitteius*) *tiliarum* (Oudemans) Wainstein 1962: 23. *Seiulus tiliarum* Abbasova 1972: 21; Karg 1982: 205; Karg and Edland 1987: 387. *Seiulus* (*Typhloctonus*) *tiliarum* (Oudemans) Beglyarov 1981: 19. *Neoseiulella* (*Typhloctona*) *tiliarum* (Oudemans) Denmark and Rather 1996: 58-59. *Neoseiulella tiliarum* (Oudemans) Chant and McMurtry 1994: 248; Moraes *et al.* 2004: 296; Chant and McMurtry 2007: 147.

Adult female (Figure 5a – d)

Dorsal shield (Figure 5a) — Dorsal shield distinctly reticulated throughout: length 350; width 164 (at level of s4) and 182 (at level of Z1). Five pairs of large circular solenostomes: gd1, gd2, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z4 and Z5 slightly serrated: j1 20; j3 30; j4 19; j5 21; j6 20; J2 26; J5 7; z2 25; z3 31; z4 32; z5 20; Z1 26; Z4 38; Z5 44; s4 34; s6 36; S2 40; S4 35; S5 18; sub-lateral setae r3 29 and R1 21. Peritreme extending anteriorly to the level of z4.

Ventral shields (Figure 5b) — Sternal shield 82 long and 84 wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 on a separate platelet close to the sternal shield. A pair of metasternal setae (ST4) on separate platelets with a pair of small poroids. Genital shield 123 long and 62 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla folded under the genital shield and between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield rectangular-shaped, 103 long and 60 wide (at level of ZV2), slightly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 26 long, smooth. Primary metapodal plate or inguinal sigillum 28 long and 3 wide.

Spermatheca (Figure 5c) — Cervix 14 long, elongated and cup-shaped.

Chelicera (Figure 5d) — One tooth and a *pilus dentilis* on the fixed digit. Movable digit 27 long, unidentate.

Legs — Measurements of legs: leg I 274; leg II 222; leg III 219; leg IV 281. Eight setae (2-2/1, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female holotype deposited in the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands. As this specimen was in bad conditions, the leg chaetotaxy and lengths were observed on one specimen of our collection (Montpellier SupAgro, UMR CBGP), collected in Valleraugues (Gard, South of France) on small leaved linden (*Tilia cordata* Miller).

Adult male (Figure 5e, f) Described by Livshitz and Kuznetsov (1972) and Denmark and Rather (1984, 1996). Dorsal shield chaetotaxy similar to the female, but the sub-lateral seta R1 on the dorsal shield. Ventrianal shield 104 long and 131 wide, distinctly reticulated and bearing five pairs of preanal setae and three pairs of poroids. Spermatodactyl L-shaped with a terminal foot and a toe slightly enlarged. This description is based on a specimen of our collection (Montpellier SupAgro, UMR CBGP), collected in Valleraugues (Gard, South of France) on *T. cordata*.

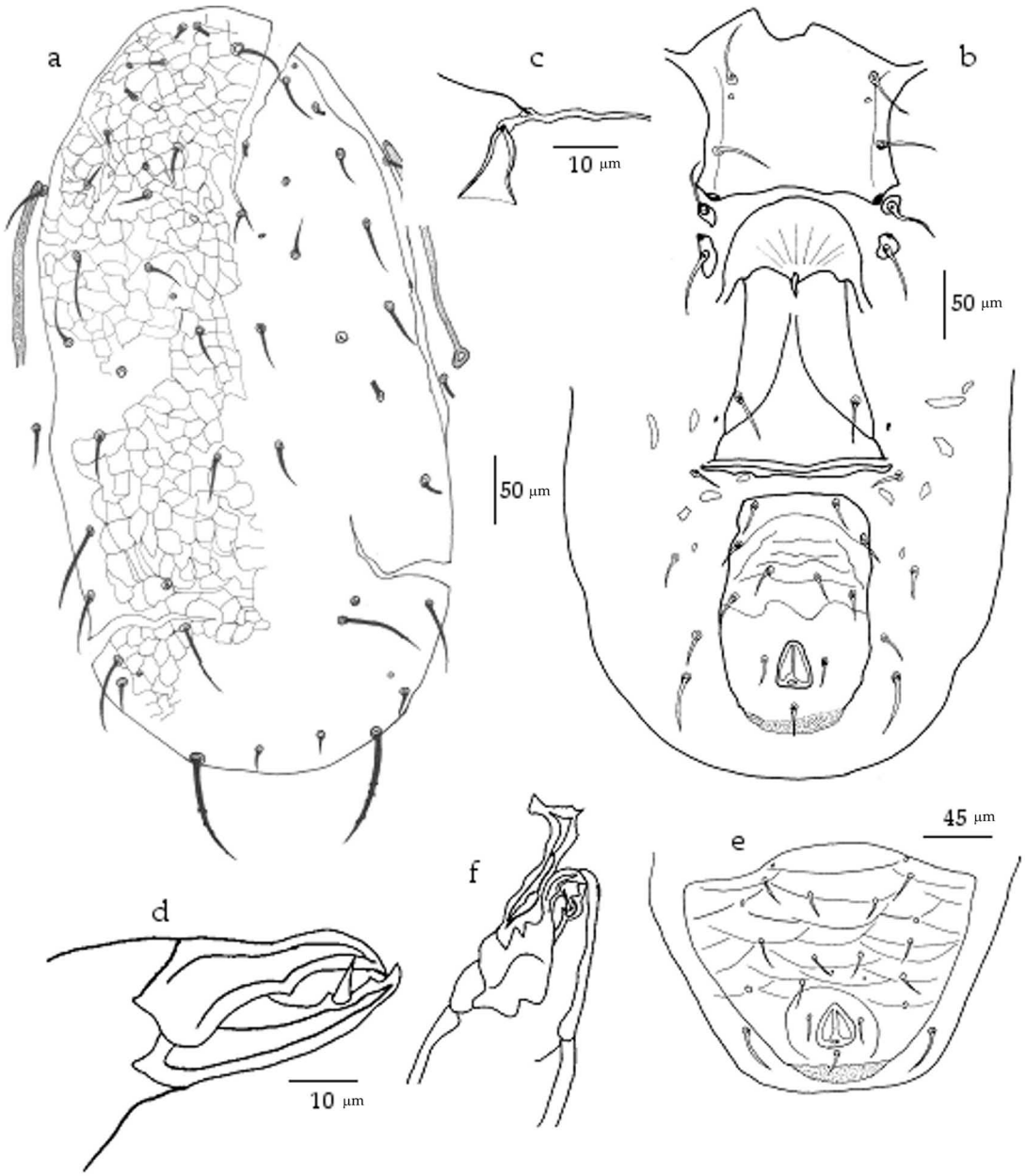

FIGURE 5: *Neoseiulella tiliarum* (Oudemans). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (collection): e – ventrianal shield; f – spermatodactyl.

Previous reports — *N. tiliarum* is only known from the West- Palaearctic and Nearctic areas. However, its occurrence in the Nearctic area (15 reports in Canada and three in USA) might be due to introductions. The three reports in Massachusetts (USA) were on insects: *Graphiphora haruspica* (Grote) and *Spaelotis clandestine* (Harris) (Noctuidae, Lepidoptera) (Treat 1975). Countries from which this species is reported are: Algeria (Athias-Henriot, 1958b); Austria (Bohm 1960; Ragusa and Ragusa 1997); Azerbaijan (Abbasova 1972); Canada (Nesbitt 1951; Herbert 1952; Chant *et al.* 1974); Croatia (Tixier *et al*. 2010); Czech Republic (Kabicek 2003; Kabicek and Rehakova 2004; Kabicek 2008,

2010); Denmark (Hansen and Johnsen 1986); England (Nesbitt 1951; Chant 1955, 1956; Collyer 1956); France (Gunthart 1957, 1960; Rambier 1974; Kreiter and Brian 1987; Kreiter *et al.* 2000; Tixier *et al.* 2000; Arnault *et al.* 2008); Georgia (Samsoniya 1977); Germany (Oudemans 1930; Dosse 1956a, b, 1957; Westerboer and Bernhard 1963; Thill 1964; Karg 1970, 1971, 1972, 1975); Greece (Swirski and Ragusa 1976; Ragusa and Tsolakis 1998); Hungary (Kropczyńska and Jenser 1968; Bozai 1980; Dellei and Szendrey 1991; Sarospataki *et al.* 1992; Bream and Bozai 1995; Bozai 1996, 1997; Ripka 1998, 2006); Iran (Daneshvar 1987); Italy (Gunthart 1957, 1960; Coiutti 1993; Duso *et al.* 1993; Michelatti *et al.* 1994; Nicotina and Cioffi 1998 ; Duso *et al.* 2004); Moldova (Beglyarov and Malov 1977); Montenegro (Mijuskovic and Tomasvic 1975); Netherlands (Nesbitt 1951; Van de Vrie and Fluiter 1958; Van de Vrie 1963, 1972; Miedema 1987); Norway (Karg and Edland 1987); Poland (Wiackowski and Suski 1963; Boczek 1964; Dabrowski 1968; Dabrowski 1970; Skorupska 1981; Chant and Yoshida-Shaul 1989; Jaworski 2000; Kropczyńska *et al.* 2009); Russia (Beglyarov 1962); Slovak Republic (Praslicka and Bartekova 2008; Praslicka *et al.* 2009); Spain (Chant and Yoshida-Shaul 1989; Villaronga and Garcia-Mari 1988, 1992; Minarro *et al.* 2005); Switzerland (Gunthart 1957, 1960; Genini *et al.* 1983; Klay 1987); Tunisia (Kreiter *et al.* 2002); Turkey (Swirski and Amitai 1982; Düzgüneş and Kiliç 1983; Cobanoglu 1991, 1992, 1996, 2000); Ukraine (Akimov and Kolodochka 1970; Livshitz and Kuznetsov 1972; Beglyarov and Malov 1977; Kolodochka and Omeri 2007; Kolodochka 2009; Omeri 2009); USA (Treat 1975).

Neoseiulella tiliarum was collected on a wide range of plant supports: *A. campestre*, *Acer* sp. (Aceraceae); *Actinidia deliciosa* (Chev.) Liang and Ferguson (Actinidiaceae); *A. hippocastanum* (Hippocastanaceae); *Agrimonia* sp., *Malus baccata* (L.) Borkh, *M. pumila* Miller, *Malus* sp., *Mespilus* sp., *P. armeniaca*, *P. cerasifera* Ehrh, *P.* (*Cerasus*) *avium* (L.) L., *P. domestica* L., *Prunus* sp., *P. spinosa* L., *Pyrus aucuparia* L., *P. communis* L., *Rosa* sp., *Rubus* sp. (Rosaceae); *Alnus* sp., *Carpinus betulus*, *Corylus avellana*, *Corylus* sp. (Betulaceae); *Castanea sativa* Miller, *Fagus sylvatica* L., *Quercus* sp. (Fagaceae); *Cercis canadensis* L. (Fabaceae); *Citrus* sp. (Rutaceae); *Cornus sanguinea* L., *Cornus* sp. (Cornaceae); *Ficus carica* L. (Moraceae); *Frangula alnus* Miller (Rhamnaceae); *Fraxinus angustifolia* Vahl, *Fraxinus* sp., *Olea* sp. (Oleaceae); *Dittrichia viscosa* (L.) Greuter (Asteraceae); *Juglans regia* (Juglandaceae); *Pteridium aquilinum* (L.) Kuhn (Hypolepidaceae); *Ribes nigrum* L., *Ribes* sp. (Grossulariaceae); *Tilia americana* L., *T. cordata* Miller, *T. miqueliana* Maxim., *T. platyphyllos* Scopoli, *Tilia* sp. (Tiliaceae); *Ulmus campestris* L., *U. laevis* Pallas, *U. pumila* L., *U. scabra* (Miller), *Ulmus* sp., *U. suberosa* Moench, *Zelkova carpinifolia* (Pall.) Dippel., *Zelkova* sp. (Ulmaceae); *Urtica dioica* L. (Urticaceae); *Vitis* sp., *V. vinifera* L. (Vitaceae).

Neoseiulella formosa (Wainstein) (Figure 6)

Typhlodromus formosus Wainstein 1958: 206; Abbasova 1966: 186. *Typhlodromus* (*Seiulus*) *formosus* (Wainstein) Ehara 1966: 16. *Typhlodromus* (*Nesbitteius*) *formosus* (Wainstein) Arutunjan 1970: 19. *Typhloctonus formosus* (Wainstein) Kolodochka 1974a: 26-27; Rivnay and Swirski 1980: 183. *Neoseiulella formosa* (Wainstein) Moraes *et al.* 2004: 297; Chant and McMurtry 2007: 147.

Adult female (Figure 6a – d)

Dorsal shield (Figure 6a) — Dorsal shield distinctly reticulated throughout: length 336; width 163 (at level of s4) and 180 (at level of Z1). Five pairs of large circular solenostomes: gd1, gd2, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z4 and Z5 slightly serrated: j1 19; j3 30; j4 19; j5 20; j6 18; J2 26; J5 11; z2 22; z3 28; z4 31; z5 17; Z1 33; Z4 38; Z5 44; s4 34; s6 34; S2 39; S4 35; S5 19; sub-lateral setae r3 28 and R1 21. Peritreme extending anteriorly to the level of z4.

Ventral shields (Figure 6b) — Sternal shield 66 long and 65 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. ST3 on an elongate projection of the sternal shield. A pair of metasternal setae (ST4) on separate platelets with a pair of small poroids. Genital shield 117 long and 62 wide (at level of

ST5), smooth. Four elongate platelets or genital sigilla folded under the genital shield and situated between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield rectangular-shaped, 102 long and 66 wide (at level of ZV2), lightly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 24 long, smooth. Primary metapodal plate or inguinal sigillum 31 long and 3 wide.

Spermatheca (Figure 6c) — Cervix 13 long, elongated and cup-shaped.

Chelicera (Figure 6d) — One tooth and a *pilus dentilis* on the fixed digit. Movable digit 26 long, bearing one tooth.

Legs — Measurements of legs: leg I 271; leg II 219; leg III 211; leg IV 275. Eight setae (2-2/1, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female lectotype deposited in the ASU, Institute of Zoology, Academy of Sciences, Kiev, Ukraine.

Adult male (Figure 6e, f) Dorsal shield chaetotaxy similar to the female, but sub-lateral seta R1 on the dorsal shield. Ventrianal shield 99 long and 139 wide, distinctly reticulated and bearing five pairs of preanal setae and four pairs of poroids. Spermatodactyl L-shaped with a terminal foot and a toe enlarged. This description is based on one of the paralectotype specimens (deposited in the ASU, Ukraine).

Previous reports — *N. formosa* is only known from the West-Palaearctic area. Countries from which this species is reported are: Armenia (Arutunjan 1970, 1971); Caucasus region (Abbasova 1966); Georgia (Wainstein 1958; Samsoniya 1972; Wainstein and Vartapetov 1973); Hungary (Bozai 1996, 1997; Ripka 1998, 2006); Moldova (Wainstein 1973); Ukraine (Wainstein 1958; Kolodochka 1974b, 1978). Plants on which *N. formosa* was reported are: *A. campestre*, *Acer* sp. (Aceraceae); *Cydonia* sp., *Malus* sp., *Mespilus germanica* L., *Mespilus* sp., *P. armeniaca*, *P. cerasifera*, *P. (Cerasus) avium*, *Prunus* sp., *P. spinosa*, *Pyrus* sp., *Rosa* sp., *Rubus* sp., *Sorbus* sp. (Rosaceae); *Alnus* sp., *C. avellana*, *Corylus* sp. (Betulaceae); *Cornus* sp. (Cornaceae); *Ficus carica* L. (Moraceae); *Juglans regia* (Juglandaceae); *Phaseolus* sp. (Fabaceae); *Q. cerris* L., *Quercus* sp. (Fagaceae); *U. laevis*, *U. scabra*, *Ulmus* sp. (Ulmaceae).

The examination of the type materials of both *N. tiliarum* and *N. formosa* shows that except for the position of sternal setae ST3 (on/off the sternal shield), all other morphological characters and measurements are similar. Furthermore, morphological and molecular analyses (Kanouh *et al*. 2010) showed that the position of seta ST3 is not a reliable diagnostic character and thus that *N. tiliarum* is a senior synonym of *N. formosa.* These results agree with the conclusions of Kolodochka (1986), Chant and Yoshida-Shaul (1989) and Denmark and Rather (1996).

(iii). Neoseiulella tuberculata (Wainstein), *N. sexapori* (Karg and Edland) and *N. arutunjani* (Kuznetsov)

Karg and Edland (1987) differentiated *N. sexapori* and *N. tuberculata* by the following characters: the shape of the ventrianal shield, the length of the peritreme, the surface of the dorsal shield and the number and the shape of dorsal solenostomes. Chant and Yoshida-Shaul (1989) synonymised *N. sexapori* and *N. tuberculata*. In 1996, Denmark and Rather did not mention *N. sexapori* in their revision. Kuznetsov (1984) then described *N. arutunjani*, similar to *N. tuberculata* but lacking the caudoventral seta JV4. However, *N. arutunjani* was not included in revisions of the genus *Neoseiulella* carried out by Chant and Yoshida-Shaul (1989) and Denmark and Rather (1996). Kolodochka (2009) discussed the presence of JV4 on *N. arutunjani*, and then synonymised this species with *N. tuberculata*.

Neoseiulella tuberculata (Wainstein) (Figure 7)

Typhlodromus tuberculatus Wainstein 1958: 205-206. Wainstein 1961: 160; Hirschmann 1962: 12; Abbasova 1966: 186; Chant and Yoshida-Shaul 1989: 1014-1015. *Typhlodromus* (*Seiulus*) *tuberculatus* (Wainstein) Ehara 1966 : 17. *Typhloctonus* (*Typhloctonus*) *tuberculatus* (Wainstein) Wainstein 1973:

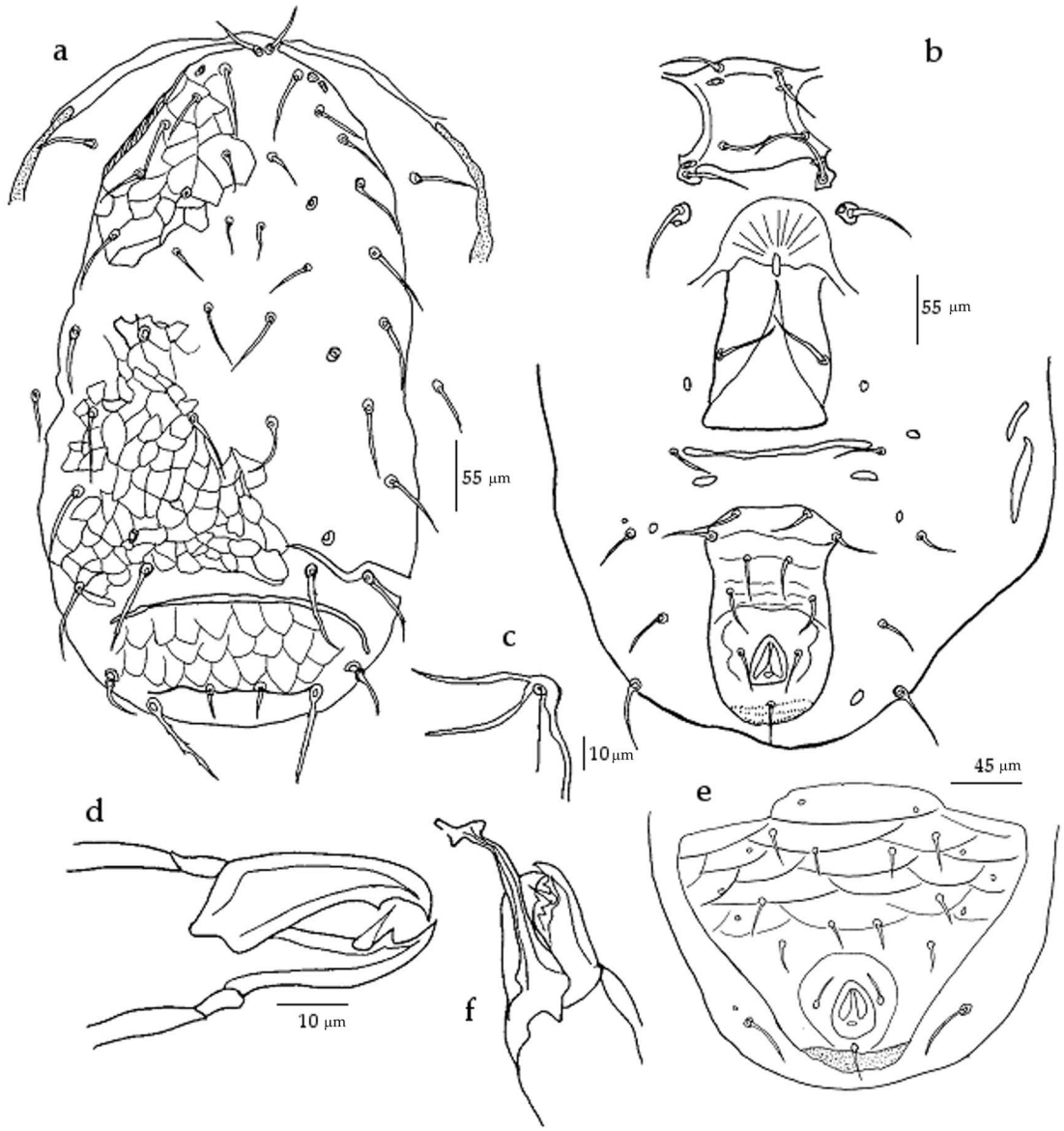

FIGURE 6: *Neoseiulella formosa* (Wainstein). Female (lectotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (collection): e – ventrianal shield; f – spermatodactyl.

176. *Typhloctonus tuberculatus* (Wainstein) Arutunjan 1977: 55; Denmark and Rather 1984: 175-176; Moraes *et al.* 1986: 235; Kolodochka 2009: 488-490. *Seiulus tuberculatus* (Wainstein) Beglyarov and Malov 1977: 6. *Seiulus* (*Typhloctonus*) *tuberculatus* (Wainstein) Beglyarov 1981: 19. *Neoseiulella* (*Typhloctona*) *tuberculata* (Wainstein) Denmark and Rather 1996: 62-63. *Neoseiulella tuberculata* (Wainstein) Moraes *et al.* 2004 : 297; Chant and McMurtry 2007: 147.

Adult female (Figure 7a – d)

Dorsal shield (Figure 7a) — Dorsal shield heavily reticulated throughout: length 380 (370 – 390); width 197 (194 – 200) (at level of s4), 242 (238 – 246) (at level of Z1). Three pairs of solenostomes: gd2, gd6, and gd9 (gd5 is present on the specimen designated as lectotype by Kolodochka [2009] but not on the specimens presently examined or the other

specimens designated as paralectotypes). Our examination of six specimens of this species collected on *Acer platanoides* in Massif Central (France) also showed that gd5 is absent. Five pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all dorsal and sub-lateral setae smooth: j1 19 (17 – 20); j3 25 (24 – 25); j4 12 (11 – 13); j5 14 (13 – 15); j6 20 (19 – 20); J2 25 (23 – 27); J5 13 (12 – 13); z2 15 (14 – 16); z3 25 (23 – 27); z4 27; z5 16 (15 – 16); Z1 22 (21 – 22); Z4 29 (27 – 30); Z5 44 (42 – 46); s4 27; s6 25 (23 – 27); S2 26 (25 – 26); S4 24 (23 – 24); S5 19 (17 – 20); sub-lateral setae r3 20 (19 – 20) and R1 19 (17 – 20). Peritreme extending anteriorly to the level of j3 or between j1-j3.

Ventral shields (Figure 7b) — Sternal shield (in poor conditions in the specimens examined) 60 (58 – 62) long and 59 (58 – 60) wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of small poroids. Third and fourth pairs of sternal setae (ST3, ST4) on separate platelets. A pair of small poroids accompanying ST4. Genital shield 124 (120 – 128) long and 65 (64 – 65) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped 114 (110 – 117) long and 98 (95 – 100) wide (at level of ZV2), lightly reticulated throughout, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 17 (15 – 18) long, smooth. Primary metapodal plate or inguinal sigillum 35 (33 – 36) long and 5 (4 – 5) wide.

Spermatheca (Figure 7c) — Cervix 4 (3 – 4) long, shallowly cup-shaped.

Chelicera (Figure 7d) — Five teeth and a *pilus dentilis* on the fixed digit. The movable digit 35 (33 – 36) long, bidentate.

Legs — Measurements of legs: leg I 268 (266 – 269); leg II 235 (233 – 237); leg III 233 (231 – 234); leg IV 290 (289 – 291). Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs.

Material examined — A female syntype, designated now as paralectotype by Kolodochka (2009), and two other female paralectotype, deposited in the ASU, Institute of Zoology, Academy of Sciences, Kiev, Ukraine.

Adult male

Unknown from the type materials. However, it has been reported on maple (*Acer pseudoplatanus*) in Kremenets region, Ternopol district (Ukraine), collected and described, for the first time, by Kolodochka (2009).

Previous reports — *N. tuberculata* is only known from the West-Palaearctic area. Countries from which this species is reported are: Caucasus region (Abbasova 1966), Croatia (Tixier *et al.* 2010), Georgia (Wainstein 1958), Greece (Papadoulis and Emmanouel 1997), Moldova (Wainstein 1973), Norway (Chant and Yoshida-Shaul 1989), and Ukraine (Kolodochka 1981, 2009). Plants on which *N. tuberculata* was reported are: *A. pseudoplatanus*, *Acer* sp., *A. steveni* Pojark. (Aceraceae); *A. hippocastanum* (Hippocastanaceae); *Artemisia* sp. (Asteraceae); *Cydonia* sp., *P. armeniaca*, *Prunus (cerasus)* sp.; *Rubus* sp. (Rosaceae); *J. regia* (Juglandaceae); *Ribes* sp. (Grossulariaceae); *Zelkova* sp. (Ulmaceae). This species was recently collected in the Massif Central (France), on *A. platanoides*.

Neoseiulella sexapori (Karg and Edland) (Figure 8)

Seiulus sexapori Karg and Edland 1987: 388-389; Karg 1991: 27. *Neoseiulella sexapori* (Karg and Edland) Moraes *et al.* 2004: 297; Chant and McMurtry 2007: 147.

Adult female (Figure 8a – d) Dorsal shield (Figure 8a) — Dorsal shield heavily reticulated throughout: length 330 (320 – 340); width 179 (177 – 181) (at level of s4), 222 (220 – 224) (at level of Z1). Four pairs of solenostomes: gd2, gd5, gd6, and gd9. Poroid not visible. Sub-lateral setae (r3 and R1) on the lateral margin. The dorsal shield bearing 19 pairs of setae, all dorsal and sub-lateral setae smooth and on tubercles, except for Z5 which is slightly serrated: j1 16 (15 – 17); j3 25 (23 – 27); j4 14 (13 – 15); j5 14 (13 – 14); j6 19 (18 – 20); J2 23 (21 – 24); J5 11 (10 – 11);

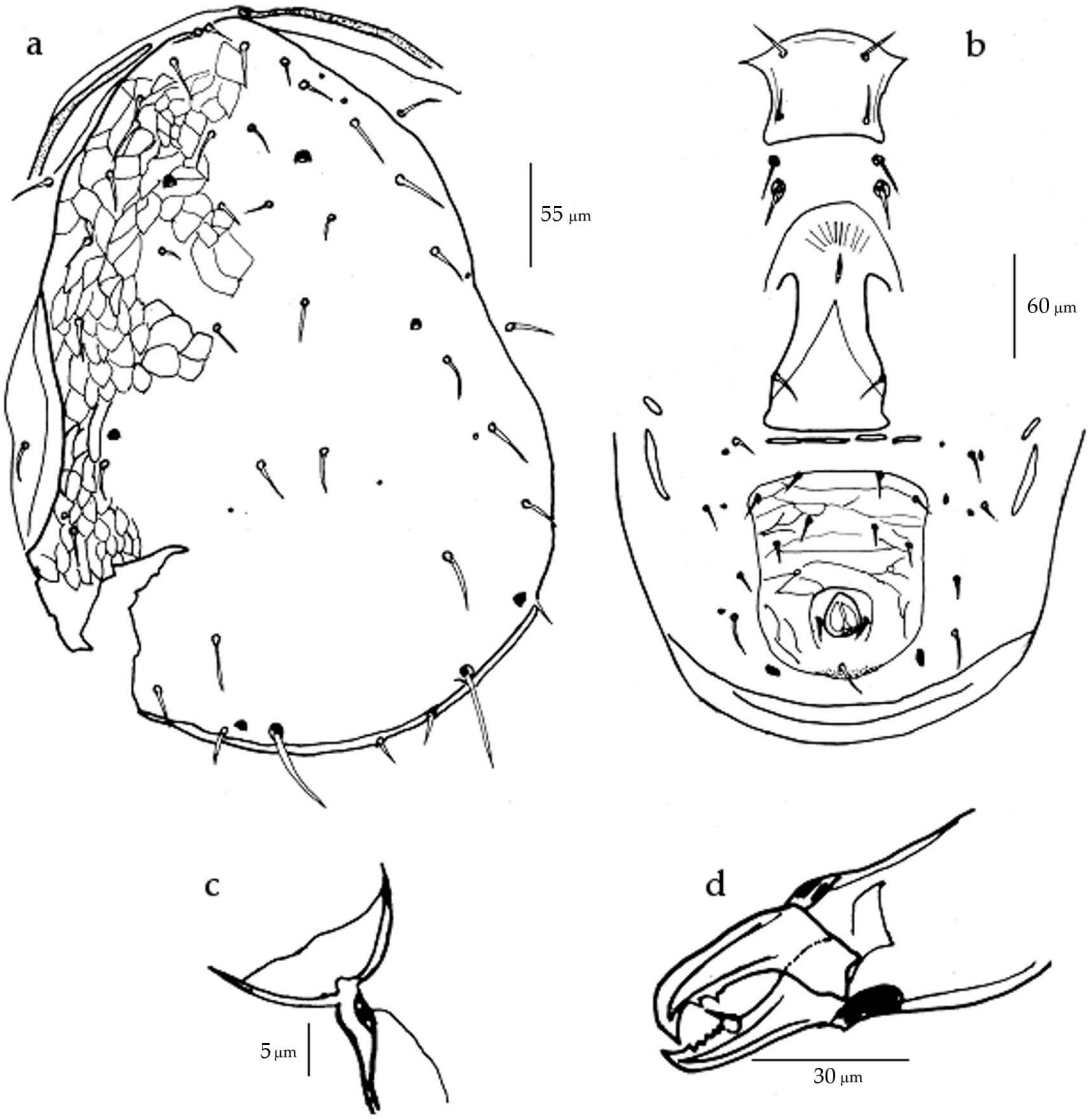

FIGURE 7: *Neoseiulella tuberculata* (Wainstein). Female (syntype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

z2 17 (16 – 17); z3 25 (22 – 27); z4 24 (23 – 25); z5 15 (14 – 15); Z1 22 (21 – 22); Z4 28 (27 – 28); Z5 41 (40 – 42); s4 26 (25 – 27); s6 25 (24 – 26); S2 24 (23 – 25); S4 22 (20 – 23); S5 17 (16 – 18); sub-lateral setae r3 20 (19 – 21) and R1 15 (14 – 16). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level between z2-j3.

Ventral shields (Figure 8b) — Sternal shield 53 (48 – 59) long and 59 (57 – 61) wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of small poroids. The third and fourth pairs of sternal setae (ST3, ST4) on separate platelets. A pair of small poroids accompanying ST4. Genital shield, 124 (122 – 126) long and 59 (55 – 63) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped, 103 (101 – 105) long and 83 (80 – 85) wide (at level of ZV2), distinctly reticulated throughout,

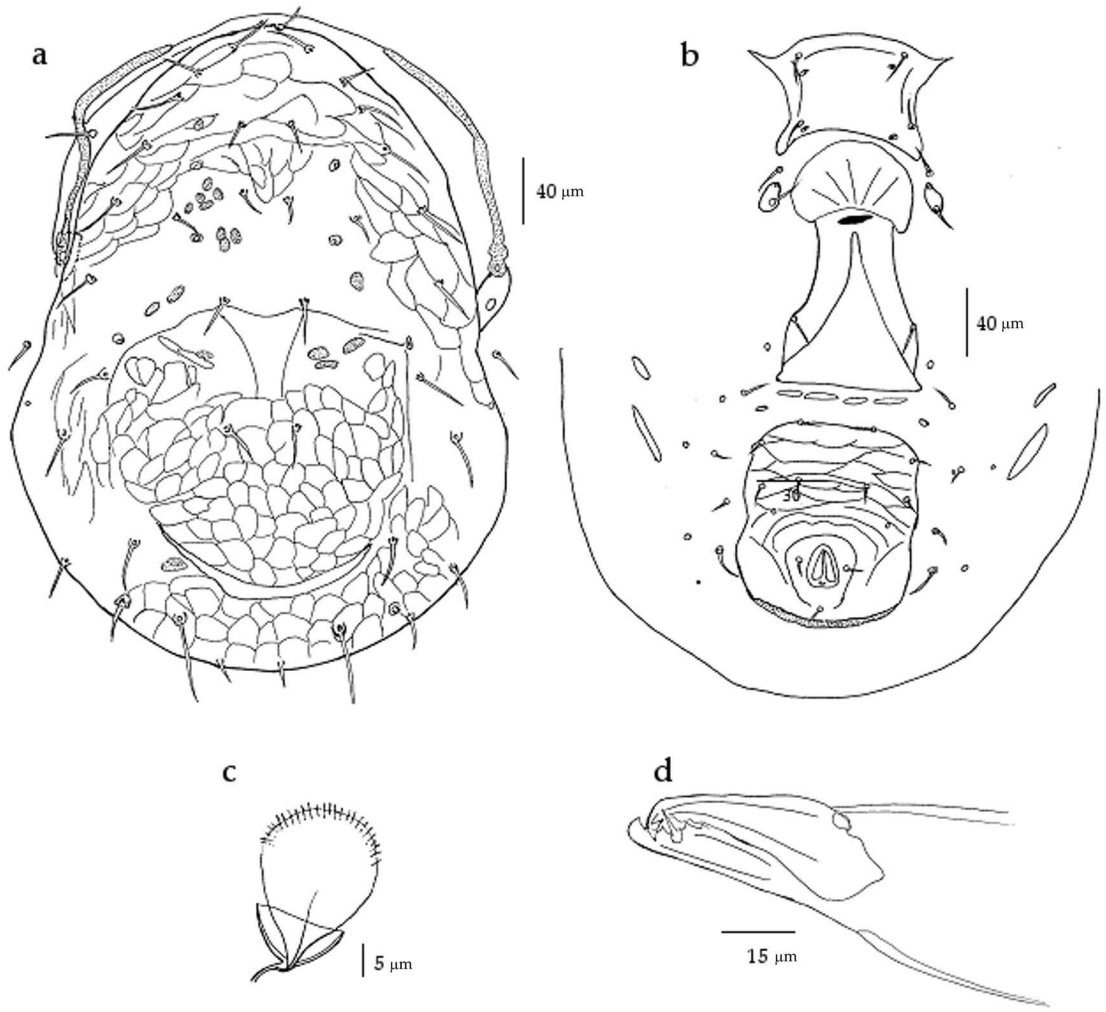

FIGURE 8: *Neoseiulella sexapori* (Karg and Edland). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 15 (13 – 17) long, smooth. Dimensions of the primary metapodal plate or inguinal sigillum 34 (33 – 33) long and 4 wide.

Spermatheca (Figure 8c) — Cervix 4 (3 – 4) long, cup-shaped.

Chelicera (Figure 8d) — Three teeth and a *pilus dentilis* on the fixed digit. Movable digit 27 (26 – 27) long, bidentate.

Legs — Measurements of legs: leg I 261 (252 – 270); leg II 215 (200 – 229); leg III 215 (210 – 219); leg IV 288 (285 – 291). Seven setae (2-2/0, 2/0-1) on the genu II. All legs much shorter than the dorsal shield and without macroseta.

Material examined — The female holotype and three female paratypes deposited in the Museum für Naturkunde, Arthropod collection, Berlin, Germany.

Adult male

The male of this species is unknown.

Previous reports — *N. sexapori* is only known from Norway on *Rubus fruticosus* L. (Rosaceae).

***Neoseiulella arutunjani* (Kuznetsov)**
(Figure 9)

Seiulus (Typhloctonus) arutunjani Kuznetsov 1984: 54-57. *Neoseiulella arutunjani* (Kuznetsov) Chant and McMurtry 1994: 248; Moraes *et al.* 2004: 292; Chant and McMurtry 2007: 147.

Adult female (Figure 9a – d)

Dorsal shield (Figure 9a) — Dorsal shield heavily reticulated throughout: length 313; width 155 (at level of s4), 160 (at level of Z1). Four pairs of large solenostomes: gd2, gd5, gd6, and gd9. No poroid visible. Sub-lateral seta r3 on the dorsal shield. The other sub-lateral seta R1 on the lateral margin. Dorsal shield bearing 20 pairs of setae, all dorsal and sub-lateral setae smooth, except Z5 slightly serrated: j1 13; j3 19; j4 12; j5 12; j6 19; J2 20; J5 10; z2 12; z3 19; z4 20; z5 13; Z1 20; Z4 24; Z5 38; s4 22; s6 20; S2 22; S4 20; S5 16; sub-lateral setae r3 13 and R1 24. Peritreme extending anteriorly to the level between z2-j3.

Ventral shields (Figure 9b) — Sternal shield 63 long and 51 wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. The third and fourth pairs of sternal setae (ST3, ST4) on separate platelets. A pair of small poroids accompanying ST4. Genital shield 105 long and 49 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shape, 110 long and 78 wide (at level of ZV2), distinctly reticulated throughout, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), with a pair of circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. NB: one seta of the JV4 pair is present (reported absent on the original description) supporting Kolodochka (2009). JV5 13 long, smooth. Primary metapodal plate or inguinal sigillum 35 long and 4 wide.

Spermatheca (Figure 9c) — Cervix short, 4 long, shallowly cup-shaped.

Chelicera (Figure 9d) — Seven teeth and a *pilus dentilis* on the fixed digit. Movable digit 29 long, bidentate.

Legs — Measurements of legs: leg I 248; leg II 213; leg III 213; leg IV 283. Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female holotype deposited in the collection of Nikita State Botanic Garden, Yalta, Crimea, Ukraine. This material was examined in the ASU, Institute of Zoology, Academy of Sciences, Kiev, Ukraine.

Adult male

The male of this species is unknown.

Previous reports — *N. arutunjani* is only known from Ukraine, on *Artemisia* sp. (Asteraceae).

Remarks — It is noteworthy that in the original description, two females mounted on one slide were mentioned. Kolodochka (2009) showed that only one female actually belonged to this species. The other female was *Paraseiulus incognitus* Wainstein and Arutunjan. Our examination of these two females supports Kolodochka's observations.

The present examination of the type materials of these three latter species could emphasize the following conclusions:

Neoseiulella tuberculata does not differ from *N. sexapori* in setal and body measurements. Even if the shape of the spermatheca of these two species is slightly different (cup-shaped cervix in *N. sexapori* and a disc-shaped [shallowly cup-shaped] cervix in *N. tuberculata*), these two types of shapes are very close and such differences could be simply due to specimen mounting artefacts. The pair of solenostomes gd5 is observed on the four examined specimens of *N. sexapori*, and only on one of the three type specimens of *N. tuberculata*. At last, we observe other differences not mentioned by Chant and Yoshida-Shaul (1989): all dorsal setae are arising from tubercles in *N. sexapori* but not in *N. tuberculata*; the peritreme is shorter (at level between z2-j3) for *N. sexapori* than for *N. tuberculata* (at level of j1 or between j1-j3); the number of teeth on the fixed digit is different (three for *N. sexapori*, five for *N. tuberculata*); the ventrianal shield is heavily reticulated in *N. sexapori,* and lightly in *N. tuberculata*. As some

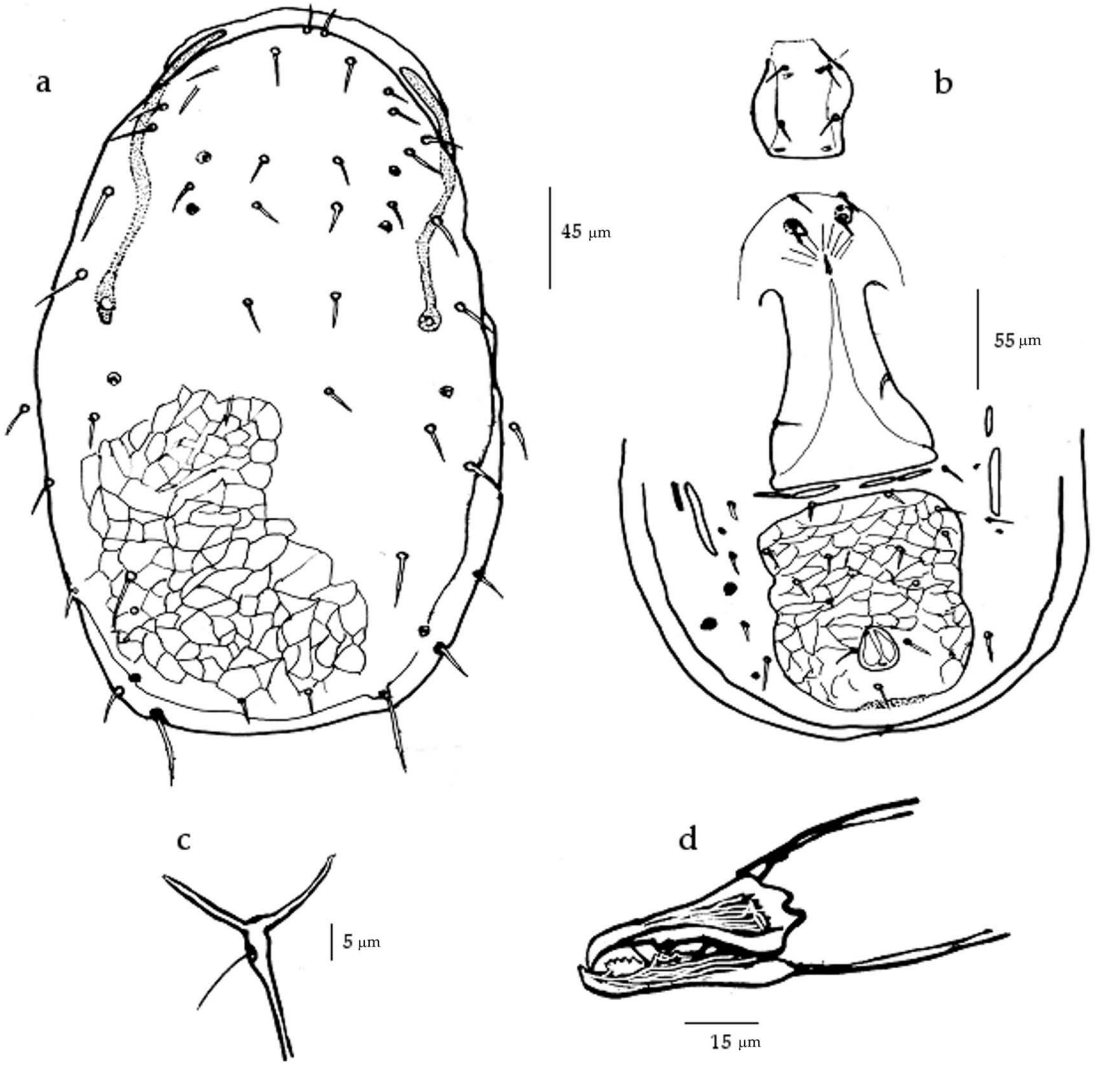

FIGURE 9: *Neoseiulella arutunjani* (Kuznetsov). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

authors have already shown the importance of such morphological characters for species differentiation (Chant and McMurtry 1994; Tixier *et al*. 2006a, b; Chant and McMurtry 2007; Okassa *et al.* 2009), we conclude that *N. tuberculata* and *N. sexapori* seem to be separate specific entities. These results agree with the conclusions of Karg and Edland (1987), but not with Chant and Yoshida-Shaul (1989).

Small differences in setal and body measurements are observed between *N. tuberculata* and *N. arutunjani.* According to intraspecific variations already observed within the family Phytoseiidae for continued characters, these differences seem to be too tiny for separating *N. tuberculata* from *N. arutunjani*. However, other differences are observed: the peritreme is shorter in *N. arutunjani* (reaching between z2-j3) than in *N. tuberculata* (reaching j1 or between j1-j3); the ventrianal shield is heavily reticulated on *N. arutunjani,* and lightly on *N. tuberculata*; fixed digit of chelicera bear seven teeth on *N. arutunjani,* and five on *N. tuberculata*; sub-lateral seta r3 is inserted on the dorsal shield on *N. arutunjani* and on lateral margin on *N. tuberculata*. However, as the position of sub-lateral seta (R1) was de-

montrasted to be a non reliable diagnostic character to differentiate between *N. aceri* and *N. squamiger* (Kanouh *et al.* 2010), the position of r3 could be also assumed to be a non reliable diagnostic character as well. Though, the other morphological differences between *N. tuberculata* and *N. arutunjani* seem sufficiently discriminant to conclude that these two species are not synonyms. These results do not agree with the conclusion of Kolodochka (2009).

Small differences in setal and body measurements are observed between *N. arutunjani* and *N. sexapori*. However, all dorsal setae are arising from tubercles on *N. sexapori*, but not on *N. arutunjani*; the number of teeth on the fixed digit is different (three on *N. sexapori*, seven on *N. arutunjani*); spermatheca has a cup-shaped cervix in *N. sexapori*, but a disc-shaped (shallowly cup-shaped) cervix in *N. arutunjani.* These morphological differences between *N. sexapori* and *N. arutunjani* seem also sufficiently discriminant to conclude that these two species are not synonyms.

It seems thus that *N. tuberculata, N. arutunjani* and *N. sexapori* present sufficiently different characters to support their specific validity. These conclusions did not agree with Chant and Yoshida-Shaul (1989) and Kolodochka (2009).

(iv). Neoseiulella vollsella (Chaudhri, Akbar and Rasool), *N. transitans* (Gupta) and *N. prunus* (Denmark and Rather)

Denmark and Rather (1984) differentiated *N. prunus* from *N. vollsella* by the length of both dorsal setae j3 and S4. Then, Chant and Yoshida-Shaul (1989) considered *N. prunus* a junior synonymy of *N. transitans*, and *N. vollsella* a provisional senior synonym to these two latter species. Denmark and Rather (1996) supported this conclusion.

Neoseiulella transitans (Gupta) (Figure 10)

Typhlodromus transitans Gupta 1981: 40-41; Chant and Yoshida-Shaul 1989: 1016-1017. *Typhlodromus* (*Typhloctonus*) *transitans* (Gupta) Gupta 1985: 404. *Typhloctonus transitans* (Gupta) Moraes *et al.* 1986: 235. *Neoseiulella transitans* (Gupta) Chant and McMurtry 1994: 248; Moraes *et al.* 2004: 298; Chant and McMurtry 2007: 147. *Neoseiulella* (*Typhloctona*) *transitans* (Gupta) Denmark and Rather 1996: 67-69. *Amblydromella* (*Aphanoseia*) *transitans* (Gupta) Denmark and Welbourn 2002: 309.

Adult female (Figure 10a – e)

Dorsal shield (Figure 10a) — Dorsal shield heavily reticulated: length 327 (320 – 334); width 187 (185 – 189) (at level of s4) and 171 (169 – 173) (at level of Z1). Three pairs of solenostomes: gd2, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z4 and Z5 which are slightly serrated; Z5 knobbed: j1 18 (17 – 19); j3 25 (24 – 26); j4 16 (15 – 17); j5 17 (16 – 17); j6 20 (18 – 22); J2 24 (23 – 25); J5 10 (9 – 10); z2 19 (18 – 20); z3 25 (24 – 26); z4 24 (22 – 26); z5 18 (17 – 19); Z1 22 (21 – 23); Z4 31 (29 – 33); Z5 46 (42 – 50); s4 27 (25 – 29); s6 27 (26 – 28); S2 31 (30 – 31); S4 30 (29 – 30); S5 23 (22 – 23); sub-lateral setae r3 25 (24 – 26) and R1 22 (21 – 22). Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 10b) — Sternal shield 71 (67 – 75) long and 69 (67 – 71) wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 110 (108 – 111) long and 67 wide (at level of ST5), is smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield much longer than wide, with distinct waist, 103 (96 – 108) long and 68 (66 – 70) wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of small circular solenostomes *gv3* posteromediad to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 38 (36 – 40) long, smooth. Primary metapodal plate or inguinal sigillum 24 (22 – 25) long and 4 (3 – 4) wide.

Spermatheca (Figure 10c) — Cervix 15 (12 – 17) long, cup-shaped.

Chelicera (Figure 10d) — Two large teeth, a ridge of 6 (5 – 6) small teeth, and a *pilus dentilis* on the

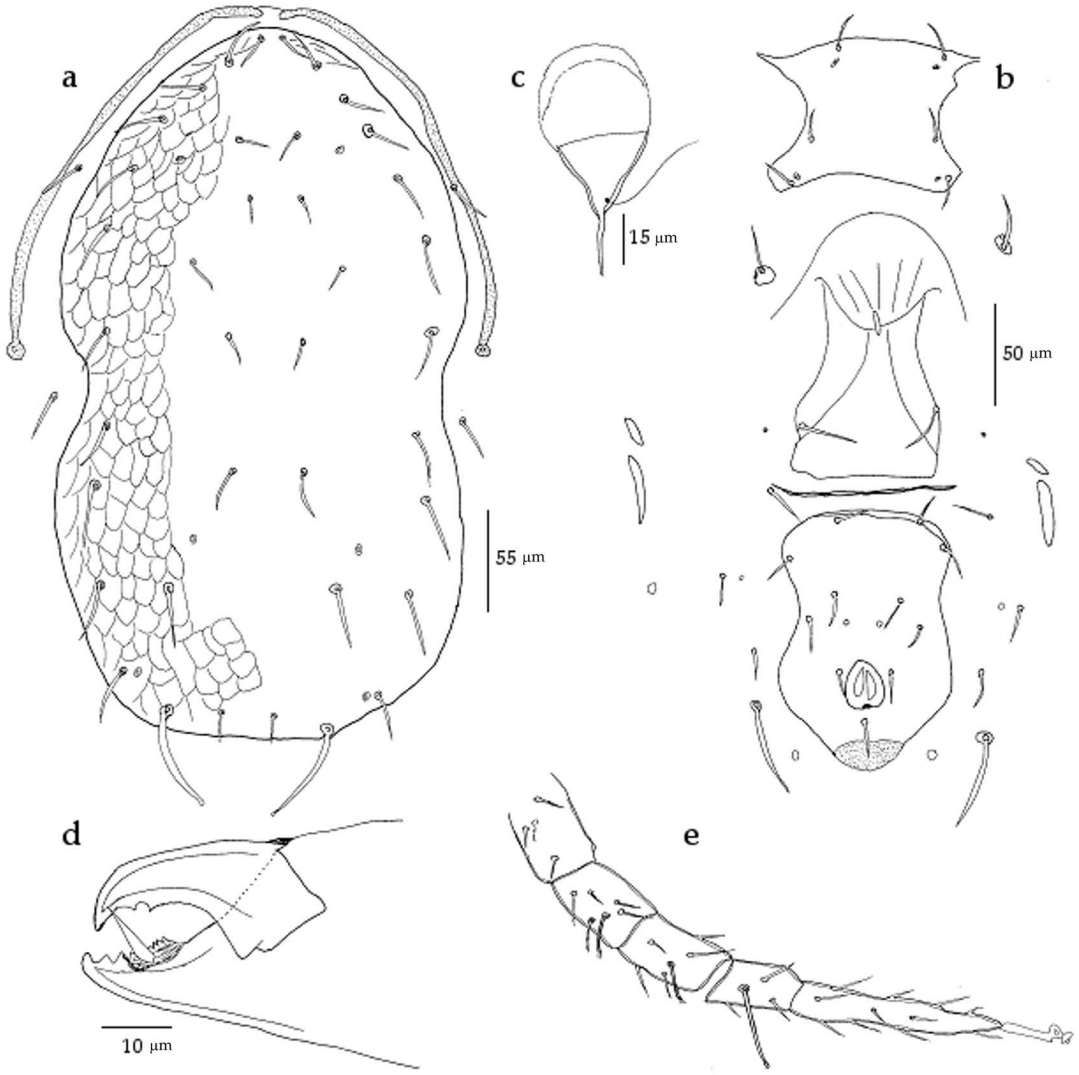

FIGURE 10: *Neoseiulella transitans* (Gupta). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

fixed digit. Movable digit 23 (21 – 25) long, bidentate.

Legs (Figure 10e) — Measurements of legs: leg I 275 (270 – 280); leg II 246 (242 – 250); leg III 244 (240 – 248); leg IV 303 (300 – 306). Seven setae (2-2/0, 2/0-1) on the genu II. Three knobbed macrosetae, 21 (20 – 21), 18 (17 – 18) and 33 (30 – 36) long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype and two female paratypes deposited in the collection of the Zoological Survey of India (ZSI), Kolkata, India.

Adult male

The male of this species is unknown.

Previous reports — *N. transitans* is only known from the Oriental area, from Jammu and Kashmir (India), on *Pyrus communis* L. (Rosaceae), and *Morus* sp. (Moraceae).

Neoseiulella prunus (Denmark and Rather) (Figure 11)

Typhloctonus prunus Denmark and Rather 1984: 172-173; Moraes *et al.* 1986: 233. *Neoseiulella prunus*

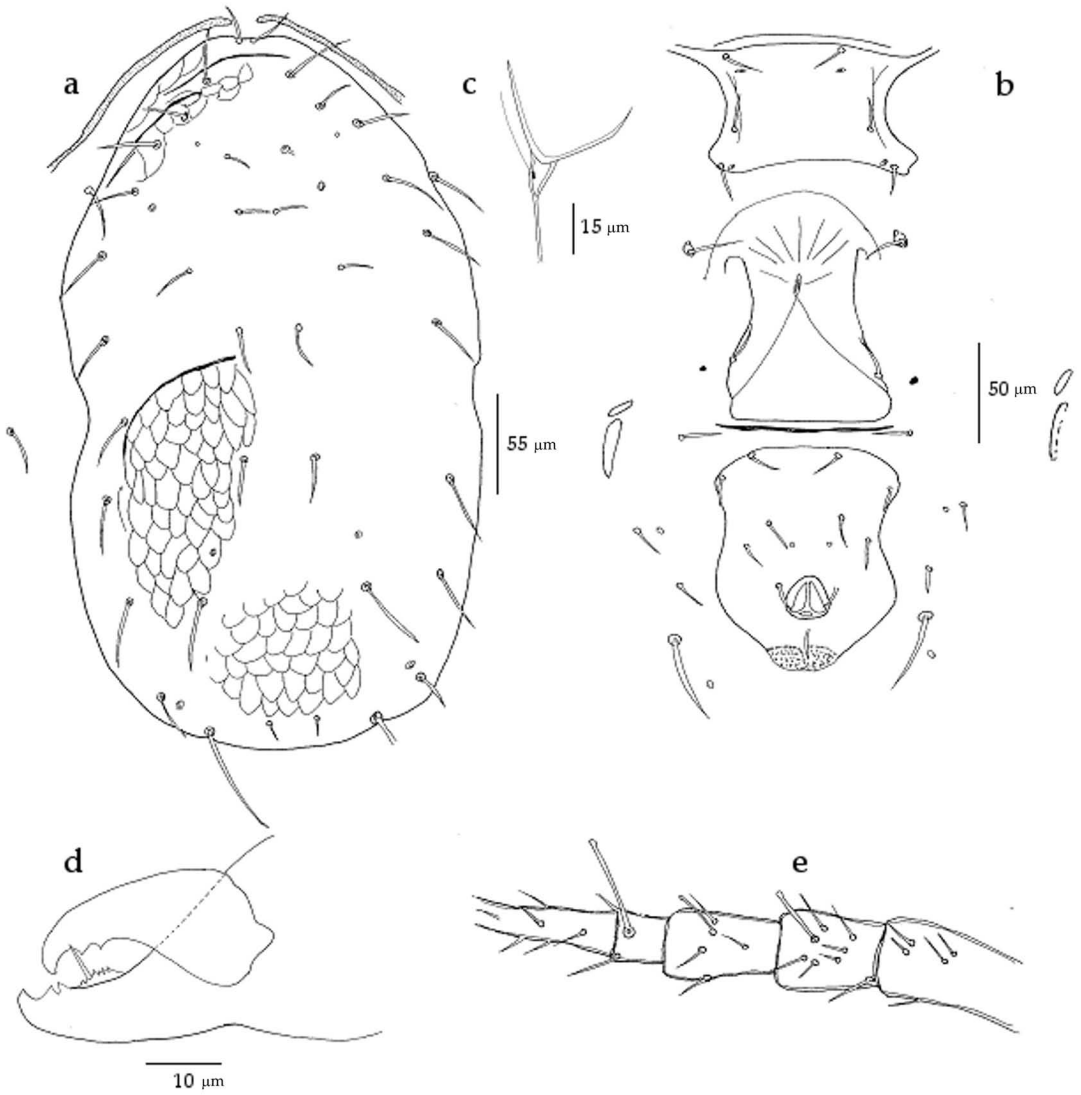

FIGURE 11: *Neoseiulella prunus* (Denmark and Rather). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

(Denmark and Rather) Moraes *et al.* 2004: 298; Chant and McMurtry 2007: 147.

Adult female (Figure 11a – e)

Dorsal shield (Figure 11a) — Dorsal shield heavily reticulated: length 339; width 183 (at level of s4) and 169 (at level of Z1). Three pairs of solenostomes on the dorsal shield: gd2, gd8, and gd9. One pair of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z4 and Z5 slightly serrated; Z5 knobbed: j1 16; j3 25; j4 17; j5 19; j6 19; J2 24; J5 9; z2 19; z3 24; z4 22; z5 19; Z1 25; Z4 28; Z5 44; s4 25; s6 27; S2 30; S4 32; S5 25; sub-lateral setae r3 25 and R1 22. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 11b) — Sternal shield 73 long and 68 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 100 long and 64 wide (at level of ST5), smooth. Elongate platelets or genital sigilla separating genital and ventrianal shields

folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield much longer than wide, with a distinct waist, 100 long and 67 wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of small circular solenostomes *gv3* posteromediad to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 40 long, smooth. Primary metapodal plate or inguinal sigillum 22 long and 3 wide.

Spermatheca (Figure 11c) — Cervix 16 long, cup-shaped.

Chelicera (Figure 11d) — Two teeth, a ridge of six denticles and a *pilus dentilis* on the fixed digit. Movable digit 22 long, bidentate.

Legs (Figure 11e) — Measurements of legs: leg I 267; leg II 238; leg III 238; leg IV 298. Seven setae (2-2/0, 2/0-1) on the genu II. Three knobbed macrosetae, 19, 18 and 32 long, on genu, tibia and basitarsus IV, respectively.

Material examined — A female paratype deposited in the collection of the Department of Zoology, University of Kashmir, Srinagar.

Adult male: The male of this species is unknown.

Previous reports — *N. prunus* is only known from the Oriental area, from Jammu and Kashmir (India), on *Prunus armeniaca* L. (Rosaceae).

No difference in all the morphological characters considered was found between *N. transitans* and *N. prunus*. Consequently, we consider that *N. prunus* is a junior synonym of *N. transitans.* Denmark (personal comm. 2010) confirmed this conclusion. As we were not able to borrow the type materials of *N. vollsella*, an attentive examination of the original description of this latter species was conducted. No morphological difference was observed between *N. vollsella, N. transitans* and *N. prunus*. Moreover, the geographical distributions of these three species are very close. Thus, we support the suggestion of Chant and Yoshida-Shaul (1989) concerning the synonymy of these three species.

(v). Neoseiulella manukae (Collyer) and *N. glenfieldensis* (Schicha)

Denmark and Rather (1996) considered these two species to be synonyms. Schicha (1980) and Chant and Yoshida-Shaul (1989) differentiated *N. manukae* from *N. glenfieldensis* by several idiosomal seta measurements (ex. j4, z2, z4, s4, and Z5).

***Neoseiulella manukae* (Collyer) (Figure 12)**

Typhlodromus manukae Collyer 1964: 637-638; Schicha 1980: 16-18; Collyer 1982: 190; Schicha 1987: 140-143; Chant and Yoshida-Shaul 1989: 1034-1036. *Neoseiulella manukae* (Collyer) Moraes *et al.* 1986: 201; Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147. *Neoseiulella* (*Neoseiulella*) *manukae* (Collyer) Denmark and Rather 1996: 55-56.

Adult female (Figure 12a – e)

Dorsal shield (Figure 12a) — Dorsal shield smooth: length 440 (439 – 440); width 226 (225 – 226) (at level of s4), 224 (223 – 224) (at level of Z1), with five pairs of solenostomes: gd2, gd4, gd5, gd6, and gd9. three pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z5 which is slightly serrated: j1 34 (33 – 34); j3 46 (45 – 46); j4 15 (14 – 15); j5 14; j6 16; J2 16; J5 14; z2 17; z3 30 (29 – 30); z4 31 (30 – 31); z5 15; Z1 15; Z4 55; Z5 134 (133 – 134); s4 36 (35 – 36); s6 25 (24 – 25); S2 28; S4 17; S5 21; sublateral setae r3 20 and R1 17. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 12b) — Sternal shield 92 (91 – 92) long and 88 (86 – 89) wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 133 (132 – 133) long and 74 (73 – 74) wide (at level of ST5), smooth. Elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield longer than wide, 143 (142 – 143) long and 110 (109 – 110) wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1,

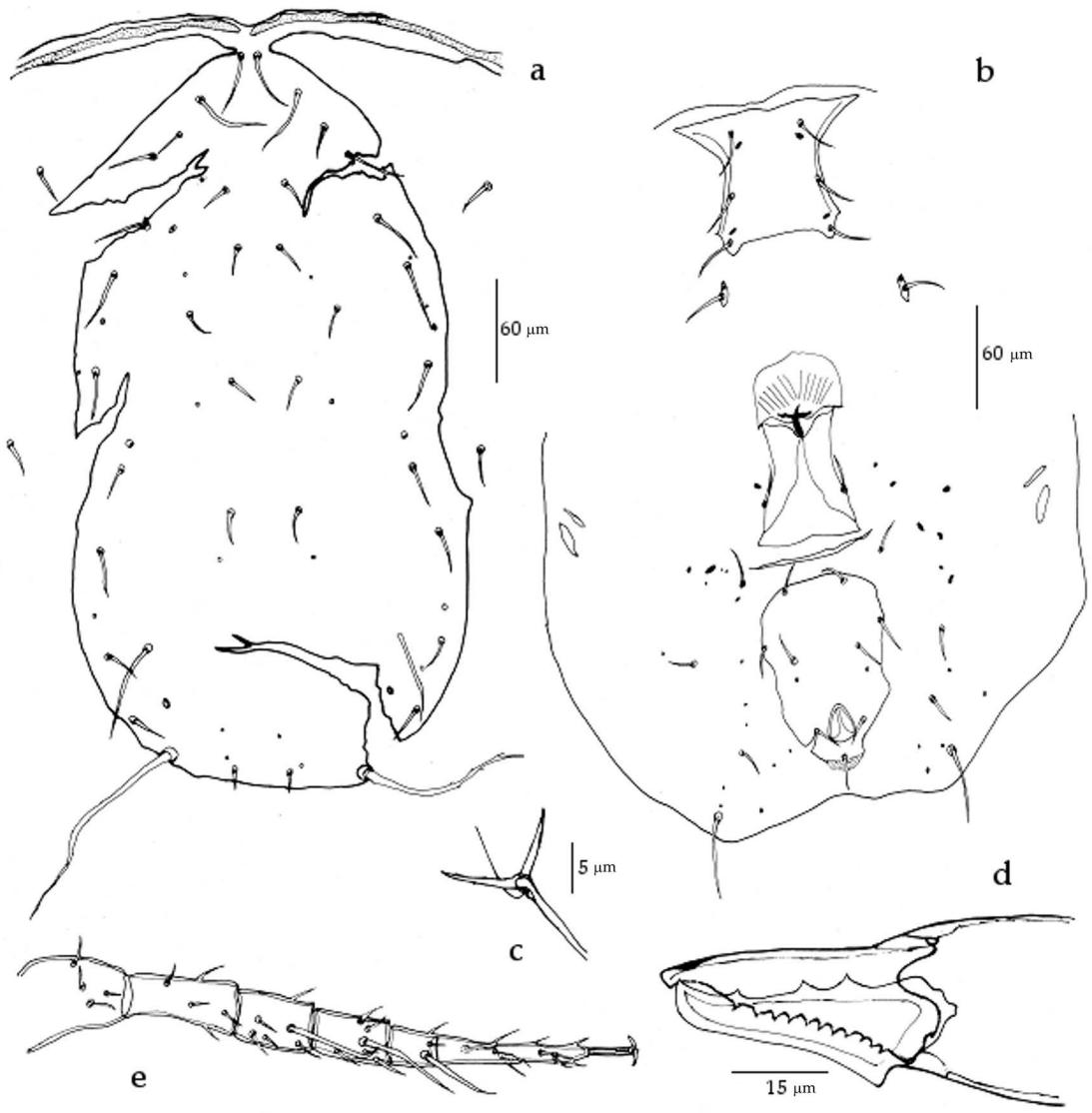

FIGURE 12: *Neoseiulella manukae* (Collyer). Female (lectotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

JV2 and ZV2; JV3 absent), and a pair of small circular solenostomes *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 50 (49 – 50) long, smooth. Primary metapodal plate or inguinal sigillum 23 (22 – 23) long and 7 wide.

Spermatheca (Figure 12c) — Cervix 5 long, cup-shaped.

Chelicera (Figure 12d) — Eleven teeth and a *pilus dentilis* on the fixed digit. Movable digit 33 (32 – 33) long, bearing three teeth.

Legs (Figure 12e) — Measurements of legs: leg I 396 (395 – 396); leg II 330 (329 – 330); leg III 345 (344 – 346); leg IV 437 (436 – 437). Seven setae (2-2/0, 2/0-1) on the genu II. Two macrosetae, 41 (40 – 41) and 32 (31 – 32) long, on genu and tibia III, respectively. Three other macrosetae, 81, 67 and 50 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female lectotype and one female paralectotype deposited in the BMNH,

the British Museum of Natural History, Cromwell Road, London, UK.

Adult male The male of this species is unknown.

Previous reports — *N. manukae* is only known from the Australasian area. The type specimens were collected at Waitakeres, near Auckland, New Zealand, on *Leptospermum scoparium* J.R. Forst. and G. Forst. (Myrtaceae) (Collyer 1964). This species has been also found on *L. ericoides* A. Rich. at Awanui Inlet, New Zealand (Collyer 1982); and on *Eucalyptus parivolia* Cambage (Myrtaceae) in New South Wales, Australia (Schicha 1987).

Neoseiulella glenfieldensis (Schicha) (Figure 13)

Typhlodromus glenfieldensis Schicha 1980: 18; Schicha, 1987: 140-142; Chant and Yoshida-Shaul 1989: 1034-1037. *Neoseiulella glenfieldensis* (Schicha) Moraes *et al.* 1986: 201; Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147.

Adult female (Figure 13a – e)

Dorsal shield (Figure 13a) — Dorsal shield smooth: length 418 (415 – 421); width 231 (230 – 232) (at level of s4), 240 (238 – 242) (at level of Z1), with five pairs of solenostomes: gd2, gd4, gd5, gd6, and gd9. Four pairs of poroids. Sub – lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 which is slightly serrated: j1 35 (34 – 36); j3 40; j4 11; j5 14 (13 – 14); j6 15 (14 – 16); J2 18 (17 – 18); J5 12 (11 – 12); z2 16; z3 25 (23 – 26); z4 21 (20 – 21); z5 14 (13 – 14); Z1 16 (15 – 16); Z4 52 (50 – 53); Z5 171 (166 – 176); s4 28 (27 – 28); s6 19; S2 22 (21 – 23); S4 18; S5 20 (19 – 20); sub – lateral setae r3 19 and R1 18 (17 – 18). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 13b) — Sternal shield 93 (91 – 95) long and 92 (91 – 93) wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 141 (140 – 141) long and 83 (82 – 83) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield longer than wide, 133 (132 – 133) long and 112 (111 – 112) wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), and a pair of small circular solenostomes *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 50 (49 – 50) long, smooth. Primary metapodal plate or inguinal sigillum 23 (22 – 23) long and 7 wide.

Spermatheca (Figure 13c) — Cervix 5 long, cup-shaped.

Chelicera (Figure 13d) — Twelve teeth and a *pilus dentilis* on the fixed digit. The movable digit, 40 (39 – 40) long, bearing three teeth.

Legs (Figure 13e) — Measurements of legs: leg I 391 (387 – 395); leg II 371 (368 – 374); leg III 349 (344 – 354); leg IV 462 (460 – 463). Seven setae (2-2/0, 2/0-1) on the genu II. Two macrosetae 39 (37 – 40) and 32 (31 – 32) long, on genu and tibia III, respectively. Three other macrosetae, 72 (69 – 75), 68 (66 – 69), 54 (53 – 55) long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype and one female paratype deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

Described by Schicha (1980). We were not able to borrow the male type specimen of this species.

Previous reports — *N. glenfieldensis* is only known from Australia (New South Wales). Plants on which this species was collected are: *Citrus* sp. (Rutaceae); *Malus domestica* Borkh (Rosaceae) and *Quercus* sp. (Fagaceae).

The present examination of the type materials of *N. manukae* and *N. glenfieldensis* shows two main differences. The first one concerns the dentition of the fixed digit (11 teeth in *N. manukae*; 12-13 teeth in *N. glenfieldensis*). However, Schicha (1980) mentioned that *N. glenfieldensis* has 11-13 teeth on the fixed digit; we do not thus consider this difference

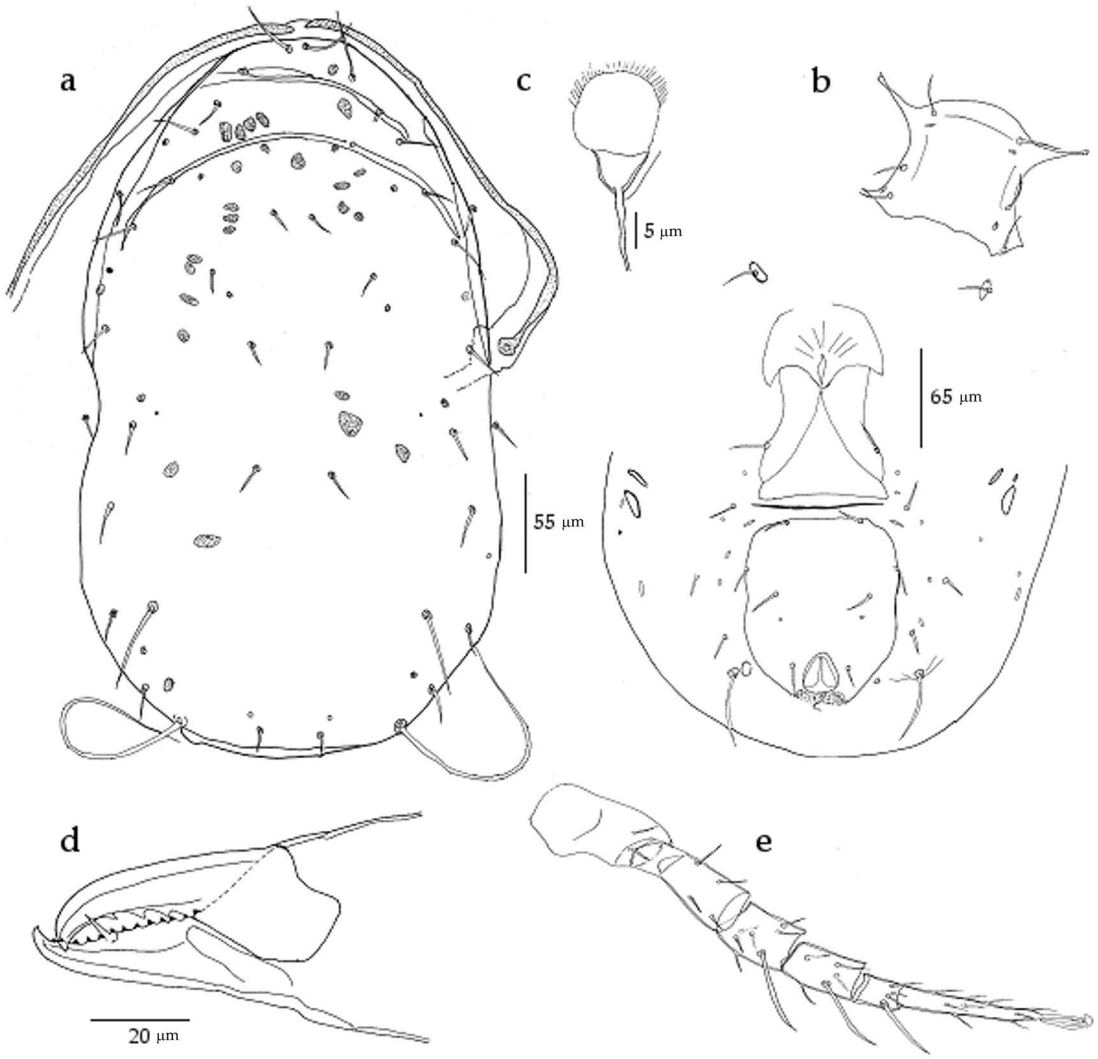

FIGURE 13: *Neoseiulella glenfieldensis* (Schicha). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

to be significant. The second difference relates to the length of the seta Z5 (Z5 134 on *N. manukae*; Z5 171 on *N. glenfieldensis*). Even if this difference is quite high, high intraspecific vatiations have been previously observed for idiosomal seta lengths in the family Phytoseiidae (Tixier *et al.* 2003, 2008). Furthermore, it would be the unique diagnostic characters to separate these two species. We thus propose that *N. manukae* is a senior synonym of *N. glenfieldensis*, in accordance with the conclusions of Denmark and Rather (1996), but not with those of Schicha (1980) and Chant and Yoshida-Shaul (1989). However, an examination of other female paratype specimens of both species and/or molecular studies would be useful to determine the reliability of the length of Z5 for species diagnosis.

Are there new cases of synonymies within the genus *Neoseiulella*?

The examination of the type materials allows to highlight similarities between two species, and thus we propose a new synonymy within this genus: *Neoseiulella nesbitti* (Womersley) and *N. armidalensis* (Schicha and Elshafie). These two species were considered in the previous revisions as two differ-

ent entities (Chant and Yoshida-Shaul 1989; Denmark and Rather 1996). Schicha and Elshafie (1980) when describing *N. armidalensis* have noted the similarity with *N. nesbitti* but stated that these species differ in the presence/absence of JV3 (present on *N. armidalensis*, absent on *N. nesbitti*). However, Chant and Yoshida-Shaul (1989) showed the absence of JV3 on the holotype specimens of these two species, but distinguished them by the presence of macrosetae on leg IV (one macroseta on *N. nesbitti*; three macrosetae on *N. armidalensis*), and the occurrence of *pilus dentilis* on the fixed digit (present on *N. nesbitti*; absent on *N. armidalensis*).

Neoseiulella nesbitti (Womersley) (Figure 14)

Typhlodromus nesbitti Womersley 1954: 179-180; Hirschmann 1962: 12; Narayanan and Ghai 1963: 541; Prasad 1974: 174; Schicha 1978: 5-7; Schicha 1987: 132-133; Chant and Yoshida-Shaul 1989: 1043-1044. *Typhlodromus* (*Typhlodromus*) *nesbitti* (Womersley) Chant 1959: 65-66. *Neoseiulella nesbitti* (Womersley) Muma 1961: 295; Moraes *et al.* 1986: 201; Chant and McMurtry 1994: 249; Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147. *Typhlodromus* (*Nesbittieus*) *nesbitti* (Womersley) Wainstein 1962: 23. *Typhlodromus* (*Seiulus*) *nesbitti* (Womersley) Ehara 1966: 16-17. *Typhloctonus* (*Neoseiulellus*) *nesbitti* (Womersley) Wainstein 1977: 1415. *Typhlodromus* (*Typhloctonus*) *nesbitti* (Womersley) Gupta 1985: 403-404. *Neoseiulella* (*Neoseiulella*) *nesbitti* (Womersley) Denmark and Rather 1996: 46-48.

textitAdult female (Figure 14a – e)

Dorsal shield (Figure 14a) — Dorsal shield lightly reticulated: length 399; width 228 (at level of s4) and 233 (at level of Z1). Five pairs of solenostomes : gd2, gd4, gd5, gd6, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z4 and Z5 which are slightly serrated: j1 25; j3 27; j4 18; j5 19; j6 20; J2 21; J5 12; z2 19; z3 28; z4 28; z5 18; Z1 20; Z4 38; Z5 57; s4 26; s6 27; S2 31; S4 25; S5 23; sub-lateral setae r3 21 and R1 20. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 14b) — Sternal shield 86 long and 82 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 126 long and 73 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield much longer than wide, 144 long and 110 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), with a pair of small circular solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5, JV3 absent) on the integument surrounding the ventrianal shield. JV5 41 long, smooth. Primary metapodal plate or inguinal sigillum 28 long and 7 wide.

Spermatheca (Figure 14c) — Cervix 6 long, shallowly cup-shaped.

Chelicera (Figure 14d) — Nine teeth and a *pilus dentilis* on the fixed digit. Movable digit 35 long, bearing three teeth.

Legs (Figure 14e) — Measurements of legs: leg I 353; leg II 322; leg III 302; leg IV 395. Seven setae (2-2/0, 2/0-1) on the genu II. Three pointed macrosetae, 31, 33 and 49 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in the South Australian Museum, Adelaide, Australia.

Adult male

Described by Schicha (1978). We were not able to borrow the male type specimens of this species.

Previous reports — The type specimens of *N. nesbitti* were collected from Australia (New South Wales) on *Medicago arborea* L. (Fabaceae). This species was reported from two biogeographical areas: Australasian and Oriental areas. Countries in which *N. nesbitti* was recorded are: Australia (New South Wales) (Womersley 1954; Schicha 1975; Wainstein 1977; Schicha 1978). Australia (Tasmania) (Schicha 1987); India (Delhi) (Narayanan and

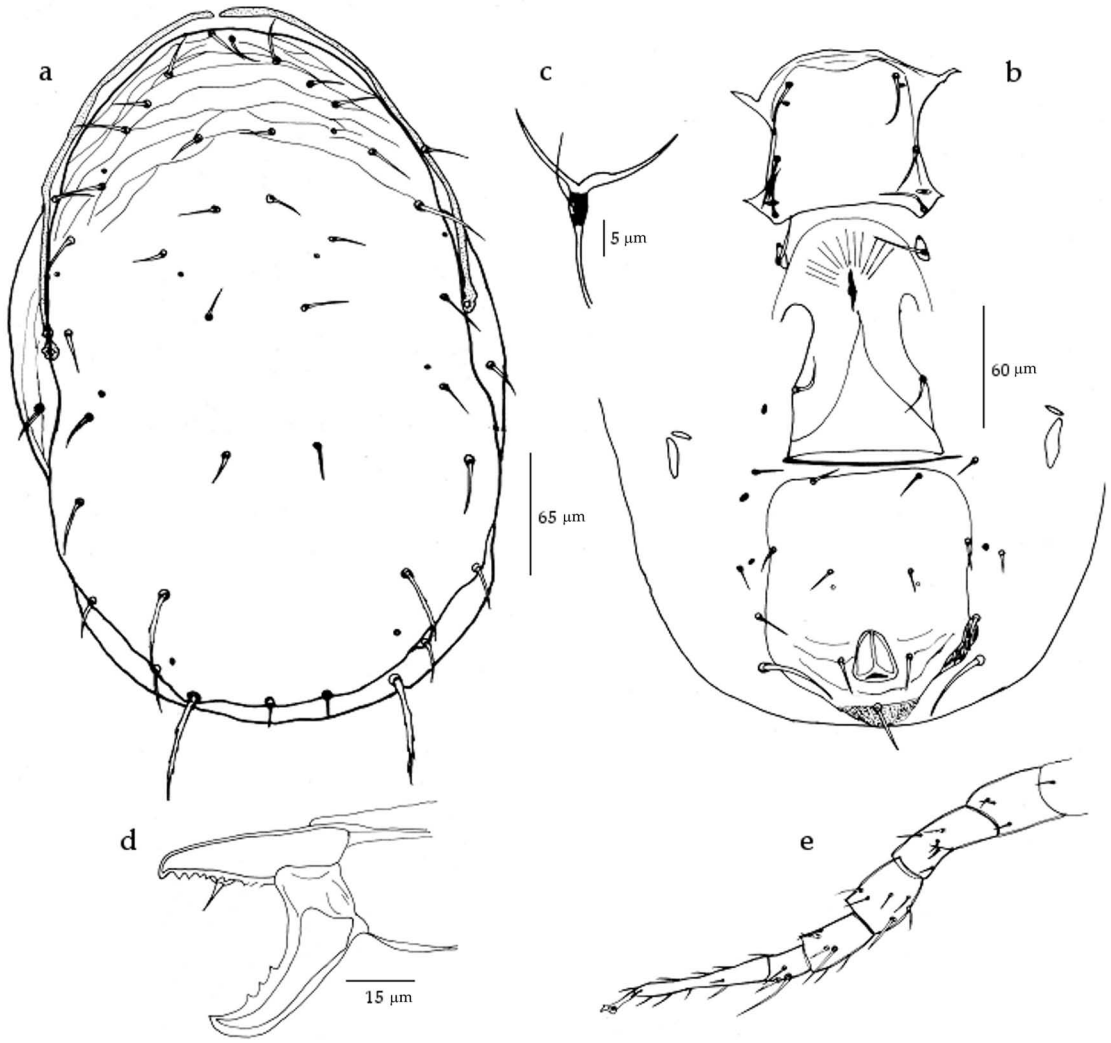

FIGURE 14: *Neoseiulella nesbitti* (Womersley). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Ghai 1961). Plants on which this species was collected are: *Actinidia chinensis* Planch. (Actinidiaceae); *Banksia integrifolia* L.f. (Proteaceae); *Eucalyptus parivolia* (Myrtaceae); *Casuarina* sp. (Casuarinaceae); *Hydrangea macrophylla* (Thunb.) Ser. (Hydrangeaceae); *Malus domestica* (Rosaceae); *Mangifera indica* L. (Anacardiaceae).

Neoseiulella armidalensis (Schicha and Elshafie) (Figure 15)

Typhlodromus armidalensis Schicha and Elshafie 1980: 36; Schicha 1987: 140; Chant and Yoshida-Shaul 1989: 1042. *Neoseiulella armidalensis* (Schicha and Elshafie) Moraes *et al.* 1986: 201; Moraes *et al.* 2004: 291; Chant and McMurtry 2007: 147. *Neoseiulella* (*Typhloctona*) *armidalensis* (Schicha and Elshafie) Denmark and Rather 1996: 57.

Adult female (Figure 15a – e)

Dorsal shield (Figure 15a) — Dorsal shield smooth: length 416; width 214 (at level of s4) and 223 (at level of Z1). Five pairs of solenostomes: gd2, gd4, gd5, gd6, and gd9. No poroid visible. Sublateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 which is slightly serrated. Lateral setae S4 and S5 on small tubercles in the specimen exam-

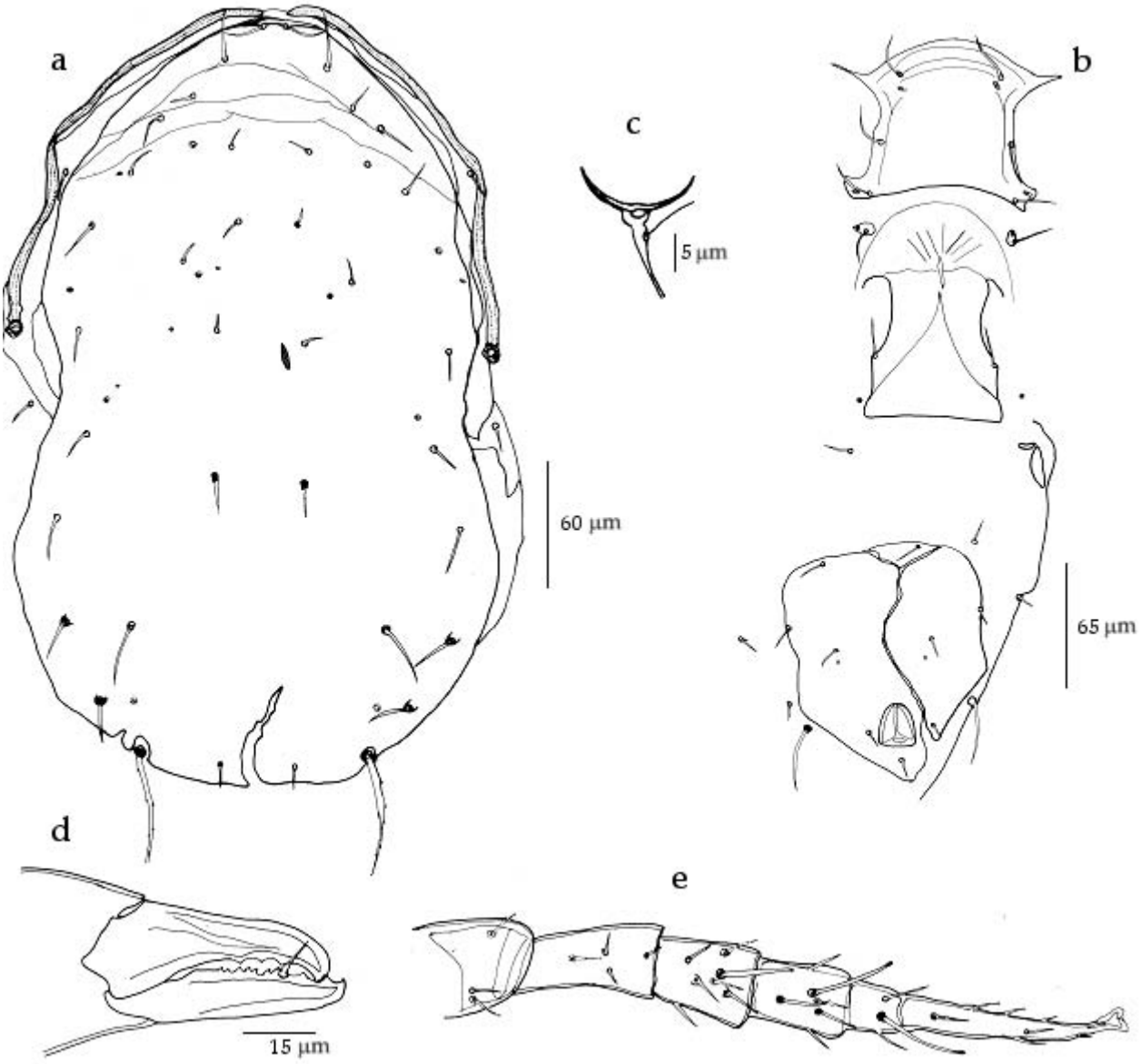

FIGURE 15: *Neoseiulella armidalensis* (Schicha and Elshafie). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

ined: j1 22; j3 28; j4 13; j5 10; j6 12; J2 broken in the specimen examined (Chant and Yoshida-Shaul [1989] and Denmark and Rather [1996] mentioned J2 15); J5 11; z2 14; z3 21; z4 18; z5 10; Z1 16; Z4 33; Z5 65; s4 22; s6 17; S2 23; S4 22; S5 22; r3 14 and R1 15. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 15b) — Sternal shield 90 long and 83 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 125 long and 73 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating the genital and ventrianal shields not discernible on the specimen examined. One pair of poroids close to the genital shield (ST 5) and no poroid visible around the genital shield. Ventrianal shield (in poor conditions in the speci-

men examined) 134 long and 117 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent) and a pair of small circular solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 42 long, smooth. Primary metapodal plate or inguinal sigillum 24 long and 7 wide.

Spermatheca (Figure 15c) — Cervix 7 long, cup-shaped.

Chelicera (Figure 15d) — Eight or nine teeth and *pilus dentilis* on the fixed digit. Movable digit 35 long, bearing three teeth. Chant and Yoshida-Shaul (1989) mentioned that the *pilus dentilis* is not visible whereas Schicha (1980, 1987) and Denmark and Rather (1996) drew the *pilus dentilis*.

Legs (Figure 15e) — Measurements of legs: leg I 390; leg II 315; leg III 305; leg IV 408. Seven setae (2-2/0, 2/0-1) on the genu II. Three knobbed macrosetae, 37, 45 and 47 long, on genu, tibia and basitarsus IV, respectively.

Material examined — One female paratype specimen (deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

The male of this species is unknown.

Previous reports — *N. armidalensis* is only known from New South Wales (Australia), on *Malus* sp. (Rosaceae) and *Eucalyptus* sp. (Myrtaceae).

The present examination of the type materials of *N. nesbitti* and *N. armidalensis* shows that JV3 is absent; the fixed digit has a *pilus dentilis*, and that leg IV bears three macrosetae for the two species. Moreover, no difference in setal and body measurements between these two species is observed. We thus propose that *N. nesbitti* is a senior synonym of *N. armidalensis*. This conclusion does not agree with those of Chant and Yoshida-Shaul (1989) and Denmark and Rather (1996). The unique difference we observe between *N. nesbitti* and *N. armidalensis* is the nature of macrosetae on leg IV (pointed on *N. nesbitti*, knobbed on *N. armidalensis*). Further experiments would be consequently interesting to carry out in order to determine the reliabilty of such a difference for species diagnosis.

From these latter considerations, we thus include 37 valid species in the genus *Neoseiulella*: *N. aceri* (Collyer) (senior synonym of *N. squamiger* [Wainstein], and provisionally of *N. aceris* [Lehman]); *N. arinoi* Moraza, Peña-Estevez and Ferragut; *N. arutunjani* (Kuznetsov); *N. ashleyae* (Chant and Yoshida-Shaul); *N. canariensis* Ferragut and Pena-Estevez; *N. carmeli* (Rivnay and Swirski); *N. cassiniae* (Collyer); *N. celtis* (Denmark and Rather); *N. compta* (Corpuz-Raros) (suspected synonym of *N. multispinosa* [Tseng] [Chant and Yoshida-Shaul, 1989]); *N. coreen* Walter; *N. corrugata* (Schicha); *N. cottieri* (Collyer); *N. crassipilis* (Athias-Henriot and Fauvel); *N. dachanti* (Collyer); *N. elaeocarpi* (Schicha); *N. elongata* Ferragut and Pena-Estevez; *N. elisae* (Schicha and McMurtry), *N. ferraguti* Moraza and Pena-Estevez; *N. litoralis* (Swirski and Amitai); *N. longiseta* Moraza, Pena-Estevez and Ferragut; *N. manukae* (Collyer) (senior synonym of *N. glenfieldensis* [Schicha]); *N. montforti* (Rivnay and Swirski); *N. myopori* (Collyer); *N. neoviniferae* (Basha, Mahrous and Mostafa); *N. nesbitti* (Womersley) (senior synonym of *N. armidalensis* [Schicha and Elshafie]); *N. novaezealandiae* (Collyer); *N. oleariae* (Collyer); *N. perforata* (Athias-Henriot); *N. runiacus* (Kolodochka); *N. spaini* (Collyer); *N. splendida* Ferragut and Pena-Estevez; *N. steeli* (Shicha and McMurtry); *N. steveni* (Schicha); *N. tiliarum* (Oudemans) (senior synonym of *N. formosa* [Wainstein]); *N. tuberculata* (Wainstein); *N. sexapori* (Karg and Edland); *N. transitans* (Gupta) (senior synonym of *N. prunus* [Denmark and Rather], and provisionally a junior synonym of *N. vollsella* [Chaudhri, Akbar and Rasool] [Chant and Yoshida-Shaul 1989; Denmark and Rather 1996).

Description of the other valid species of the genus *Neoseiulella*

Neoseiulella arinoi Moraza, Peña-Estévez and Ferragut (Figure 16)

Neoseiulella arinoi Moraza, Peña-Estévez and Ferragut 2005: 109-112; Moraza and Peña-Estevez 2006: 59; Chant and McMurtry 2007: 147.

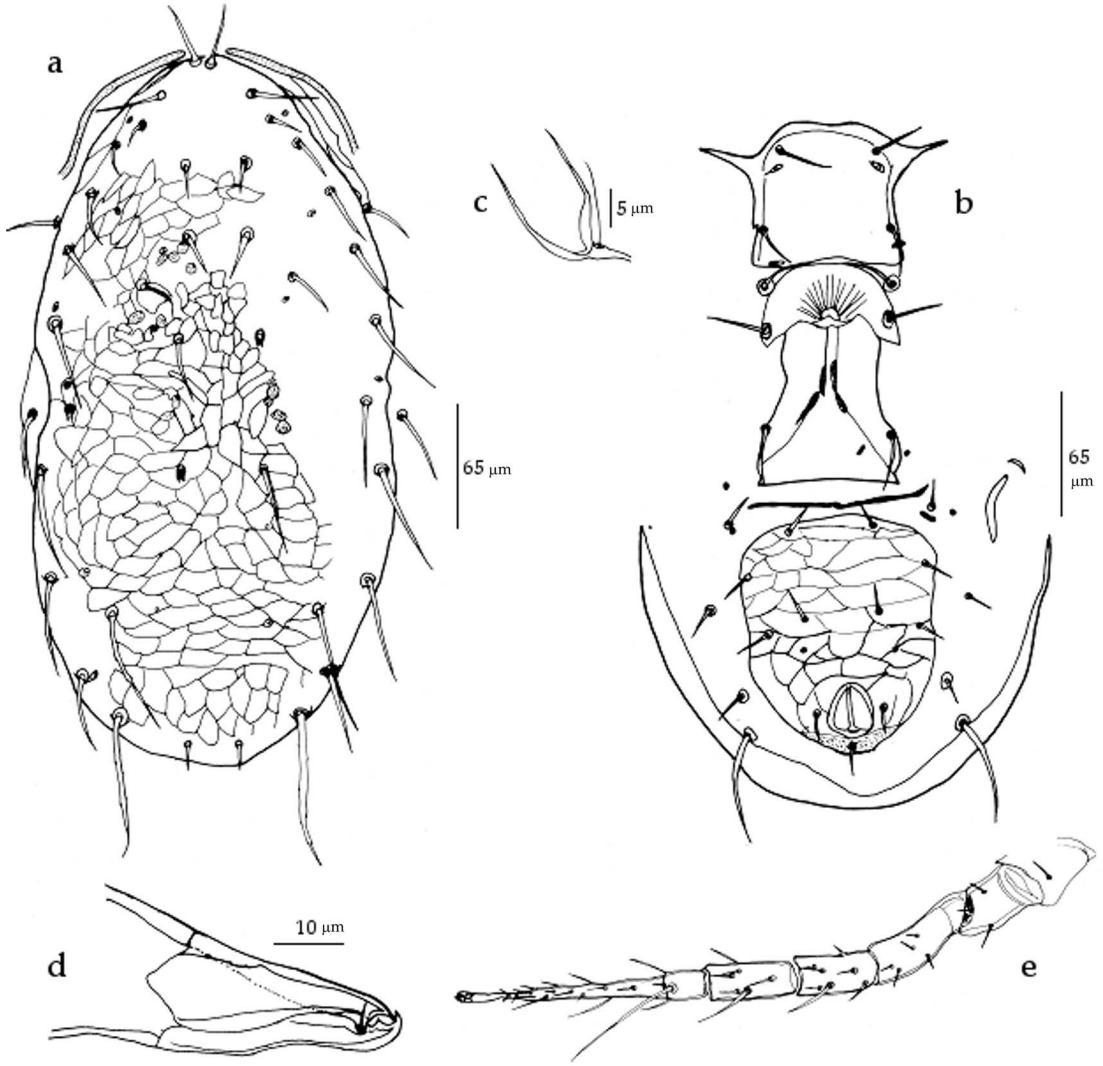

FIGURE 16: *Neoseiulella arinoi* Moraza, Peña-Estévez and Ferragut. Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Adult female (Figure 16a – e)

Dorsal shield (Figure 16a) — Dorsal shield distinctly reticulated throughout: length 409; width 191 (at level of s4) and 202 (at level of Z1). Seven pairs of solenostomes: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) inserted on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except for Z4 and Z5 slightly serrated. Lateral setae on small tubercles: j1 34; j3 37; j4 18; j5 20; j6 36; J2 49; J5 12; z2 18; z3 30; z4 42; z5 24; Z1 46; Z4 75; Z5 80; s4 41; s6 52; S2 63; S4 60; S5 47; sub-lateral setae r3 41 and R1 41. Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 16b) — Sternal shield 75 long and 78 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets, and a pair of small poroids accompanying ST4. Genital shield 122 long and 74 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close

to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield longer than wide, 141 long and 110 wide (at level of ZV2), faintly striate, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 62 long, smooth. Dimensions of the primary metapodal plate or inguinal sigillum 37 long and 5 wide.

Spermatheca (Figure 16c) — Cervix 4 long, U-shaped.

Chelicera (Figure 16d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 33 long, unidentate.

Legs (Figure 16e) — Measurements of legs: leg I 373; leg II 345; leg III 328; leg IV 416. Seven setae (2-2/0, 2/0-1) on the genu II. One pointed macroseta, 82 long, on the basitarsus IV. On the specimen examined, two other macrosetae, 30 and 36, on genu and tibia IV, respectively. Even if Moraza *et al.* (2005) draw three macrosetae on the leg IV, they only mentioned in the text, the presence of one macroseta on this leg (on basitarsus).

Material examined — A female paratype deposited in Museum of Zoology of University of Navarra, Spain.

Adult male

Described by Moraza *et al.* (2005). We were not able to borrow the male type specimen of this species.

Previous reports — *N. arinoi* is only known from the Canary Islands. It was collected from lichens on dead log, from soil of "lapilli" and litter of *Ficus carica* (Moraceae), *Castanea sativa* (Fagaceae) and *Echium virescens* D. C. (Boraginaceae) (Moraza *et al.* 2005).

Neoseiulella ashleyae (Chant and Yoshida-Shaul) (Figure 17)

Typhlodromus oleariae sensu Schicha (1987, 187, plate 92), *non sensu* Collyer (1982). *Typhlodromus ashleyae* Chant and Yoshida-Shaul 1989: 1039-1041. *Neoseiulella* (*Neoseiulella*) *ashleyae* (Chant and Yoshida-Shaul) Denmark and Rather 1996: 51. *Neoseiulella ashleyae* (Chant and Yoshida-Shaul) Moraes *et al.* 2004: 292; Chant and McMurtry 2007: 147.

Adult female (Figure 17a – e)

Dorsal shield (Figure 17a) — Dorsal shield smooth: length 464 (458 – 469); width 302 (299 – 304) (at level of s4) and 285 (280 – 290) (at level of Z1). Six pairs of small solenostomes: gd2, gd4, gd5, gd6, gd8 and gd9. Four pairs of poroids. In the original description of this species, Chant and Yoshida-Shaul (1989) noted the presence of only five pairs of solenostomes (gd2, gd4, gd5, gd6, and gd9). However, on their drawings a large pair of solenostomes corresponding to the position of gd8 (according to Athias-Henriot [1975] and Swirski *et al.* [1998]) is present. We observed this pair of solenostomes on the four type specimens examined, we thus considered that gd8 is present and that *N. ashleyae* bears six solenostomes on the dorsal shield.

Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 slightly serrated: j1 35 (33 – 37); j3 53 (51 – 56); j4 17 (15 – 18); j5 13 (10 – 16); j6 20; J2 24 (21 – 27); J5 11 (10 – 11); z2 18 (16 – 20); z3 48 (45 – 50); z4 26 (25 – 27); z5 11 (10 – 11); Z1 28 (26 – 29); Z4 61 (59 – 62); Z5 91 (88 – 94); s4 51 (49 – 53); s6 38 (36 – 39); S2 51 (50 – 52); S4 31 (28 – 33); S5 27 (26 – 27); sub-lateral setae r3 24 (20 – 28) and R1 22 (19 – 24). Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 17b) — Sternal shield 93 (91 – 94) long and 101 (98 – 103) wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 147 long, 78 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 152 (147 – 156) long and 128 (122 – 133) wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent) and a pair of small solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ven-

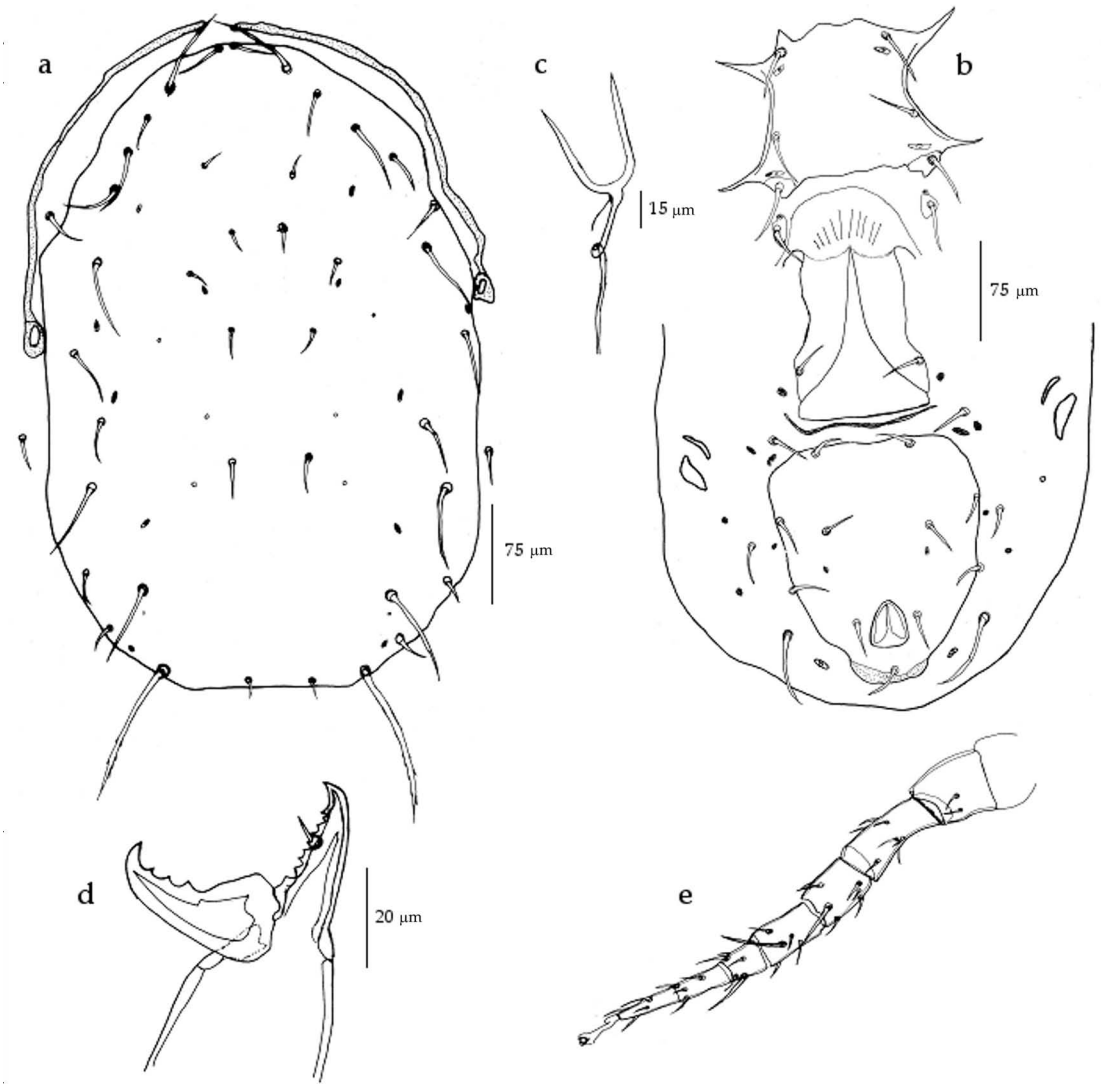

FIGURE 17: *Neoseiulella ashleyae* (Chant and Yoshida-Shaul). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

trianal shield. JV5 46 (41 – 51) long, smooth. Primary metapodal plate or inguinal sigillum 26 (24 – 28) long and 8 (6 – 9) wide.

Spermatheca (Figure 17c) — Cervix 14 (12 – 16) long, thick and U-shaped.

Chelicera (Figure 17d) — Nine teeth and a *pilus dentilis* on the fixed digit. Movable digit 42 (39 – 44) long, bears three teeth.

Legs (Figure 17e) — Measurements of legs: leg I 435 (430 – 440); leg II 388 (386 – 390); leg III 364 (361 – 366); leg IV 441 (436 – 445). Seven setae (2-2/0, 2/0-1) on the genu II. One macroseta (28 long) on the genu III. Three other macrosetae, 42 (39 – 45), 42 (40 – 44) and 34 (32 – 35) long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype and three female paratypes deposited in the Canadian National Collection, Department of Zoology, University of Toronto, Toronto, Canada. A specimen of this species labeled as *Typhlodromus oleariae* (Schicha 1987) (deposited in the New Zealand Arthropod Collection [NZAC], Landcare Research, Auckland, New Zealand) was also presently examined. Our

examination of this specimen shows that, as stated by Chant and Yoshida-Shaul (1989), it belongs to *N. ashleyae*, but not to *N. olearia*e.

Adult male

The male of this species is unknown.

Previous reports — *N. ashleyae* is only known from New Zealand (Nelson Province) (Chant and Yoshida-Shaul 1989). Plants on which this species was collected are: *Elaeocarpus hookerianus* Raoul (Elaeocarpaceae), *Citrus* sp. (Rutaceae), *Nothofagus menziesii* (Hook.f.) Oerst. (Nothofagaceae) and *Pinus uncinata* Ramond ex D. C. (Pinaceae).

Neoseiulella canariensis Ferragut and Peña-Estevez (Figure 18)

Neoseiulella canariensis Ferragut and Peña-Estevez 2003: 159-161; Moraes *et al.* 2004: 292; Moraza and Peña-Estevez 2006: 59; Chant and McMurtry 2007: 147.

Adult female (Figure 18a – e)

Dorsal shield (Figure 18a) — Dorsal shield smooth: length 364 (342 – 385); width 185 (174 – 195) (at level of s4) and 209 (183 – 235) (at level of Z1). Seven pairs of small solenostomes on the dorsal shield: gd1, gd2, gd4, gd5, gd6, gd8 and gd9. Five pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, thick, and rising up tubercles, except J5, Z4 and Z5 slightly serrated: j1 28 (26 – 30); j3 42; j4 21 (19 – 23); j5 20 (20 – 22); j6 32 (30 – 33); J2 37 (35 – 39); J5 32 (31 – 33); z2 22 (20 – 23); z3 40 (38 – 42); z4 29 (27 – 31); z5 21 (19 – 23); Z1 35 (32 – 38); Z4 61 (59 – 62); Z5 90 (88 – 91); s4 47 (43 – 50); s6 46 (44 – 48); S2 51 (48 – 53); S4 41 (34 – 47); S5 30 (28 – 31); sub-lateral setae r3 30 (28 – 32) and R1 31 (28 – 33). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 18b) — Sternal shield 61 (50 – 71) long and 60 (47 – 73) wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and the metasternal setae (ST4) on separate platelets, with a pair of small poroids with ST4. Genital shield 110 (90 – 129) long, 54 (48 – 60) wide (at level of ST5), smooth. Three elongate platelets or genital sigilla situated between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 102 (85 – 118) long and 77 (60 – 84) wide (at level of ZV2), smooth or faintly striate, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of small solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 34 (30 – 38) long, smooth. Primary metapodal plate or inguinal sigillum 25 (21 – 29) long and 6 (5 – 7) wide.

Spermatheca (Figure 18c) — Cervix 4 (3 – 5) long, U-shaped, flaring towards vesicle.

Chelicera (Figure 18d) — Six teeth and a *pilus dentilis* on the fixed digit. Movable digit 26 long, bidentate.

Legs (Figure 18e) — Measurements of legs: leg I 374 (365 – 383); leg II 310 (301 – 320); leg III 297 (286 – 308); leg IV 415 (404 – 425). Seven setae (2-2/0, 2/0-1) on the genu II. Three pointed macrosetae 33 (31 – 34), 31 (30 – 32) and 55 (51 – 59) long on genu, tibia and basitarsus IV, respectively.

Material examined — Three female paratypes deposited in the Department of Agroforestal Ecosystems, Universidad Politécnica de Valencia, Spain.

Adult male (Figure 18f, g)

Dorsal shield slightly reticulated and chaetotaxy similar to the female. Sub-lateral seta R1 on the dorsal shield. Ventrianal shield 118 long and 150 wide, slightly reticulated and bearing 7 pairs of preanal setae and 4 pairs of poroids. Spermatodactyl L-shaped. This description is based on a male paratype specimen.

Previous reports — *N. canariensis* is only known from the Canary Islands (Ferragut and Peña-Estevez 2003, 2007). It was collected on various plants belonging to 15 botanical families: *Ageratina adenophora* (Spreng.) King and H. Rob, *Andryala pinnatifida* Ait., *Argyranthemum frutescens* (L.) Sch.Bip., *Argyranthemum gracile* Webb ex Sch.Bip., *Carlina salicifolia* (L.fil.) Cav., *Cynara cardunculus* L.,

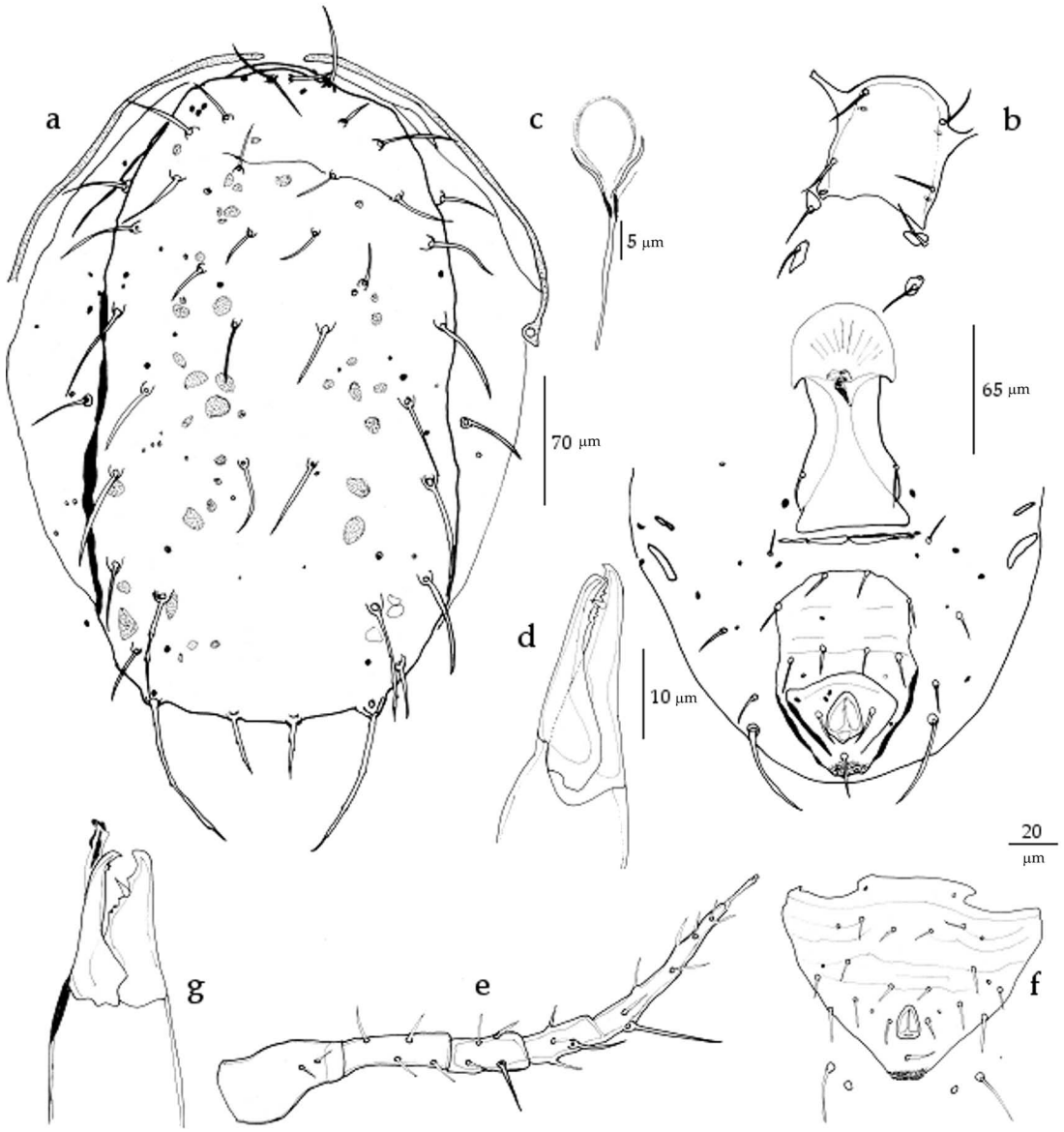

FIGURE 18: *Neoseiulella canariensis* Ferragut and Peña-Estevez. Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV. Male (paratype): f – ventrianal shield; g – spermatodactyl.

Gonospermum gomerae Bolle., *Senecio tussilaginis* (L'Hér.) (Asteraceae); *Bencomia caudata* (Aiton) Webb and Berthel. (Rosaceae); *Bosea yervamora* L. (Amaranthaceae); *Calamintha sylvatica* Bromf., *Cedronella canariensis* (L.) Webb and Berthel., *Lavandula buchii* Webb (Lamiaceae); *Chamaecytisus prolifer* (L.f.) Link, *Teline microphylla* (DC.) Gibbes and Dingw., *Teline gomerae* (Gibbs and Dingw.) Kunkle (Fabaceae); *Convolvulus* sp. (Convolvulaceae); *Crambe pritzelii* Bolle, *Crambe strigosa* L'Hér. (Cruciferae); *Echium acanthocarpum* Svent., *Echium* sp. (Boraginaceae); *Erica arborea* L., *Erica scoparia* L. (Ericaceae); *Geranium canariensis* L. (Geraniaceae); *Gesnouinia arborea* (L.f.) Gaudich.(Urticaceae); *Laurus novocanariensis* Rivas Mart. Rivas Mart., Lousã, Fern. Prieto, E.Díaz, J.C. Costa and C. Aguiar (Lauraceae); *Scrophularia smithii* Hornem (Scrophulariaceae); *Viburnum rigidum* Vent. (Caprifoliaceae); *Vi-*

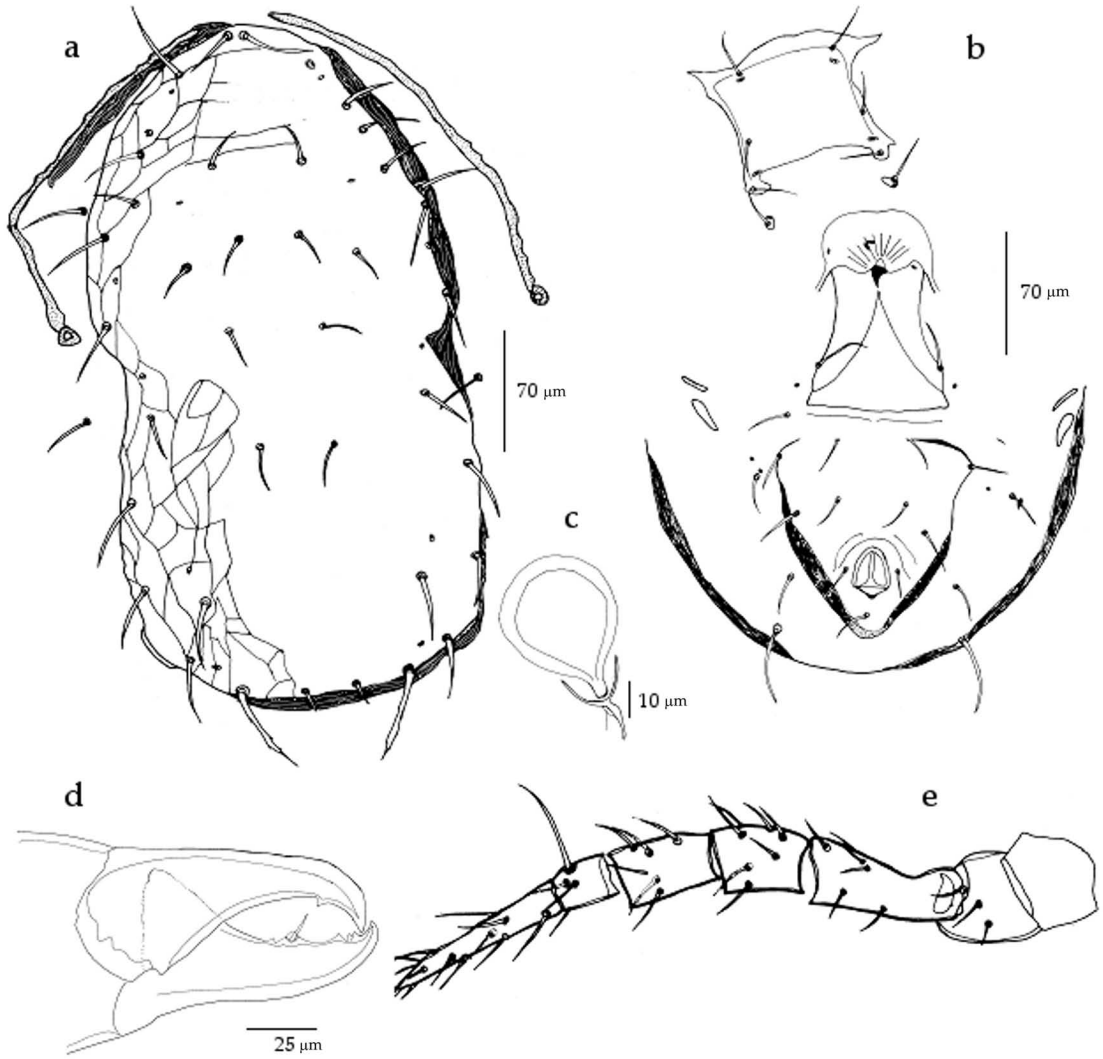

FIGURE 19: *Neoseiulella carmeli* (Rivnay and Swirski). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

ola riviniana Rchb. (Violaceae).

Neoseiulella carmeli (Rivnay and Swirski) (Figure 19)

Typhloctonus carmeli Rivnay and Swirski 1980: 177-179; Denmark and Rather 1984: 167; Moraes *et al.* 1986: 232. *Typhlodromus carmeli* (Rivnay and Swirski) Chant and Yoshida-Shaul 1989: 1020. *Neoseiulella* (*Typhloctona*) *carmeli* (Rivnay and Swirski) Denmark and Rather 1996: 65-66. *Neoseiulella carmeli* (Rivnay and Swirski) Swirski and Amitai 1997b: 37; Swirski *et al.* 1998: 115; Moraes *et al.* 2004: 292; Chant and McMurtry 2007: 147.

Adult female (Figure 19a – e)

Dorsal shield (Figure 19a) — Dorsal shield slightly reticulated along the lateral area: length 409; width 204 (at level of s4) and 188 (at level of Z1). Six pairs of solenostomes on the dorsal shield: gd1, gd2, gd4, gd6, gd8 and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z5 slightly serrated: j1 38; j3 47; j4 24 (22 – 25); j5 22; j6 24; J2 28; J5 12; z2 26; z3 33 (31 – 35); z4

25; z5 24; Z1 27; Z4 42; Z5 55; s4 38 (36 – 39); s6 37; S2 39 (37 – 40); S4 35 (33 – 36); S5 38; sub-lateral setae r3 35 and R1 30. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 19b) — Sternal shield 87 long and 90 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small circular poroids. Genital shield 134 long and 87 wide (at level of ST5), smooth. Platelets or genital sigilla separating between genital and ventrianal shields not discernible. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield subtriangular-shaped, lightly longer than wide, 142 long and 136 wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 54 (50 – 58) long, smooth. Primary metapodal plate or inguinal sigillum 25 long and 7 wide.

Spermatheca (Figure 19c) — Cervix 12 long, U-shaped.

Chelicera (Figure 19d) — Three or four teeth and a *pilus dentilis* on the fixed digit. Movable digit 55 long, unidentate.

Legs (Figure 19e) — Measurements of legs: leg I 412; leg II 357 (353 – 360); leg III 370 (361 – 378); leg IV 467. Six setae (1-2/0, 2/0-1) on the genu II. One macroseta 58 (56 – 59) long, on the basitarsus IV.

Material examined — Three female paratypes deposited in the Division of Entomology, Agricultural Research Organization, Bet Dagan, Israel.

Adult male

The male of this species is unknown.

Previous reports — *N. carmeli* is only known from Israel (Rivnay and Swirski 1980; Swirski and Amitai 1997b; Swirski *et al*. 1998). Plants on which this species was collected are: *Quercus calliprinos* Webb (Fagaceae); *Phillyrea latifolia* L. (Oleaceae); *Salvia* sp. (Lamiaceae); and *Styrax officinalis* L. (Styracaceae).

Neoseiulella cassiniae (Collyer) (Figure 20)

Typhlodromus cassiniae Collyer 1982: 189; Chant and Yoshida-Shaul 1989: 1024-1026. *Typhloctonus cassiniae* (Collyer) Denmark and Rather 1984: 171; Moraes *et al.* 1986: 232. *Neoseiulella* (*Typhloctona*) *cassiniae* (Collyer) Denmark and Rather 1996: 70. *Neoseiulella cassiniae* (Collyer) Moraes *et al.* 2004: 292; Chant and McMurtry 2007: 147.

Adult female (Figure 20a – e)

Dorsal shield (Figure 20a) — Dorsal shield slightly reticulated throughout: length 473; width 235 (at level of s4) and 260 (at level of Z1). Six pairs of solenostomes on the dorsal shield: gd1, gd2, gd4, gd5, gd6 and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae all smooth: j1 20; j3 20; j4 11; j5 11; j6 12; J2 broken in the specimen examined (Denmark and Rather [1984, 1996] mentioned J2 11); J5 11; z2 11; z3 15; z4 14; z5 9; Z1 14; Z4 broken on the specimen examined (Denmark and Rather [1984, 1996] mentioned Z4 27); Z5 39; s4 20; s6 21; S2 19; S4 14; S5 14; sub-lateral setae r3 19 and R1 18. Peritreme extending anteriorly to the level between j1-j3.

Ventral shields (Figure 20b) — Sternal shield 71 long and 76 wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets and a pair of small poroids accompanying ST4. Genital shield 167 long and 87 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital shield and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 157 long and 131 wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 36 long, smooth. Primary metapodal plate or inguinal sigillum 34 long and 7 wide.

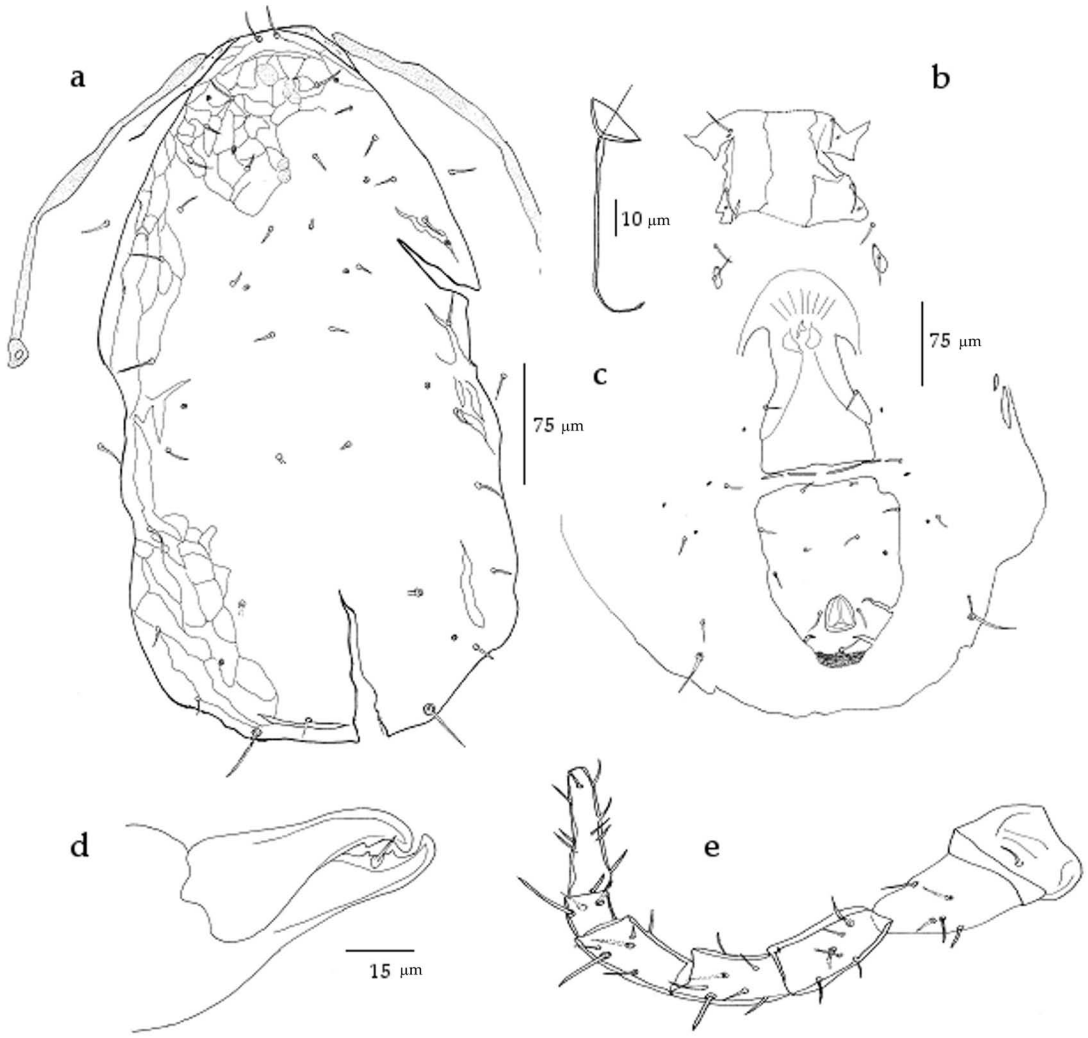

FIGURE 20: *Neoseiulella cassiniae* (Collyer). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Spermatheca (Figure 20c) — Cervix 8 long, cup-shaped.

Chelicera (Figure 20d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 37 long, unidentate.

Legs (Figure 20e) — Measurements of legs: leg I 391; leg II 323; leg III 337; leg IV 417. Eight setae (2-2/1, 2/0-1) on the genu II. Three macrosetae, 25, 30 and 32 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland, New Zealand.

Adult male

The adult of this species is unknown.

Previous reports — *N. cassiniae* is only known from New Zealand, on *Cassinia* sp. (Asteraceae) and *Hebe* sp. (Plantaginaceae).

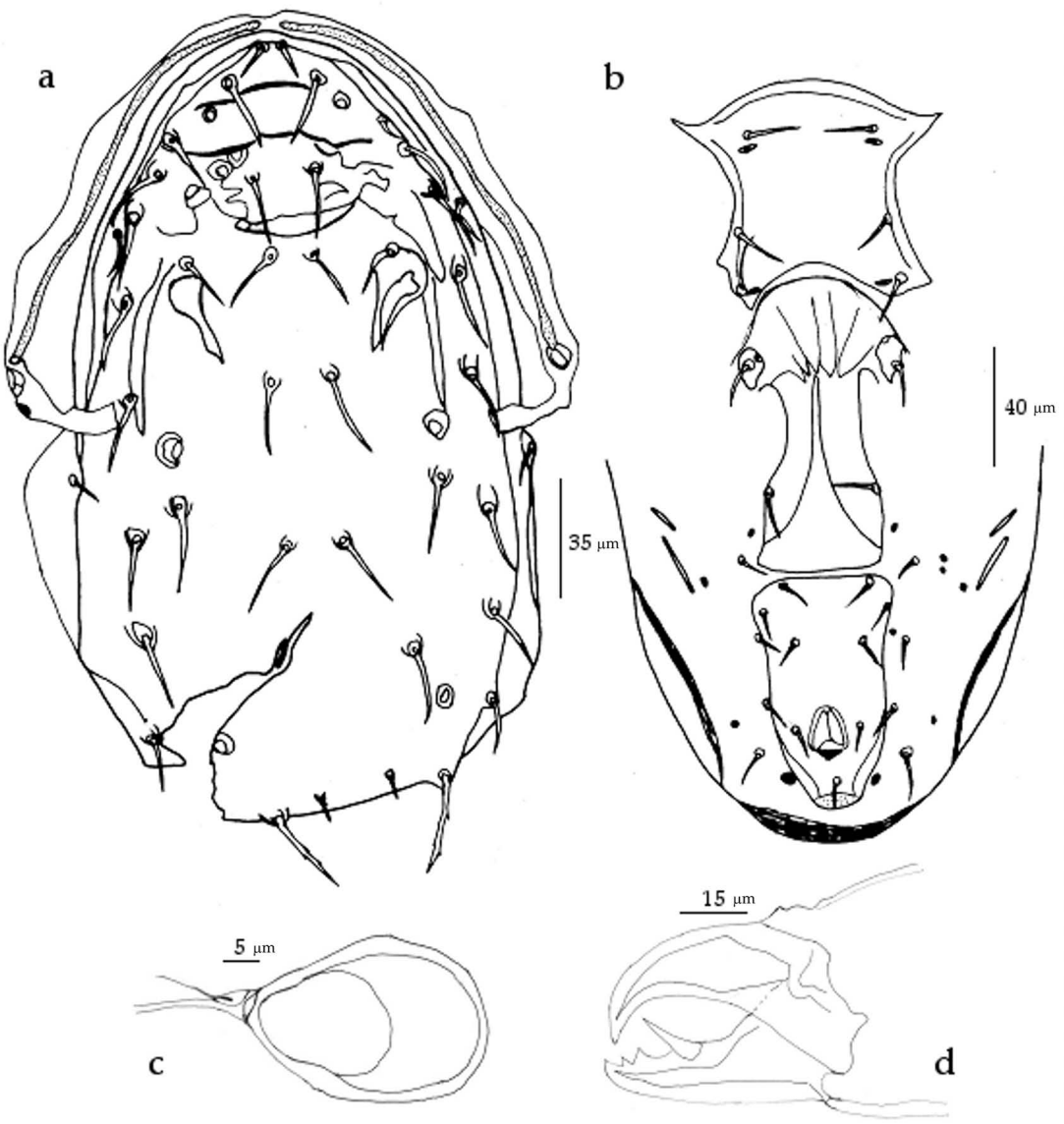

FIGURE 21: *Neoseiulella coreen* Walter. Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera.

Neoseiulella coreen Walter (Figure 21)

Neoseiulella coreen Walter 1997: 336-337. *Neoseiulella coreen* Walter, Moraes *et al.* 2004: 292; Chant and McMurtry 2007: 147.

Adult female (Figure 21 a – d)

Dorsal shield (Figure 21a) — Dorsal shield is smooth: length 266 (261 – 270); width 132 (129 – 135) (at level of s4), 145 (139 – 150) (at level of Z1). Tuberculous ornements covering the lateral areas of the dorsal shield. Three pairs of large circular solenostomes (gd1, gd6, and gd9) and one pair of small and crescent-shaped solenostomes (gd8) on the dorsal shield. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae all smooth and rising to tubercles, except Z5 slightly serrated: j1 16 (12 – 20); j3 22 (20 – 24); j4 24 (23 – 25); j5 29 (28 – 30); j6 30 (28 – 31); J2 28

(26 – 30); J5 9 (8 – 10); z2 18; z3 25 (23 – 26); z4 25 (24 – 26); z5 16 (15 – 17); Z1 31 (30 – 32); Z4 25 (24 – 26); Z5 31 (30 – 32); s4 23; s6 29; S2 30 (29 – 31); S4 24 (22 – 25); S5 20 (19 – 21); sub-lateral setae r3 22 (21 – 23) and R1 14 (12 – 15). Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 21b) — Sternal shield weakly sclerotized, 58 (54 – 62) long and 56 (55 – 57) wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of small poroids. A pair of metasternal setae (ST4) inserted on separate platelets accompanied by a pair of small poroids. Genital shield 95 (93 – 96) long and 39 (35 – 42) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield 79 (74 – 83) long and 47 (44 – 49) wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 14 (13 – 15) long, smooth. Primary metapodal plate or inguinal sigillum 19 long and 2 (1.5 – 2) wide.

Spermatheca (Figure 21c) — Cervix 4 (3 – 4) long, U-shaped.

Chelicera (Figure 21d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 24 (23 – 25) long, edentate.

Legs — Measurements of legs: leg I 270 (268 – 272); leg II 205 (195 – 215); leg III 191 (188 – 194); leg IV 271 (268 – 274). Eight setae (2-2/1, 2/0-1) observed on the genu II. No macroseta on legs.

This species is easily distinghuished from the other species in the genus *Neoseiulella* by the tuberculous ornements on the dorsal shield, and by the small size and the shape of the ventrianal shield, which is narrowly vase-shaped.

Material examined — The female holotype and five female paratypes deposited in the UQIC, Department of Entomology, University of Queensland, St Lucia, Australia.

Adult male

Described by Walter (1997). We were not able to borrow any male type specimens of this species.

Previous reports — *N. coreen* is only known from Queensland (Australia) on rainforest trees.

Neoseiulella corrugata (Schicha) (Figure 22)

Typhlodromus corrugatus Schicha 1983: 120; Schicha 1987: 141-144; Chant and Yoshida-Shaul 1989: 1039-1040. *Seiulus corrugatus* (Schicha) Moraes *et al*. 1986: 230. *Neoseiulella* (*Neoseiulella*) *corrugata* (Schicha) Denmark and Rather 1996: 50. *Neoseiulella corrugata* (Schicha) Moraes *et al.* 2004 : 293; Chant and McMurtry 2007: 147.

Adult female (Figure 22 a – e)

Dorsal shield (Figure 22a) — Dorsal shield smooth: length 409; width 247 (at level of s4), 240 (at level of Z1) and 272 (at level of S2). Four pairs of solenostomes on the dorsal shield: gd2, gd4, gd6 and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all except j1 on tubercles. All dorsal and sub-lateral setae smooth, except Z4 and Z5 distinctly serrated: j1 29; j3 40; j4 28; j5 26; j6 30; J2 35; J5 12; z2 25; z3 37; z4 37; z5 24; Z1 37; Z4 66; Z5 117; s4 42; s6 40; S2 48; S4 36; S5 29; sub-lateral setae r3 23 and R1 22. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 22b) — Sternal shield 80 long and 92 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) inserted on separate platelets accompanied by a pair of small poroids. Genital shield 126 long and 83 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield 148 long and 120 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), with a pair of circular solenostomes *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 53 long,

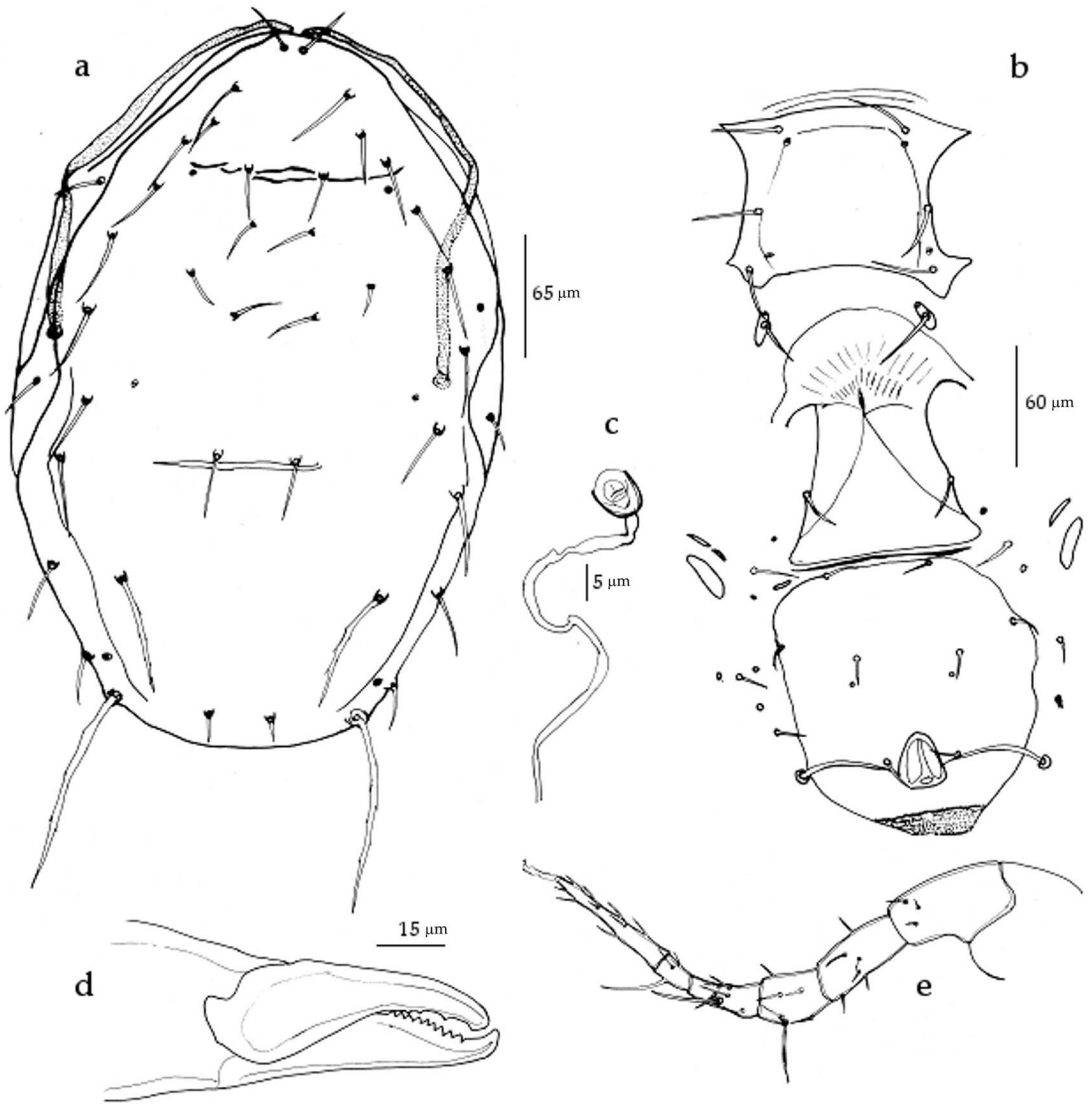

FIGURE 22: *Neoseiulella corrugata* (Schicha). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

smooth. Primary metapodal plate or inguinal sigillum 29 long and 8 wide.

Spermatheca (Figure 22c) — Cervix 6 long, U-shaped.

Chelicera (Figure 22d) — Nine teeth, without *pilus dentilis*, on the fixed digit. Movable digit 33 long, bearing three teeth.

Legs (Figure 22e) — Measurements of legs: leg I 443; leg II 351; leg III 361; leg IV 456. Seven setae (2-2/0, 2/0-1) on the genu II. One macroseta (32 long) on the genu III. Three other macrosetae, 47, 55 and 52 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

The male of this species is unknown.

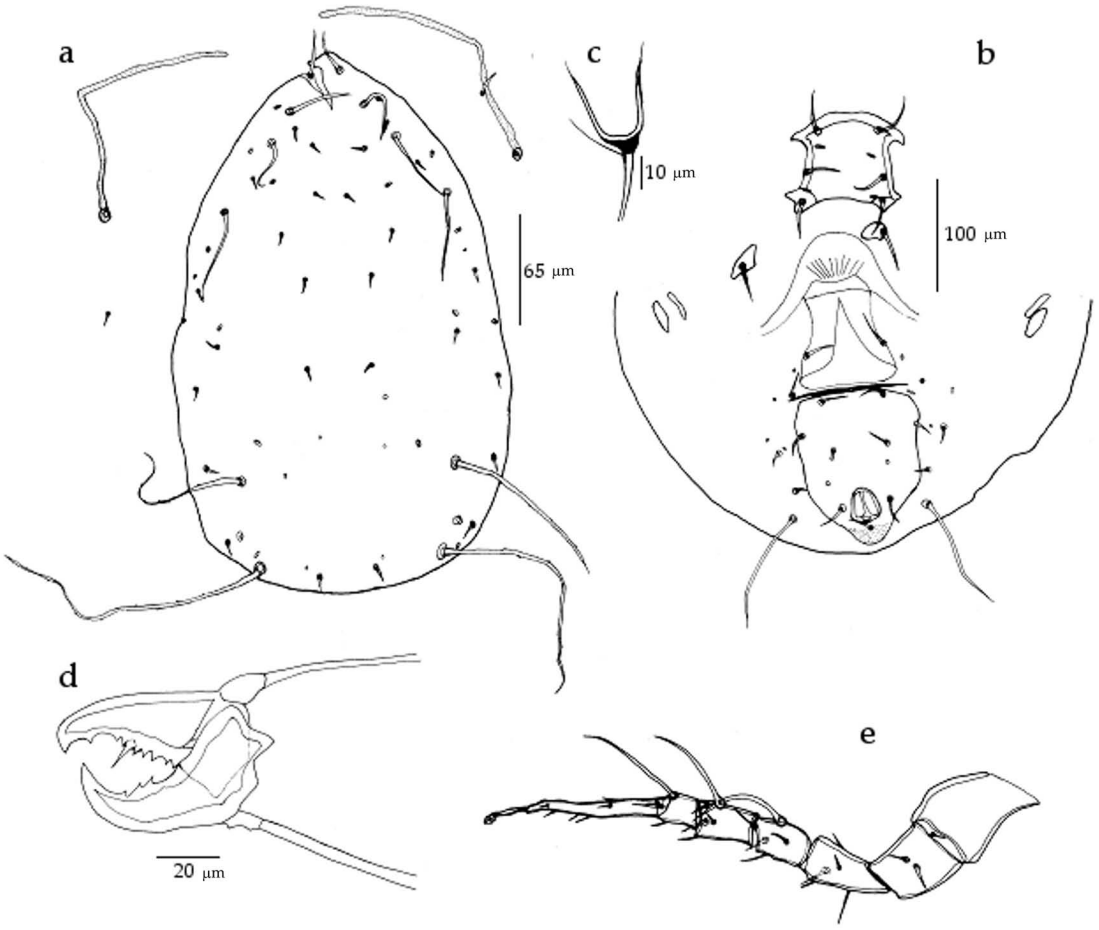

FIGURE 23: *Neoseiulella cottieri* (Collyer). Female (lectotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Previous reports — *N. corrugata* is only known from Australia on *Malus domestica* (Rosaceae).

Neoseiulella cottieri (Collyer) (Figure 23)

Typhlodromus cottieri Collyer 1964: 640-641; Schicha 1980: 20-22; Collyer 1982: 189-190; Schicha 1987: 138-140; Chant and Yoshida-Shaul 1989: 1029-1032. *Typhloctonus* (*Tasmanidromus*) *cottieri* (Collyer) Wainstein 1977: 1415. *Neoseiulella* (*Neoseiulella*) *cottieri* (Collyer) Denmark and Rather 1996: 53. *Neoseiulella cottieri* (Collyer) Moraes *et al.* 1986: 248; Chant and McMurtry 1994: 248; Moraes *et al.* 2004: 293; Chant and McMurtry 2007: 147.

Adult female (Figure 23a – e)

Dorsal shield (Figure 23a) — Dorsal shield smooth: length 385; width 215 (at level of s4) and 255 (at level of Z1). Six pairs of solenostomes observed: gd1, gd2, gd4, gd6, gd8 and gd9. Four pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except for Z4 and Z5 which are slightly serrated: j1 29; j3 43; j4 5; j5 6; j6 9; J2 8; J5 11; z2 6; z3 48; z4 7; z5 6; Z1 6; Z4 121; Z5 232; s4 67; s6 7; S2 9; S4 10; S5 11; sub-lateral setae r3 15 and R1 12. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 23b) — Sternal shield 77 long and 70 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small

poroids. Genital shield 120 long and 68 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla situated between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield, longer than wide 124 long and 101 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), with a pair of circular solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) inserted on the integument surrounding the ventrianal shield. JV5 93 long, smooth. Primary metapodal plate or inguinal sigillum 25 long and 7 wide.

Spermatheca (Figure 23c) — Cervix 11 long, U-shaped.

Chelicera (Figure 23d) — Eight teeth and a *pilus dentilis* on the fixed digit. Movable digit 30 long, bearing three teeth.

Legs (Figure 23e) — Measurements of legs: leg I 403; leg II 318; leg III 313; leg IV 427. Seven setae (2-2/0, 2/0-1) on the genu II. One pointed macroseta (38 long) on the genu III. Three other pointed macrosetae, 82, 65 and 77 long, on genu, tibia and basitarsus IV, respectively.

This species is easily distinguished from all other species of this genus by the lengths of Z4 (121) and Z5 (232).

Material examined — The female lectotype deposited in the BMNH, the British Museum of Natural History, Cromwell Road, London, UK.

Adult male

Described by Collyer (1964) and Schicha (1980). We were not able to borrow the male type specimens of this species.

Previous reports — The type specimens of *N. cottieri* were collected from New Zealand on thistle (Asteraceae). This species is only known from the Australasian area: Australia (Wainstein 1977; Schicha 1980, 1987) and New Zealand (Collyer 1964, 1982). Plants on which this species was collected are: *Astelia* sp. (Asteliaceae); *Cassiniae* sp. (Asteraceae); *Fragaria x ananassa* Duchesne, *Malus domestica* (Rosaceae); *Hebe* sp. (Plantaginaceae); *Humulus lupulus* L. (Cannabaceae); *Trifolium repens* L. (Fabaceae) and on moss samples.

Neoseiulella crassipilis (Athias-Henriot and Fauvel) (Figure 24)

Pegodromus crassipilis Athias-Henriot and Fauvel 1981: 72-73; Ragusa 2006: 3. *Typhlodromus crassipilis* (Athias-Henriot and Fauvel) Chant and Yoshida-Shaul 1989: 1011-1013. *Neoseiulella crassipilis* (Athias-Henriot and Fauvel) Moraes *et al.* 2004: 293; Chant and McMurtry 2007: 147.

Adult female (Figure24 a – d)

Dorsal shield (Figure 24a) — Dorsal shield heavily reticulated throughout: length 454; width 248 (at level of s4) and 290 (286 – 294) (at level of Z1). Five pairs of solenostomes: gd1, gd2, gd6, gd8, and gd9. No poroid visible. The presence of gd1 was stated by Athias-Henriot and Fauvel (1981), but not by Chant and Yoshida-Shaul (1989). Sub-lateral setae (r3 and R1) on the dorsal shield. Dorsal shield bearing 21 pairs of setae, all are thick and serrated: j1 35 (34 – 36); j3 51 (50 – 52); j4 39 (37 – 40); j5 37 (34 – 39); j6 50 (49 – 50); J2 63 (62 – 64); J5 17 (16 – 17); z2 35 (34 – 35); z3 45 (44 – 45); z4 62 (59 – 65); z5 30 (28 – 31); Z1 65 (64 – 65); Z4 73 (71 – 75); Z5 67 (65 – 68); s4 57 (56 – 58); s6 58 (57 – 58); S2 68 (65 – 71); S4 75 (72 – 77); S5 39 (37 – 40); sub-lateral setae r3 49 (44 – 54) and R1 44 (40 – 47). Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 24b) — Sternal shield 47 (45 – 48) long and 79 (78 – 80) wide (at level of ST2), smooth with distinct striation on the lateral areas, with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets. A pair of small poroids accompanies ST4. Genital shield 143 (141 – 145) long and 82 wide (at level of ST5), distinctly reticulated along. Four platelets or sigillla separate between genital and ventrianal shields. No pair of poroids visible close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped, 160 (158 – 162) long and 168 (163 – 172) wide (at level of ZV2), strongly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of solenostomes *gv3* posterormediad to

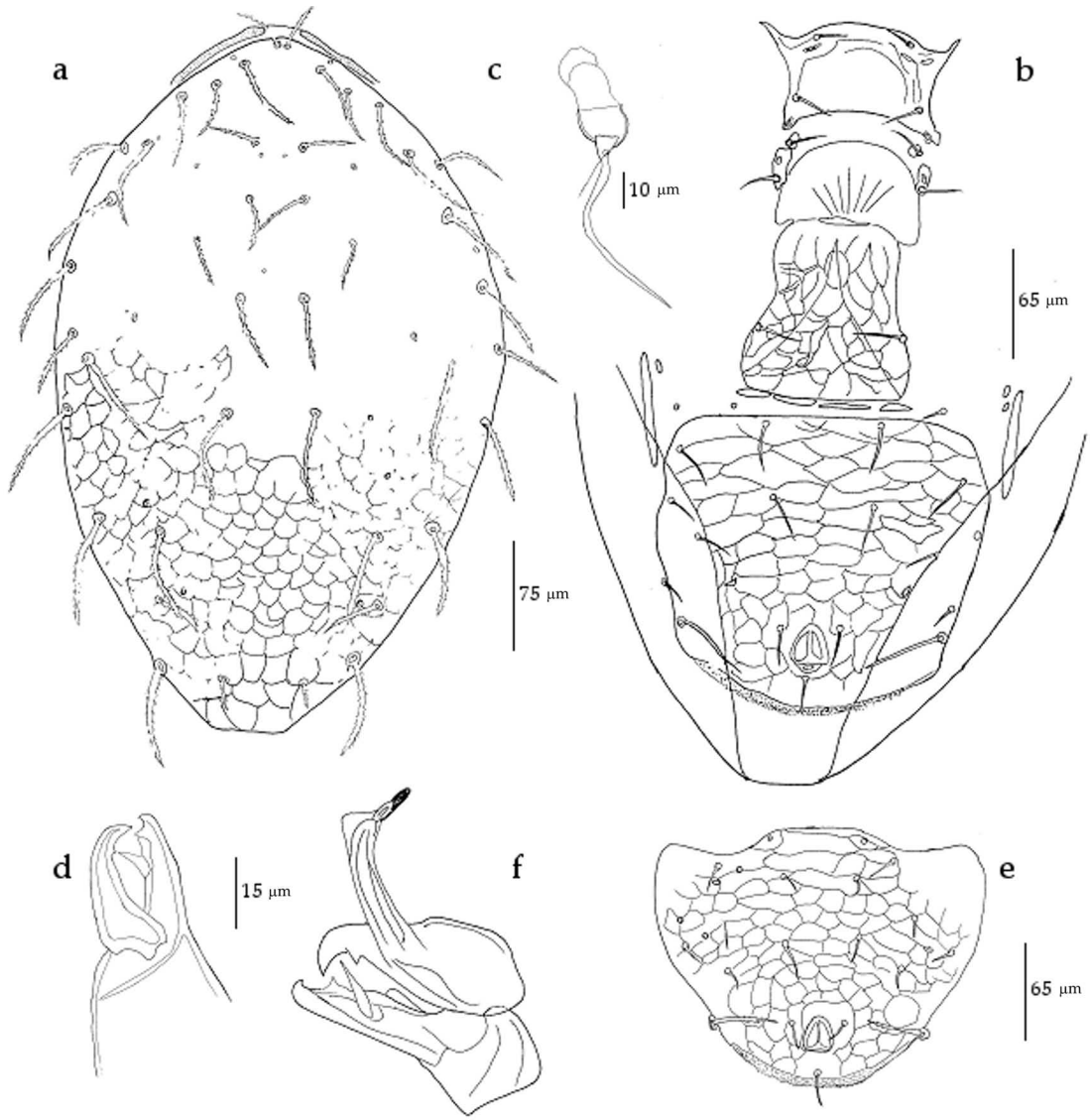

FIGURE 24: *Neoseiulella crassipilis* (Athias-Henriot and Fauvel). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (paratype): e – ventrianal shield; f – spermatodactyl.

JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 44 (42 – 45) long, serrated. Primary metapodal plate or inguinal sigillum 65 (63 – 66) long and 5 wide. This plate much longer than those of all the species of this genus.

Spermatheca (Figure 24c) — Cervix 13 long, cup-shaped.

Chelicera (Figure 24d) — One large tooth and a *pilus dentilis* on the fixed digit. The movable digit, 30 long, unidentate.

Legs — Measurements of legs: leg I 316 (313 – 319); leg II 293 (287 – 298); leg III 300 (293 – 307); leg IV 385 (383 – 387). Eight setae (2-2/1, 2/0-1) on the genu II. No macroseta on legs.

This species is easily distinguished from the other species of the genus by the shape of the ventrianal shield and the reticulation of the genital shield.

Material examined — Three female paratypes deposited in Montpellier SupAgro, UMR CBGP,

Campus International de Baillarguet, CS 30016, 34988 Montferrier-sur-Lez, France).

Adult male (Figure 24e, f)

Dorsal shield chaetotaxy similar to the female. Ventrianal shield 152 long and 196 wide, distinctly reticulated, bearing six pairs of preanal setae with four or five pairs of poroids. Spermatodactyl L-shaped. This description is based on a male paratype specimen.

Previous reports — *N. crassipilis* is only known from the West-Palaearctic area. Countries from which this species was reported are: France (Athias-Henriot and Fauvel 1981; Viollier and Fauvel 1984) and Greece (Ragusa and Tsolakis 1998; Ragusa 2006). It was collected on *Pyrus amygdaliformis* Vill. and *Pyrus* sp. (Rosaceae).

Neoseiulella dachanti (Collyer) (Figure 25)

Typhlodromus dachanti Collyer 1964: 638-640. Schicha 1980: 22-24; Collyer 1982: 189; Schicha 1987: 139, 141; Chant and Yoshida-Shaul 1989: 1032-1034. *Neoseiulella* (*Neoseiulella*) *dachanti* (Collyer) Denmark and Rather 1996: 54-55. *Neoseiulella dachanti* (*Collyer*) Moraes *et al.* 1986: 201; Moraes *et al.* 2004 : 293; Chant and McMurtry 2007: 147.

Adult female (Figure 25a – e)

Dorsal shield (Figure 25a) — Dorsal shield smooth: length 394; width 225 (at level of s4), 226 (at level of Z1). Four pairs of solenostomes: gd2, gd4, gd6, and gd9. Four pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all dorsal and sub-lateral setae smooth, except Z5 slightly serrated: j1 27; j3 41; j4 7; j5 8; j6 12; J2 13; J5 7; z2 11; z3 39; z4 13; z5 8; Z1 13; Z4 48; Z5 111 (106 – 115); s4 42; s6 17; S2 23; S4 12; S5 10; r3 14 and R1 15. Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 25b) — Sternal shield 83 long and 80 wide (at level of ST2), smooth with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 104 long and 68 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield 121 long and 88 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent), with a pair of large solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 39 long, smooth. Primary metapodal plate or inguinal sigillum 20 long and 6 wide.

Spermatheca (Figure 25c) — Cervix 3 long, shallowly cup-shaped.

Chelicera (Figure 25d) — Twelve teeth, without *pilus dentilis*, on the fixed digit. Movable digit, 35 long, bearing three teeth.

Legs (Figure 25e) — Measurements of legs: leg I 372; leg II 323 (318 – 328); leg III 323 (318 – 328); leg IV 395 (391 – 400). Seven setae (2-2/0, 2/0-1) on the genu II. Two macrosetae, 30 and 27 long, on genu and the tibia III, respectively. Three other macrosetae, 46, 48 and 48 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female lectotype deposited in the BMNH, the British Museum of Natural History, Cromwell Road, London, UK.

Adult male

Described by Collyer (1964) and Schicha (1980). We were not able to borrow the male type specimen of this species.

Previous reports — The type specimens of *N. dachanti* were collected at Waitakeres, near Auckland, New Zealand, on "native bush". This species is only known from the Australasian area: New Zealand (Collyer 1964, 1982) and Australia (Schicha 1987). Plant supports on which this species was reported are: *Brachyglottis repanda* J. R. and G. Forst. (Asteraceae); *Coprosma* sp. (Rubiaceae); *Cytisus* sp. (Fabaceae); *Elaeocarpus dentatus* (G. R. and G. Forster) Vahl (Elaeocarpaceae); *Erica* sp. (Ericaceae); *Melicytus ramiflorus* G. R. and G. Forster (Violaceae); *Nothofagus* sp. (Nothofagaceae); *Nothopanax* sp., *Pseudopanax* sp. *(Araliaceae)*; *Podocarpus* sp.

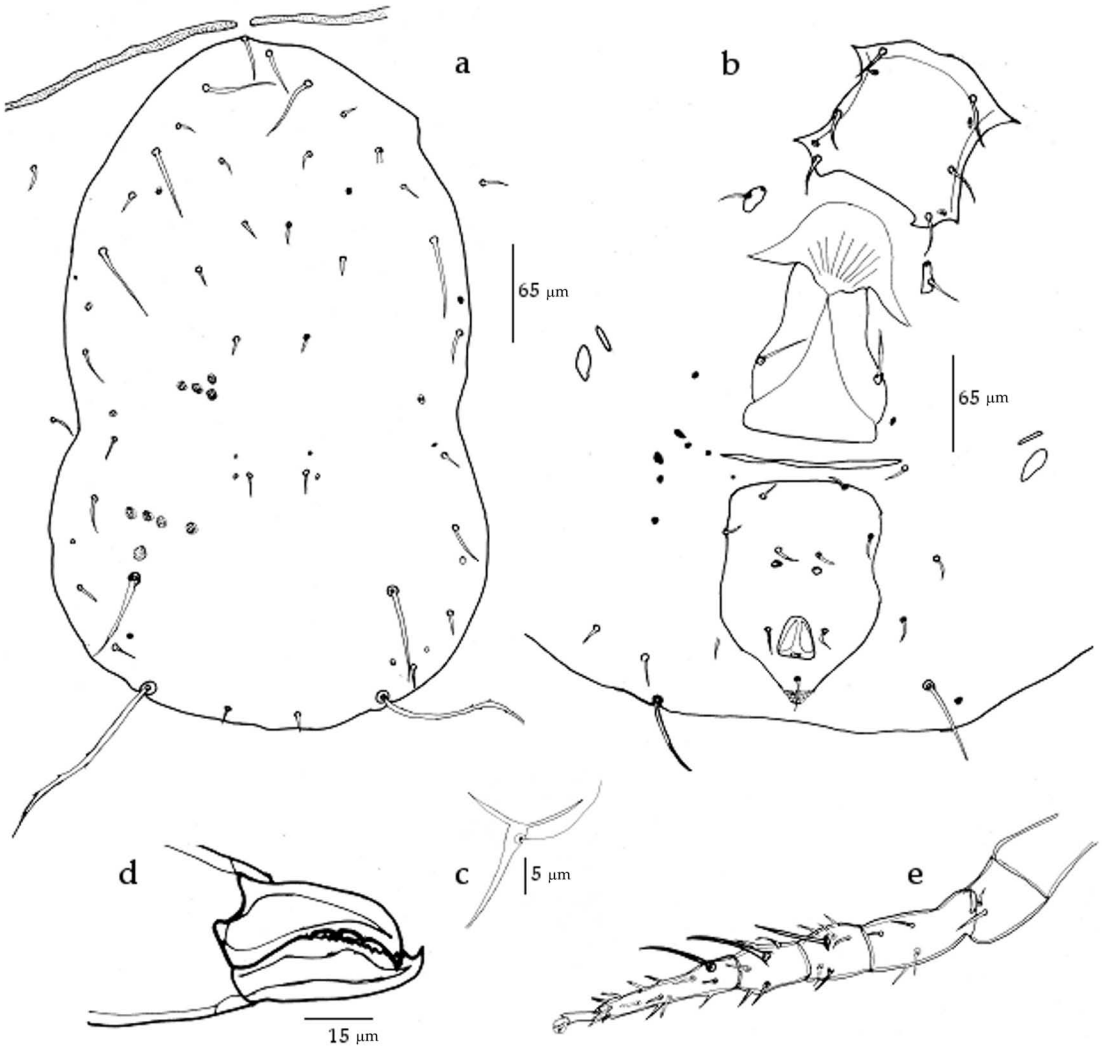

FIGURE 25: *Neoseiulella dachanti* (Collyer). Female (lectotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

(Podocarpaceae); *Eucalyptus* sp. (Myrtaceae); *Rubus* sp. (Rosaceae) and tree ferns.

Neoseiulella elaeocarpi (Schicha) (Figure 26)

Typhlodromus elaeocarpi Schicha, *in* Schicha and O'Dowd 1993: 304-305. *Neoseiulella* (*Neoseiulella*) *elaeocarpi* (Schicha) Denmark and Rather 1996: 49. *Neoseiulella elaeocarpi* (Schicha) Moraes *et al.* 2004 : 293; Chant and McMurtry 2007: 147.

Adult female (Figure 26a – e)

Dorsal shield (Figure 26a) — Dorsal shield heavily reticulated throughout: length 356; width 201 (at level of s4) and 226 (at level of Z1). Six pairs of solenostomes on the dorsal shield: gd1, gd4, gd5, gd6, gd8, and gd9. One pair of poroids. Sublateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except for Z4 (slightly serrated) and Z5 (distinctly serrated), and on tubercles: j1 18; j3 20; j4 16; j5 16; j6 18; J2 22; J5 9; z2 16; z3 20; z4 20; z5 17; Z1 21; Z4 25; Z5 42; s4 19; s6 21; S2 22; S4 23; S5 25; sub-lateral setae r3 18 and R1 18. Peritreme extending anteriorly to the level j1.

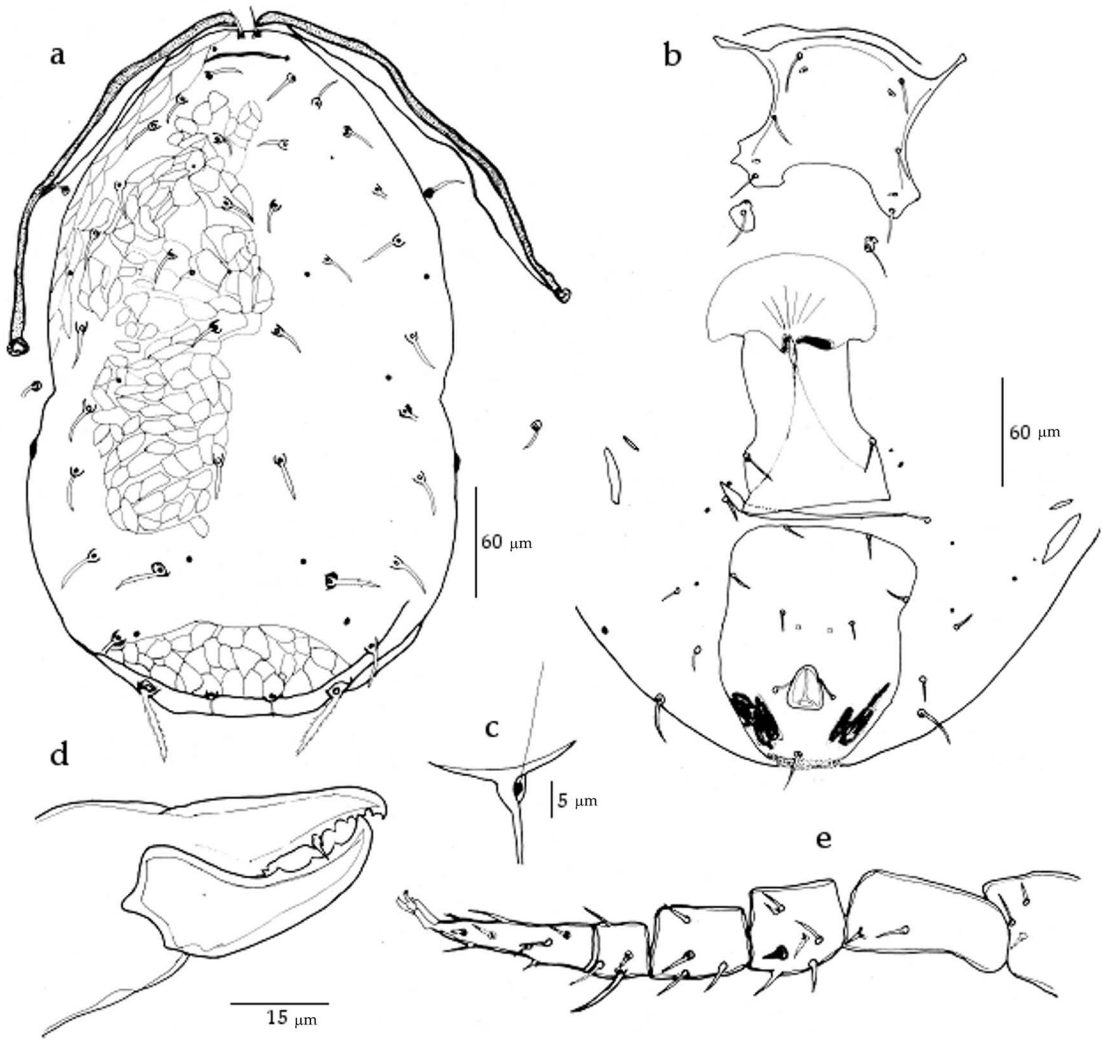

FIGURE 26: *Neoseiulella elaeocarpi* (Schicha). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Ventral shields (Figure 26b) — Sternal shield 67 long and 72 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. The metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 128 long and 67 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield subgquadrate-shaped, 122 long and 92 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent) and a pair of large solenostomes *gv3* posteromediad to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 22 long, smooth. Primary metapodal plate or inguinal sigillum 30 long and 6 wide.

Spermatheca (Figure 26c) — Cervix 4 long, shallowly cup-shaped.

Chelicera (Figure 26d) — Seven or eight teeth and a *pilus dentilis* on the fixed digit. Movable digit 31 long, bearing three teeth.

Legs (Figure 26e) — Measurements of legs: leg

I 299; leg II 270; leg III 264; leg IV 332. Seven setae (2-2/0, 2/0-1) on the genu II. Two thick and short macrosetae, 6 and 22 long, on genu and basitarsus IV, respectively.

Material examined — The female holotype deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

The male of this species is unknown.

Previous reports — *N. elaeocarpi* is only known from Queensland (Australia), on *Elaeocarpus cooran-gooloo* J. Bailey and C. White (Elaeocarpaceae).

Neoseiulella elongata Ferragut and Peña-Estevez (Figure 27)

Neoseiulella elongata Ferragut and Peña-Estevez 2003: 164; Moraes *et al.* 2004: 293; Moraza and Peña-Estevez 2006: 58; Chant and McMurtry 2007: 147.

Adult female (Figure 27a – e)

Dorsal shield (Figure 27a) — Dorsal shield heavily reticulated: length 394; width 175 (at level of s4), 178 (at level of Z1), with four pairs of solenostomes: gd2, gd6, gd8, and gd9. Four pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth: j1 20; j3 16; j4 12; j5 11; j6 14; J2 16; J5 11; z2 14; z3 16; z4 16; z5 11; Z1 20; Z4 23; Z5 29; s4 17; s6 19; S2 20; S4 21; S5 19; sub-lateral setae r3 23 and R1 24. Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of z2. It is noteworthy that the peritreme differs from the ones of the other species of the genus *Neoseiulella* as its anterior surface is striate.

Ventral shields (Figure 27b) — Sternal shield 83 long and 73 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of small poroids. Two other pairs of sternal setae (ST3, ST4) on separate platelets. A pair of small poroids accompanies ST4. Genital shield 140 long and 66 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 134 long and 93 wide (at level of ZV2), lightly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 20 long, smooth. Primary metapodal plate or inguinal sigillum 42 long and 4 wide.

Spermatheca (Figure 27c) — Cervix 5 long, shallowly cup-shaped.

Chelicera (Figure 27d) — One tooth and a *pilus dentilis* on the fixed digit. Movable digit 44 long, unidentate.

Legs (Figure 27e) — Measurements of legs: leg I 335; leg II 281; leg III 275; leg IV 356. Seven setae (2-2/0, 2/0-1) on the genu II. One macroseta, 61 long, on the basitarsus IV.

Material examined — A female paratype deposited in the Department of Agroforestal Ecosystems, Universidad Politécnica of Valencia, Spain.

Adult male

The adult of this species is unknown.

Previous reports — *N. elongata* is only known from the Canary Islands on *Pinus canariensis* C. Sm. (Pinaceae).

Neoseiulella ferraguti Moraza and Peña-Estevez (Figure 28)

Neoseiulella ferraguti Moraza and Peña-Estevez 2006: 56-58.

Adult female (Figure 28a – e)

Dorsal shield (Figure 28a) — Dorsal shield smooth: length 365; width 226 (at level of s4), 264 (at level of Z1), with seven pairs of solenostomes: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. Seven pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z4 and Z5 which are slightly serrated: j1 28; j3 49; j4 31; j5 32; j6 38; J2 34; J5 19; z2 15; z3 54; z4 47; z5 29; Z1 34; Z4 77; Z5 94; s4 62; s6 64; S2 71; S4 54; S5 33; sub-lateral setae r3 28 and R1 35. Most dorsal setae of opisthosomal area (S2, S4, S5,

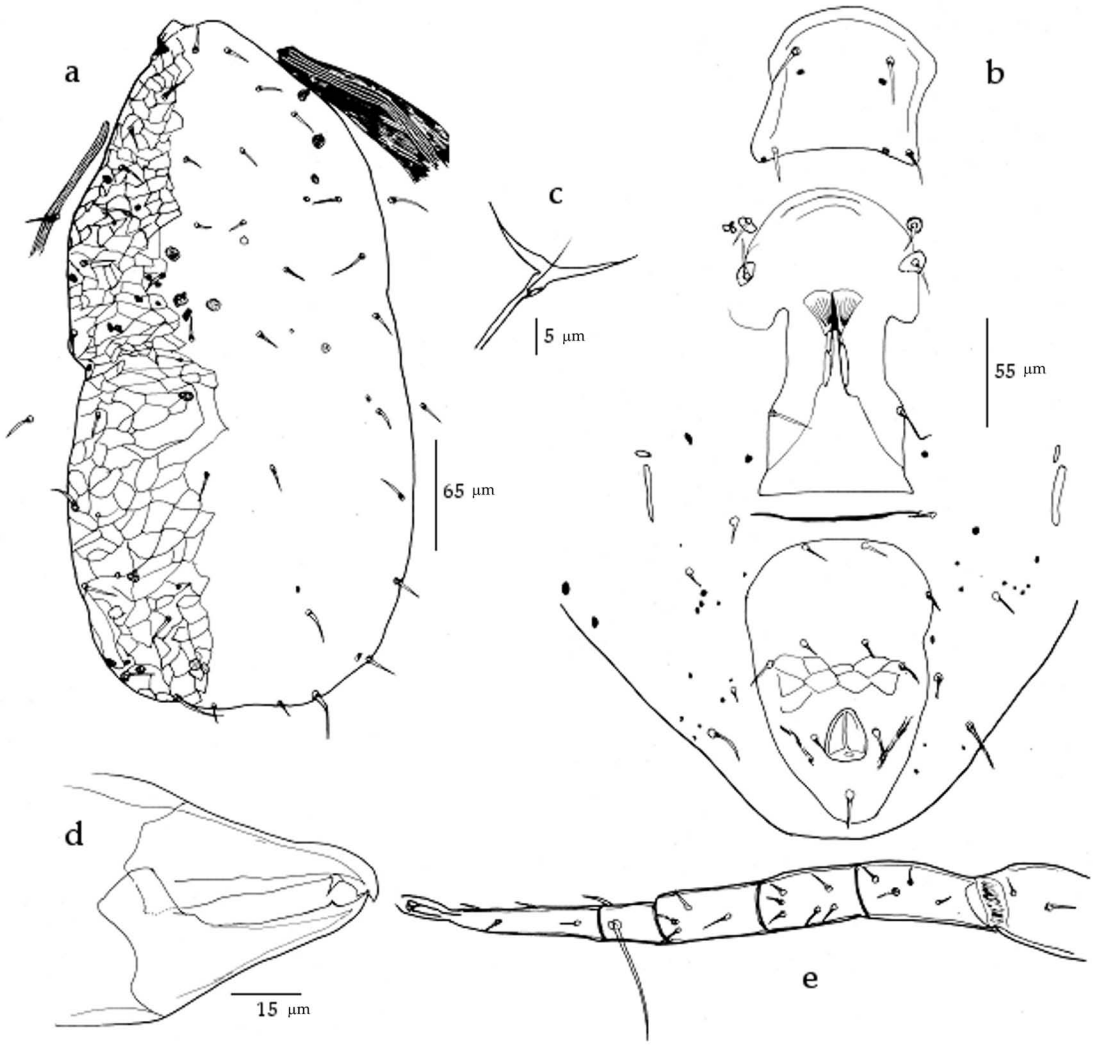

FIGURE 27: *Neoseiulella elongata* Ferragut and Peña-Estevez. Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Z4, Z5, and J5) on tubercles. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 28 b) — Sternal shield 67 long and 68 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of distinct poroids. ST3 and ST4 on separate platelets. A pair of small poroids accompanies ST4. Genital shield 130 long and 66 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 127 long and 112 wide (at level of ZV2), faintly striate, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of large and circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 66 long, lightly serrated. Primary metapodal plate or inguinal sigillum 22 long and 11 wide.

Spermatheca (Figure 28c) — Cervix 4 long, U-shaped.

Chelicera (Figure 28d) — Seven teeth and a *pilus*

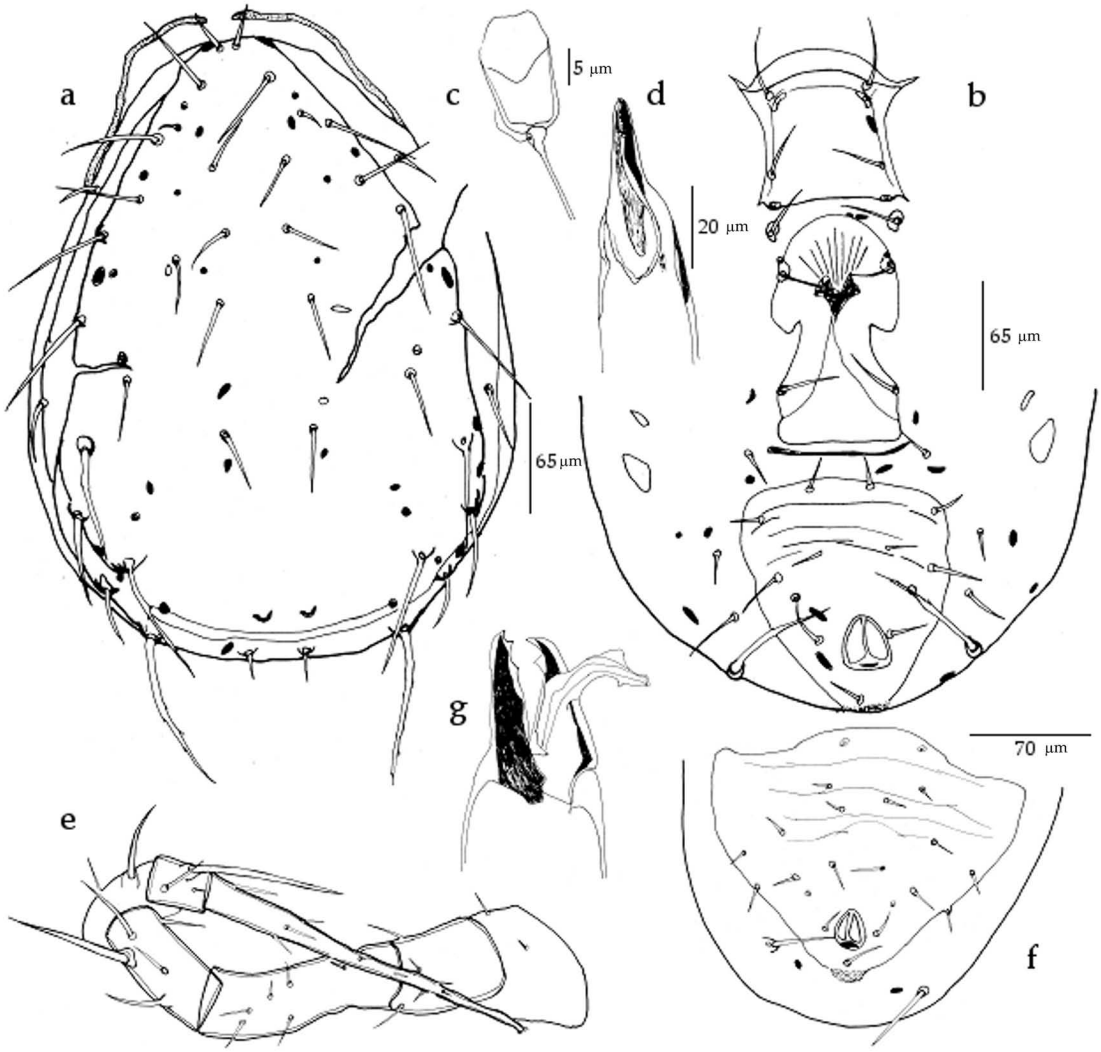

FIGURE 28: *Neoseiulella ferraguti* Moraza and Peña-Estevez. Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV. Male (paratype): f – ventrianal shield; g – spermatodactyl.

dentilis on the fixed digit. Movable digit 37 long, bidentate.

Legs (Figure 28e) — Measurements of legs: leg I 422; leg II 313; leg III 314; leg IV 362. Eight setae (2-2/1, 2/0-1) on the genu II. One macroseta (not reported on the original description), 33 long, on the genu III. Three other pointed macrosetae, 54, 34, 67 long, on genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in Museum of Zoology of University of Navarra (MZUNAV), Spain.

Adult male (Figure 28f, g)

Male specimen of this species similar to but smaller than the female. Moraza and Peña-Estevez (2006) described the male of *N. ferraguti*. However, these authors did not give a complete setal and body measurements. We thus present a complete description of this male.

Dorsal shield — Dorsal shield chaetotaxy similar to the female, with smooth surface: length 322; width 163 (at level of s4), 200 (at level of Z1), with seven pairs of solenostomes: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. Dorsal shield bearing 21 pairs of setae (sub-lateral setae, r3 and R1 on the dorsal

shield). All dorsal setae smooth, except Z5 which is slightly serrated: j1 29; j3 36; j4 22; j5 22; j6 25; J2 25; J5 13; z2 11; z3 43; z4 33; z5 24; Z1 25; Z4 55; Z5 68; s4 49; s6 48; S2 50; S4 39; S5 29; sub-lateral setae r3 23 and R1 32. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 28f) — Sternogenital shield is smooth. Ventrianal shield 135 long and 170 wide, lightly reticulated, bearing seven pairs of preanal setae with two pairs of poroids. Caudoventral seta JV5 42 long, smooth, on the integument surrounding the ventrianal shield.

Chelicera (Figure 28g) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 31 long, unidentate. Spermatodactyl L-shaped.

Legs — Measurements of legs: leg I 375; leg II 306; leg III 283; leg IV 355. Three macrosetae, 35, 35 and 50 long, on genu, tibia, and basitarsus IV, respectively.

The male specimen of this species is different from the female by the position of both sub-lateral setae (r3 and R1) (on dorsal shield on the male; on lateral margin on the female), and the number of solenostomes on the ventrianal shield (two pairs on the male; one pair on the female).

Material examined — A male paratype specimen.

Previous reports — *N. ferraguti* is only known from Tenerife (Canary Islands). It was reported from lichens on dead log, and from soil and litter of *Cheirolophus canariensis* var. *subexpinnatus* (Burch.) A. Hansen and Sunding (Asteraceae).

Neoseiulella litoralis (Swirski and Amitai) (Figure 29)

Typhloctonus litoralis Swirski and Amitai 1984: 73-76. *Neoseiulella* (*Typhloctona*) *litoralis* (Swirski and Amitai) Denmark and Rather 1996: 71-72. *Neoseiulella litoralis* (Swirski and Amitai) 1997b: 37; Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147.

Adult female (Figure 29a – e)

Dorsal shield (Figure 29a) — Dorsal shield heavily reticulate: length 393 (383 – 403); width 184 (178 – 190) (at level of s4), 197 (188 – 205) (at level of Z1), with six pairs of solenostomes: gd1, gd2, gd5, gd6, gd8, and gd9. One pair of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae all smooth (in one paratype specimen, Z5 is slightly serrated): j1 23 (21 – 24); j3 24 (22 – 26); j4 15 (13 – 17); j5 13 (11 – 14); j6 15 (14 – 16); J2 18 (17 – 18); J5 14; z2 13 (11 – 15); z3 22 (20 – 24); z4 18 (17 – 19); z5 14 (12 – 15); Z1 19 (18 – 20); Z4 50 (48 – 51); Z5 63 (60 – 66); s4 20 (19 – 21); s6 28 (26 – 30); S2 37 (35 – 38); S4 29 (26 – 31); S5 29 (26 – 31); sub-lateral setae r3 23 and R1 23 (20 – 25). Peritreme extending anteriorly to the level of j3 or between z2 – j3.

Ventral shields (Figure 29b) — Sternal shield 59 (55 – 63) long and 69 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of poroids. The third and fourth pairs of sternal setae (ST3, ST4) on separate platelets and a pair of small poroids accompanying ST4. Genital shield 130 (122 – 137) long and 67 (66 – 68) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. No pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield subtriangular-shaped with conspicuous waist, much longer than wide, 140 (137 – 143) long and 98 (92 – 104) wide (at level of ZV2), reticulate with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 45 (37 – 52) long, smooth. Primary metapodal plate or inguinal sigillum 41 (37 – 44) long and 5 wide.

Spermatheca (Figure 29c) — Cervix 4 long, U-shaped.

Chelicera (Figure 29d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 37 (36 – 38) long, unidentate.

Legs (Figure 29e) — Measurements of legs: leg I 338 (331 – 344); leg II 299 (295 – 303); leg III 296 (292 – 300); leg IV 395 (386 – 404). Seven setae (2-2/0, 2/0-1) on the genu II. One pointed macroseta 41 (36 – 45) long, on the basitarsus IV.

Material examined — Three female paratypes

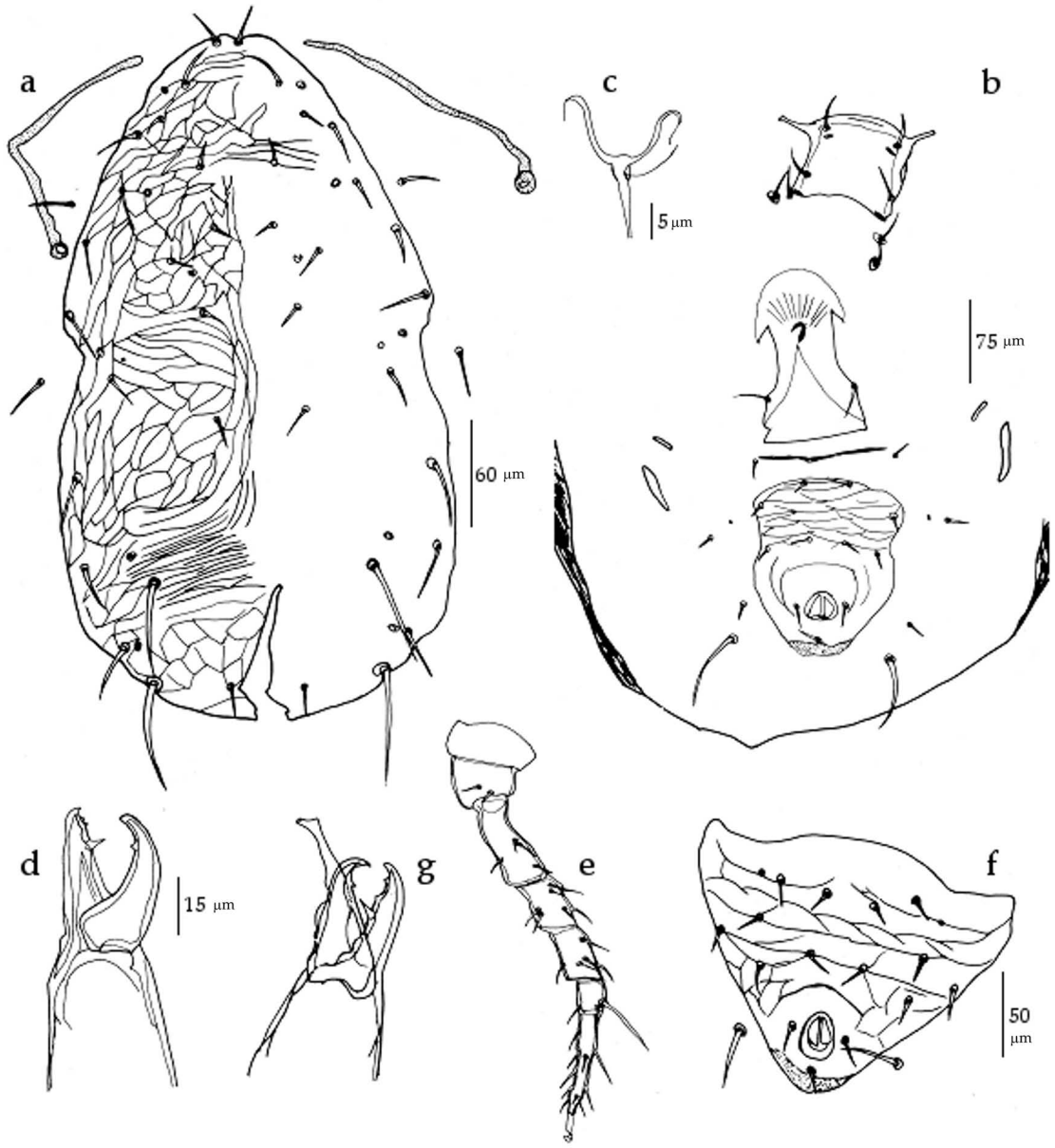

FIGURE 29: *Neoseiulella litoralis* (Swirski and Amitai). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV. Male (paratype): f – ventrianal shield; g – spermatodactyl.

deposited in the Division of Entomology, Agricultural Research Organization, Bet Dagan, Israel.

Adult male (Figure 29f, g)

Dorsal shield chaetotaxy similar to but smaller than the female. Sub-lateral seta R1 inserted on the dorsal shield (different from the female, on which R1 on lateral margin). Six pairs of solenostomes on the dorsal shield. Ventrianal shield 124 long and 142 wide, distinctly reticulated, bearing six pairs of preanal setae and a pair of poroids. Spermatodactyl L-shaped. This description is based on a paratype specimen.

Previous reports — *N. litoralis* is only known from the West- Palaearctic area. Countries from which this species was reported are: Israel (Swirski and Amitai 1984; Klein *et al.* 1994); Spain (Fer-

ragut *et al*. 2008). Plant supports on which this species was collected are: *Ammophila arenaria* (L.) Link (Poaceae); *Achillea maritima* (L.) Ehrend and Y.P.Guo, *Artemisia monosperma* Delile, *Limbarda crithmoides* (L.) Dumort (Asteraceae); *Crucianella maritima* L. (Rubiaceae); *Echiohilon fruticosum* Desf. (Boraginaceae); *Lotus creticus* L., *Retama raetam* (Forssk.) Webb. (Fabaceae); *Oenothera drummondi* Hook (Onagraceae); *Polygonum equisetiforme* Sibth and Sm. (Polygonaceae); *Scrophularia syriaca* A.D.C. (Scrophulariaceae); *Vitis vinifera* subsp. *sylvestris* (C.C.Gmel.) Hegi (Vitaceae).

This species was recently collected in Villeneuve-lès-Maguelone (Hérault, Mediterranean Coast) on red swampfire (*Salicornia rubra* Nelson) and sea purslane (*Halimione portulacoides* (L.) Aellen (Amaranthaceae) (Kanouh *et al*. 2010).

Neoseiulella longiseta
Moraza, Peña-Estevez and Ferragut
(Figure 30)

Neoseiulella longiseta Moraza, Peña-Estévez and Ferragut 2005: 107-111; Moraza and Peña-Estevez 2006: 59; Chant and McMurtry 2007: 147.

Adult female (Figure 30a – e)

Dorsal shield (Figure 30a) — Dorsal shield faintly striate: length 405 (401 – 408); width 202 (196 – 207) (at level of s4), 238 (234 – 242) (at level of Z1), with seven pairs of solenostomes: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. No poroid visible. Sublateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z4 and Z5 serrated. Most lateral setae on tubercles: j1 31; j3 41 (37 – 45); j4 12 (10 – 14); j5 16 (15 – 16); j6 26 (25 – 26); J2 16 (15 – 16); J5 14 (13 – 15); z2 10; z3 46 (41 – 51); z4 25 (23 – 27); z5 15 (14 – 15); Z1 15; Z4 88 (84 – 91); Z5 117 (116 – 118); s4 67 (63 – 70); s6 71 (70 – 72); S2 75 (73 – 76); S4 63 (62 – 63); S5 45 (41 – 48); sub-lateral setae r3 24 (23 – 25) and R1 34 (33 – 35). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 30 b) — Sternal shield 75 (74 – 76) long and 75 (74 – 76) wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and poroids. ST3 and ST4 on separate platelets with a pair of small poroids accompanying ST4. Genital shield 140 long and 75 (73 – 76) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. No pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield subcircular-shaped, reticulate with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of large and circular solenostomes *gv3* posteromediad to JV3. Length 136 (135 – 137); wide 129 (127 – 130) (at level of ZV2), 142 (137 – 147) (at level of JV3), 99 (97 – 101) (al level of anus). Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 83 (80 – 85) long, smooth. Primary metapodal plate or inguinal sigillum 26 (24 – 28) long and 8 (6 – 7) wide.

Spermatheca (Figure 30c) — Cervix 5 (4 – 6) long, U-shaped.

Chelicera (Figure 30d) — Six teeth and a *pilus dentilis* on the fixed digit. Movable digit 46 (42 – 48) long, bidentate.

Legs (Figure 30e) — Measurements of legs: leg I 401; leg II 306 (287 – 325); leg III 313 (300 – 325); leg IV 438 (430 – 445). Eight setae (2-2/1, 2/0-1) on the genu II. Three pointed macrosetae, 63 (62 – 64), 49 (40 – 58) and 76 (72 – 78) long, on the genu, tibia and basitarsus IV, respectively.

Material examined — Two female paratypes deposited in Museum of Zoology of University of Navarra, Spain.

Adult male

Described by Moraza *et al.* (2005). We were not able to borrow the male type specimen of this species.

Previous reports — *N. longiseta* is only known from the Canary Islands. It was collected from dry soil, moss and litter under the following plants: *Aeonium* sp., *Monanthes* sp. (Crassulaceae), *Asplenium* sp. (Aspleniaceae), *Juniperus turbinata* Guss. (Cupressaceae), *Cistus monspeliensis* L. (Cistaceae), and from lichens (Moraza *et al.* 2005).

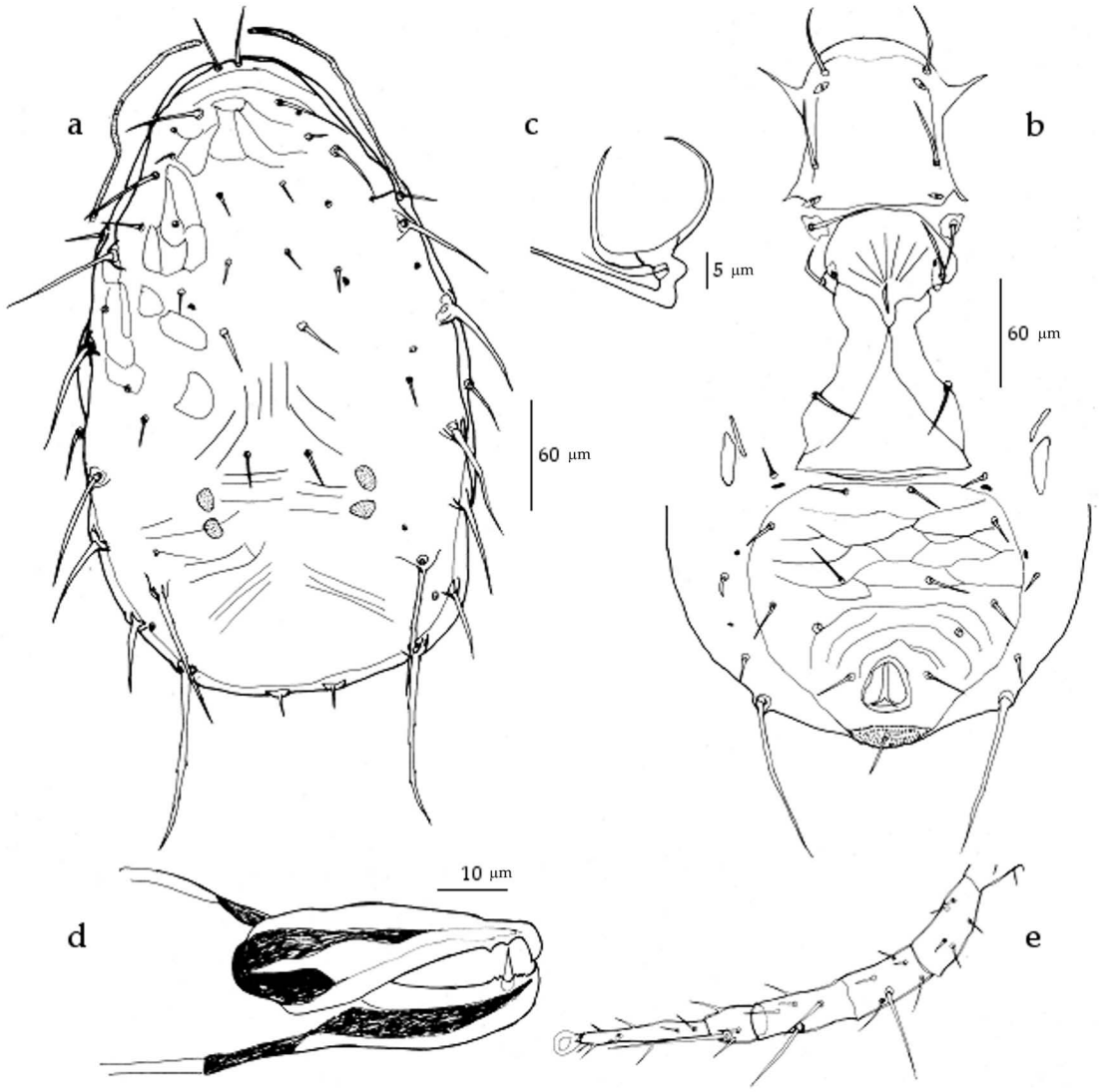

FIGURE 30: *Neoseiulella longiseta* Moraza, Peña-Estevez and Ferragut. Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Neoseiulella montforti (Rivnay and Swirski) (Figure 31)

Typhloctonus montforti Rivnay and Swirski 1980: 179-182; Swirski and Amitai 1984: 77; Denmark and Rather 1984: 169-170; Moraes *et al.* 1986: 233. *Typhlodromus montforti* (Rivnay and Swirski) Chant and Yoshida-Shaul 1989: 1020-1023. *Neoseiulella montforti* (Rivnay and Swirski) Swirski and Amitai 1997b: 37; Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147. *Neoseiulella* (*Typhloctona*) *montforti* (Rivnay and Swirski) Denmark and Rather 1996: 66-68.

Adult female (Figure 31a – d)

Dorsal shield (Figure 31a) — Dorsal shield heavily reticulate: length 383 (381 – 384); width 193 (191 – 194) (at level of s4), 196 (194 – 197) (at level of Z1), with six pairs of solenostomes: gd1, gd2, gd4, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae. On one of specimens examined, one seta of the J1 pair is present. All dorsal and sub-lateral setae smooth, except Z5 serrated: j1

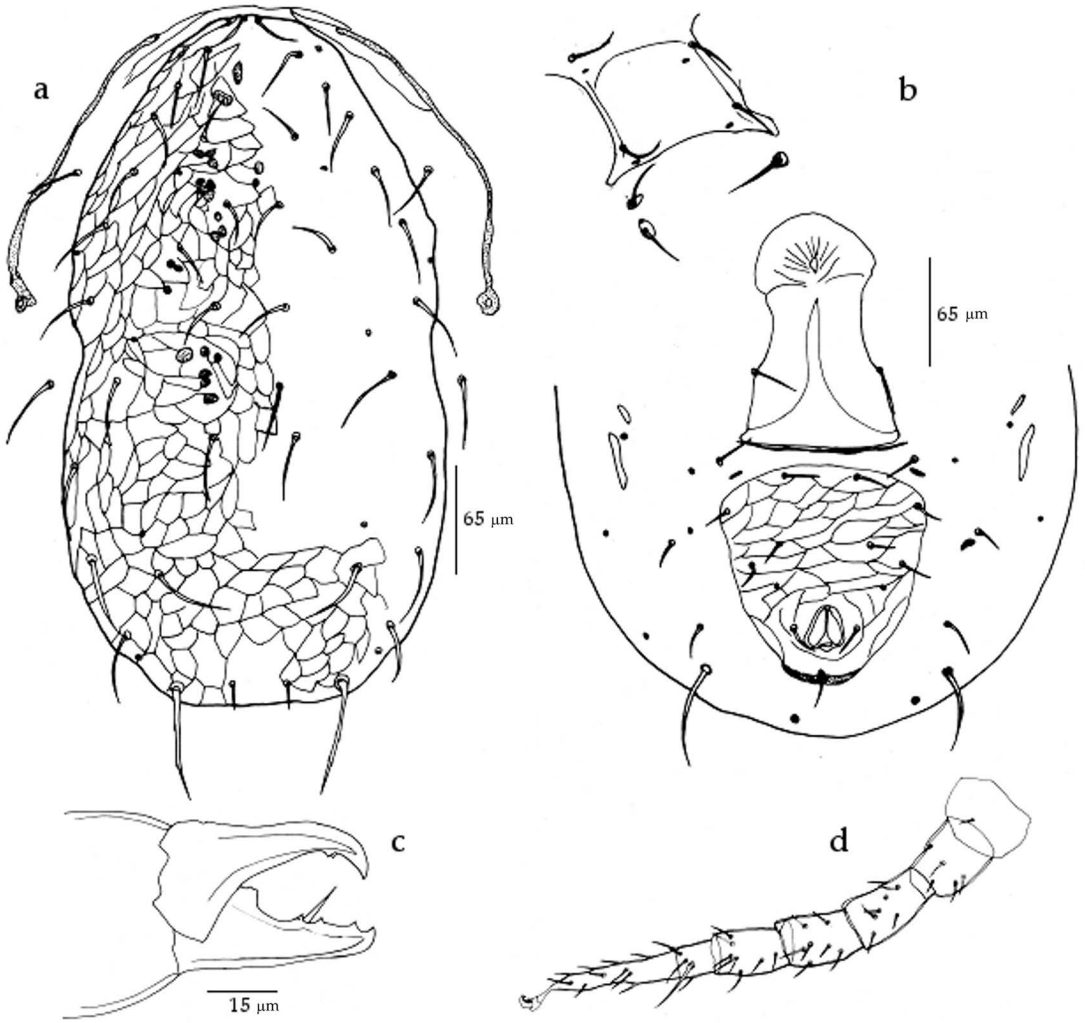

FIGURE 31: *Neoseiulella montforti* (Rivnay and Swirski). Female (paratype): a – dorsal shield; b – ventral shields; c – chelicera; d – leg IV.

30 (28 – 31); j3 36 (34 – 37); j4 25 (23 – 26); j5 23 (22 – 24); j6 31 (30 – 31); J1 36; J2: 37 (36 – 37); J5 13 (12 – 13); z2 24 (22 – 25); z3 32 (31 – 32); z4 34 (33 – 34); z5 23; Z1 41 (39 – 43); Z4 48 (46 – 50); Z5 58 (56 – 59); s4 38 (37 – 39); s6 43; S2 45 (43 – 46); S4 43 (41 – 45); S5 40 (38 – 41); sub-lateral setae r3 35 (33 – 36) and R1 41 (39 – 42). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j3 or between j1-j3.

Ventral shields (Figure 31b) — Sternal shield weakly sclerotized, 74 (73 – 74) long and 80 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets with a pair of small poroids accompanying ST4. Genital shield 150 long and 76 (74 – 78) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 133 (131 – 135) long and 116 (112 – 119) wide (at level of ZV2), reticulate with four pairs of preanal setae (JV1, JV2, JV3 and ZV2), and a pair of small circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 52 (51 – 53) long, is smooth. Primary metapodal plate

or inguinal sigillum 38 (35 – 40) long and 5 (4 – 6) wide.

Spermatheca — Spermatheca not discernible in the two type specimens examined. Rivnay and Swirski (1980) mentioned that the cervix has a U-shaped type.

Chelicera (Figure 31c) — Two or three teeth and a *pilus dentilis* on the fixed digit. Movable digit 39 (38 – 40) long, bears one or two teeth.

Legs (Figure 31d) — Measurements of legs: leg I 357 (350 – 363); leg II 302 (297 – 307); leg III 312 (302 – 321); leg IV 422 (411 – 432). Seven setae (2-2/0, 2/0-1) on the genu II. One macroseta, 38 (34 – 41) long, on the basitarsus IV.

Material examined — Two female paratypes deposited in the Division of Entomology, Agricultural Research Organization, Bet Dagan, Israel.

Adult male

The male of this species is unknown.

Previous reports — *N. montforti* is only known from Israel (Swirski and Amitai 1984; Swirski and Amitai 1997a). The type specimens were collected at Monfort (Western Galilee, Israel) on *Quercus calliprinos* (Fagaceae). It has since been reported on *Artemisia monosperma*, *Limbarda crithmoides* (Asteraceae); at Haifa (Western Carmel) on *Q. calliprinos*; and on *Platanus orientalis* L. (Platanaceae).

Neoseiulella myopori (Collyer) (Figure 32)

Typhlodromus myopori Collyer 1982: 190; Chant and Yoshida-Shaul 1989: 1028-1029. *Typhloctonus myopori* (Collyer) Denmark and Rather 1984: 168-169; Moraes *et al.* 1986: 233. *Neoseiulella* (*Typhloctona*) *myopori* (Collyer) Denmark and Rather 1996: 63-65. *Neoseiulella myopori* (Collyer) Moraes *et al.* 2004: 294; Chant and McMurtry 2007: 147.

Adult female (Figure 32a – e)

Dorsal shield (Figure 32a) — Dorsal shield smooth, except for the lateral area slightly reticulated: length 462 (456 – 467); width 266 (242 – 269) (at level of s4) and 259 (258 – 260) (at level of Z1). Five pairs of solenostomes on the dorsal shield: gd1, gd2, gd4, gd6, and gd9. No poroid visible. Sublateral setae (r3 and R1) on the lateral margin. The dorsal shield bearing 19 pairs of setae, all smooth, except Z5 slightly serrated. On the specimen examined, one seta of the J1 pair is present; this pair of setae is absent in the other type specimens examined of this species: j1 36 (35 – 37); j3 52 (47 – 56); j4 13 (12 – 13); j5 11 (10 – 12); j6 14 (12 – 16); J1 16; J2 18; J5 14; z2 17 (16 – 18); z3 32 (27 – 37); z4 29 (26 – 32); z5 11 (10 – 11); Z1 18 (17 – 18); Z4 46 (45 – 47); Z5 112; s4 34 (33 – 34); s6 24 (23 – 24); S2 23 (21 – 24); S4 19 (17 – 20); S5 17 (16 – 18); sub-lateral setae r3 21 (21 – 22) and R1 18 (17 – 19). Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 32b) — Sternal shield 87 (86 – 88) long and 97 (95 – 98) wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 151 (149 – 153) long and 86 (85 – 86) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating the genital and ventrianal shields not discernible on the specimen examined. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield 153 (150 – 155) long and 117 (110 – 124) wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of small circular solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 37 (33 – 40) long, smooth. Primary metapodal plate or inguinal sigillum 33 (32 – 33) long and 8 (7 – 8) wide.

Spermatheca (Figure 32c) — Cervix 10 (9 – 10) long, cup-shaped.

Chelicera (Figure 32d) — Eight teeth and a *pilus dentilis* on the fixed digit. Movable digit 38 (36 – 39) long, unidentate.

Legs (Figure 32e) — Measurements of legs: leg I 369 (397 – 427); leg II 389 (368 – 403); leg III 387 (378 – 396); leg IV 488 (464 – 512). Eight setae (2-2/1, 2/0-1) on the genu II. Three macrosetae, 34, 32 and 28 long, on the genu, tibia and basitarsus III, respectively. Three other macrosetae, 74 (70 – 78), 68

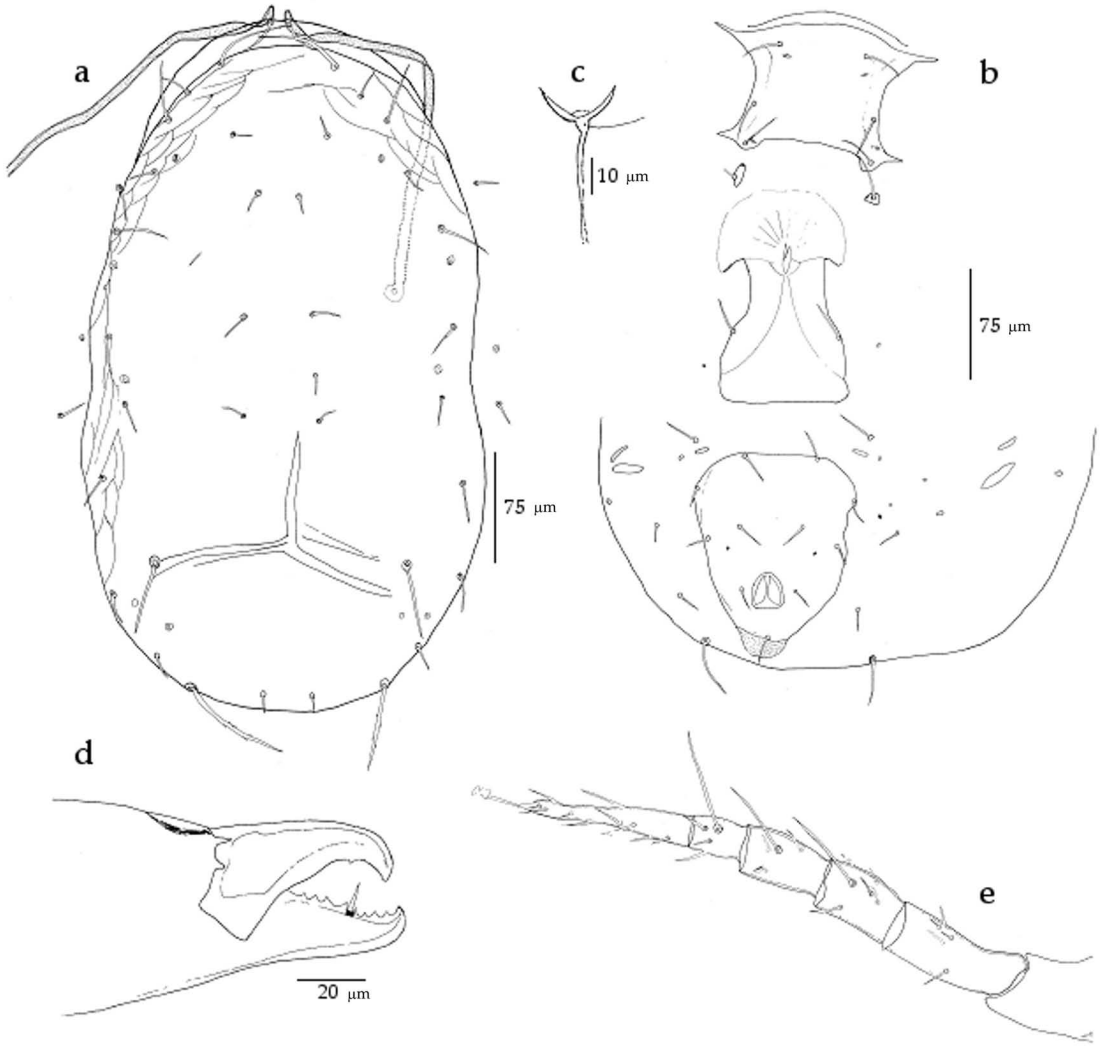

FIGURE 32: *Neoseiulella myopori* (Collyer). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

(60 – 76) and 71 (65 – 77) long, on the genu, tibia and basitarsus IV, respectively.

Material examined — Two female paratypes deposited in the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland, New Zealand.

Adult male

The male of this species is unknown.

Previous reports — *N. myopori* is only known from New Zealand. The female holotype and six female paratypes were collected on *Myoporum laetum* G. Forst. (Myoporaceae) at Clifton Coast, South of Napier. One additional report (1 female and a deutonymph), excluded from the type series, was from Dun Mountain (Nelson Province), on *Holocarpus bidwillii* (Hook. f.ex T.Kirk.) Quinn (Podocarpaceae) (Collyer 1982).

Neoseiulella neoviniferae Basha, Mahrous and Mostafa (Figure 33)

Neoseiulella grapevini Basha *et al.*, Chant and McMurtry 2007: 147.

Adult female (Figure 33a – d)

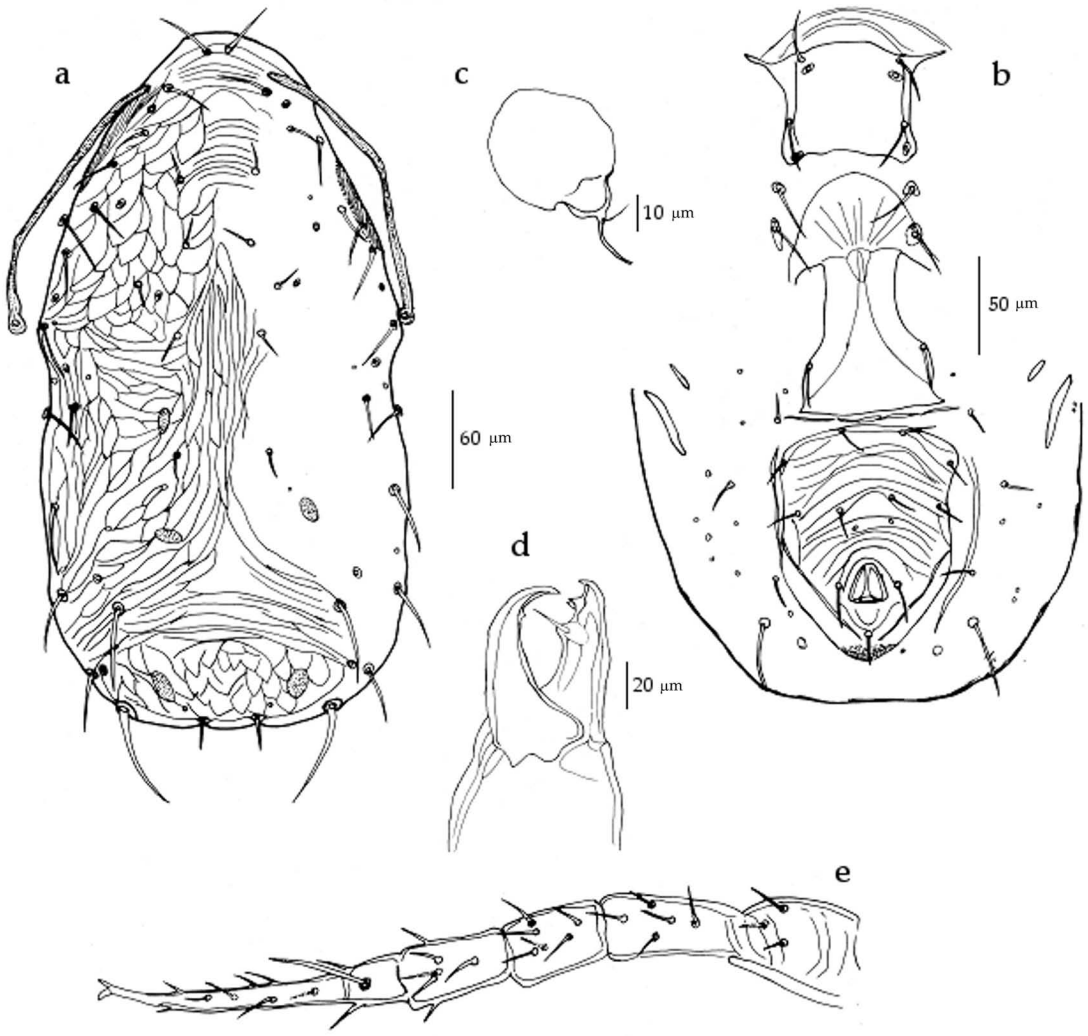

FIGURE 33: *Neoseiulella neoviniferae* Basha, Mahrous and Mostafa. Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Dorsal shield (Figure 33a) — Dorsal shield distinctly reticulated throughout: length 386 (381 – 390), width 175 (171 – 178) (at level of s4) and 191 (187 – 195) (at level of Z1). Seven pairs of large solenostomes on the dorsal shield: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. Five pairs of poroids. Sublateral setae (r3 and R1) on the lateral margin. Like us, Basha *et al*. (2004) noted the presence of seven pairs of solenostomes. However, on their drawings gd4 is absent (present on the specimens examined). Dorsal shield bearing 19 pairs of setae, all smooth: j1 23 (21 – 25); j3 24 (22 – 26); j4 14 (12 – 15); j5 12 (10 – 13); j6 16 (15 – 17); J2 15 (14 – 15); J5 15 (14 – 15); z2 10 (9 – 11); z3 24 (22 – 25); z4 19 (17 – 20); z5 14 (13 – 15); Z1 17 (16 – 17); Z4 47 (44 – 49); Z5 62 (59 – 64); s4 23 (22 – 24); s6 26 (25 – 27); S2 35 (34 – 36); S4 33 (31 – 35); S5 28 (26 – 30); sub-lateral setae r3 28 (26 – 30) and R1 25 (23 – 27). Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j3.

Ventral shields (Figure 33b) — Sternal shield 62 (60 – 63) long and 67 (66 – 67) wide (at level of ST2), is smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets. A pair of small poroids accompany-

ing ST4. Genital shield 128 (125 – 131) long and 66 (64 – 67) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 130 (125 – 134) long and 98 (95 – 101) wide (at level of ZV2), distinctly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of solenostomes *gv3* posterior to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 48 (46 – 50) long, smooth. Primary metapodal plate or inguinal sigillum 39 (38 – 40) long and 5 (4 – 6) wide.

Spermatheca (Figure 33c) — Cervix 4 (3 – 4) long, cup-shaped.

Chelicera (Figure 33d) — Two large teeth and a *pilus dentilis* on the fixed digit. Movable digit 38 (36 – 39) long, unidentate. Basha *et al.* (2004) mentioned that the fixed digit bears three teeth.

Legs (Figure 33e) — Measurements of legs: leg I 341 (333 – 349); leg II 286 (285 – 286); leg III 285 (284 – 286); leg IV 381 (369 – 393). Seven setae (2-2/0, 2/0-1) on the genu II. One macroseta 42 (37 – 47) long, on the basitarsus IV.

Material examined — Four female paratypes deposited in the collection of Plant Protection Department, Faculty of Agriculture, Zagazig University, Egypt.

Adult male

The male of this species is unknown.

Previous reports — *N. neoviniferae* is only known from Al-Sharkia Governorate, El-Khattara District (Egypt) on *Vitis vinifera* L. (Vitaceae).

Remarks — *N. neoviniferae* is similar to *N. montforti* but differs by the presence/ absence of gd5 (present on *N. neoviniferae*; absent on *N. montforti*), the shape of the spermatheca (c-shaped on *N. neoviniferae*; U-shaped on *N. montforti*) and measurements of some dorsal setae (j6, J2, z2, Z1 and R1).

Neoseiulella novaezealandiae (Collyer) (Figure 34)

Typhlodromus novaezealandiae Collyer 1964: 635-637; Schicha 1980: 24-26; Collyer 1982: 188-189; Schicha 1987: 136-137; Chant and Yoshida-Shaul 1989: 1032-1035. *Neoseiulella novaezealandiae* (Collyer) Moraes *et al.* 1986: 202; Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147. *Neoseiulella* (*Neoseiulella*) *novaezealandiae* (Collyer) Denmark and Rather 1996: 48-49.

Adult female (Figure 34a – e)

Dorsal shield (Figure 34a) — Dorsal shield heavily reticulated: length 400; width 235 (at level of s4), 231 (at level of Z1), and 262 (at level of S2). Five pairs of solenostomes on the dorsal shield: gd2, gd4, gd5, gd6, and gd9. One pair of poroids. Chant and Yoshida-Shaul (1989) draw and mentioned only four pairs of solenostomes (gd5 absent). However, the present examination of type material shows the presence of gd5, like in the drawings of Schicha (1987). Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z4 and Z5 serrated: j1 24; j3 27; j4 17; j5 15; j6 18; J2 21; J5 12; z2 17; z3 24; z4 23; z5 17; Z1 22; Z4 40; Z5 59; s4 24; s6 22; S2 25; S4 23; S5 21; sub-lateral setae r3 21 and R1 17. Presence of very few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 34b) — Sternal shield 85 long and 84 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 121 long and 74 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields not discernible in the specimen examined. No pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield 139 long and 110 wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent) and a pair of large solenostomes *gv3* mediad to JV2. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 35

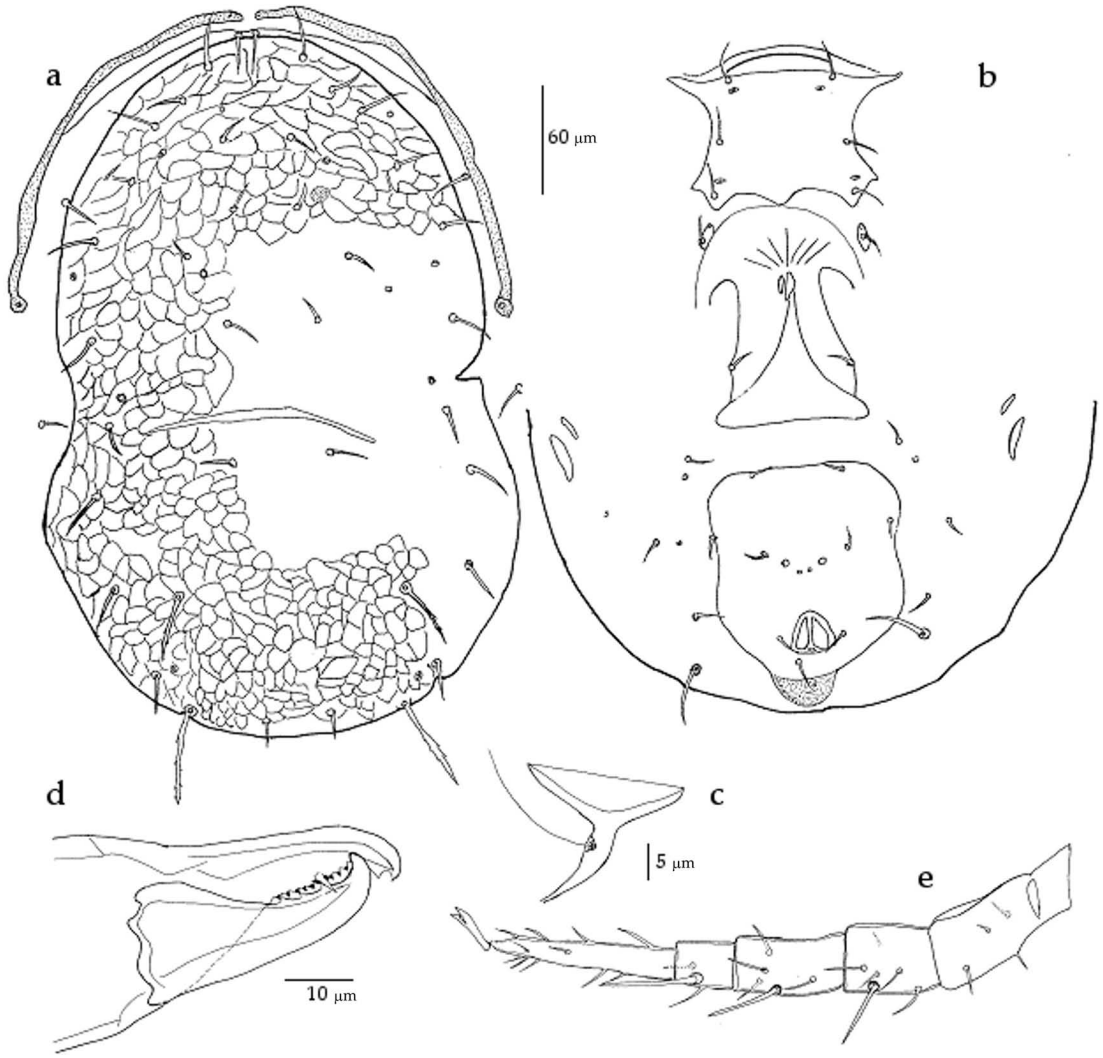

FIGURE 34: *Neoseiulella novaezealandiae* (Collyer). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

long, smooth. Primary metapodal plate or inguinal sigillum 30 long and 8 wide.

Spermatheca (Figure 34c) — Cervix 5 long, shallowly cup-shaped.

Chelicera (Figure 34d) — Nine teeth and a *pilus dentilis* on the fixed digit. Movable digit 33 (32 – 34) long, bearing three teeth.

Legs (Figure 34e) — Measurements of legs: leg I 320; leg II 286; leg III 286; leg IV 391.. Seven setae (2-2/0, 2/0-1) on the genu II. Three thick and pointed macrosetae, 30, 33 and 45 long, on the genu, tibia and basitarsus IV, respectively.

Material examined — One female paralectotype deposited in the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland, New Zealand.

Adult male

Described by Collyer (1964) and Schicha (1980) and Denmark and Rather (1996). We were not able to borrow male type specimens of this species.

Previous reports — *N. novaezealandiae* is only known from the Australasian area. The type specimens (30 females and 5 males) were collected at Kawau Island (New Zealand), on *Metrosideros ex-*

celsa Gaertn (Myrtaceae). Collyer (1964, 1982,) reported that this species is distributed throughout New Zealand, on a wide range of native plants. Additional collections of this species have been reported from New South Wales and Queensland (Australia) (Schicha 1987; Walter 1999). Plants on which this species was collected are: *Brachyglottis repanda* (Asteraceae); *Pseudopanax* sp. (Araliaceae); *Callicoma serratifolia* Andrews (Cunoniaceae); *Elaeocarpus dentatus* (Elaeocarpaceae); *Nothofagus* sp., *Quercus* sp., *Sophora tetraptera* J.F.Mill. (Fagaceae); *Eucalyptus* sp., *Leptospermum scoparium* (Myrtaceae); *Tacsonia mollissima* Kunth, *Passiflora* sp. (Passifloraceae); *Dacrydium cupressinum* Sol. ex Lamb., *Podocarpus* sp. (Podocarpaceae); *Eriobotrya* sp., *Malus domestica*, *Pyrus communis* (Rosaceae); *Elatostema rugosum* A.Cunn. (Urticaceae); *Lantana camara* L., *Vitex lucens* T. Kirk (Verbenaceae).

Remarks — *N. novaezealandiae* is very similar to *N. nesbitti* in setal and body measurements. However, differences are observed for the ornementation of dorsal shield (lightly reticulated on *N. nesbitti*, heavily reticulated on *N. novaezealandiae*) and the position and size of prenanal solenostomes (small and posterior to JV2 in *N. nesbitti*, large and mediad to JV2 in *N. novaezealandiae*). As several authors have showed the importance of such characters for species identification (Shicha 1980; Chant and McMurtry 1994; Swirski *et al*. 1998; Chant and McMurtry 2007; Okassa *et al.* 2009), we consider that these two species are separate specific entities.

Neoseiulella oleariae (Collyer) (Figure 35)

Typhlodromus oleariae Collyer 1982: 190-191; Schicha 1987: 137-138; Chant and Yoshida-Shaul 1989: 1035-1039. *Amblydromella oleariae* (Collyer) Moraes *et al.* 1986: 168-169. *Neoseiulella* (*Neoseiulella*) *oleariae* (Collyer) Denmark and Rather 1996: 52-53. *Neoseiulella oleariae* (Collyer) Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147.

Adult female (Figure 35a – e)

Dorsal shield (Figure 35a) — Dorsal shield smooth, except for the lateral area of the podosoma lightly reticulated: length 418 (417 – 418); width 258 (257 – 259) (at level of s4), 269 (at level of Z1), and 280 (279 – 280) (at the level of S2). Five pairs of solenostomes on the dorsal shield: gd2, gd4, gd5, gd6, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z4 and Z5 slightly serrated: j1 38 (37 – 39); j3 56; j4 31 (30 – 31); j5 23 (22 – 23); j6 30 (29 – 30); J2 37 (35 – 39); J5 11 (10 – 11); z2 28; z3 50 (45 – 55); z4 38 (37 – 39); z5 11; Z1 46; Z4 87 (86 – 88); Z5 112 (110 – 113); s4 57 (55 – 58); s6 54 (51 – 56); S2 58 (57 – 59); S4 33 (32 – 34); S5 35 (33 – 36); sub-lateral setae r3 40 (38 – 42) and R1 31. Presence of few visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 35b) — Sternal shield 92 long and 94 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 121 (119 – 123) long and 76 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 4 pairs of poroids around the genital shield. Ventrianal shield 152 (150 – 153) long and 123 (121 – 124) wide (at level of ZV2), smooth, with three pairs of preanal setae (JV1, JV2 and ZV2; JV3 absent) and a pair of small circular solenostomes *gv3* posterior or posterolateral to JV2. Three pairs of caudoventral setae (ZV1, ZV3 and JV5, JV4 absent) on the integument surrounding the ventrianal shield. Absence of the caudoventral seta JV4 allows to easily distinguish this species from all the. JV5 53 (51 – 55) long, smooth. Primary metapodal plate or inguinal sigillum 35 (34 – 35) long and 11 (10 – 11) wide.

Spermatheca (Figure 35c) — Cervix 10 (9 – 10) long, U-shaped.

Chelicera (Figure 35d) —1 Nine teeth and a *pilus dentilis* on the fixed digit. Movable digit 38 (36 – 39) long, bearing three teeth.

Legs (Figure 35e) — Measurements of legs: leg I 391 (387 – 395); leg II 334 (324 – 343); leg III 340 (331 – 348); leg IV 439. Seven setae (2-2/0, 2/0-1) on the genu II. Two macrosetae 34 (34 – 35) and 33 (32 – 33) long on the genu and tibia III, respectively.

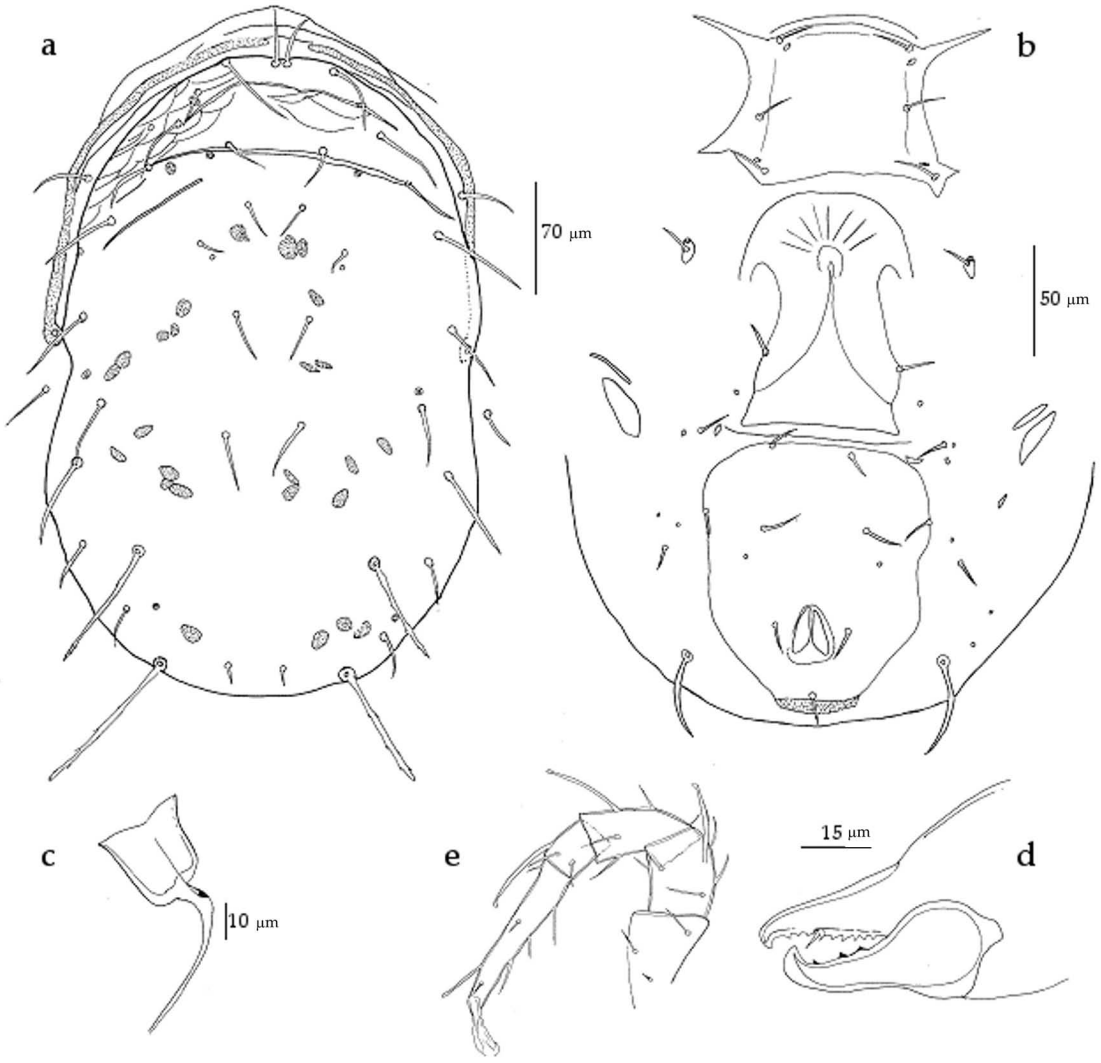

FIGURE 35: *Neoseiulella oleariae* (Collyer). Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Three other knobbed macrosetae, 53 (52 – 54), 52 (50 – 54) and 54 (51 – 57) long, on the genu, tibia and basitarsus IV, respectively.

Material examined — Two female paratypes deposited in the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland, New Zealand.

Adult male

Described by Collyer (1982) and Denmark and Rather (1996). We were not able to borrow male type specimens of this species.

Previous reports — *N. oleariae* is only known from New Zealand. The female holotype and two paratype specimens (1 female and 1 male) of *N. oleariae* were collected on *Olearia colensoi* Moench. (Asteraceae) at Ruahine Range. Other paratype specimens (2 females and 1 male) were also collected on *O. colensoi* at Magister Ridge (Westland), Strachan Ridge (South Westland), and Pillans Pass (Manapouri). Other specimens (excluded from the type series) were collected from both North and South islands of New Zealand. Plants on which this species was collected are: *Carmichaelia* sp. (Fagaceae); *Carpodetus serratus* J.R. and G.Forst. (Car-

podetaceae); *Coprosma polymorpha* W.R.B. Oliver (Rubiaceae); *Dacrophyllum* sp. (Podocarpaceae); *Olearia lacunosa* Moench. (Asteraceae); *Pseudowintera axillaris* J.R. and G.Forst. (Winteraceae); *Vitex lucens* Kirk (Verbenaceae).

Neoseiulella perforata (Athias-Henriot) (Figure 36)

Typhlodromus perforatus Athias-Henriot 1960: 72; Chant and Yoshida-Shaul 1989: 1018. *Amblydromella perforata* (Athias-Henriot) Moraes *et al.* 1986: 169. *Typhloctonus perforatus* (Athias-Henriot) McMurtry and Bounfour 1989: 15. *Neoseiulella* (*Typhloctona*) *perforata* (Athias-Henriot) Denmark and Rather 1996: 61. *Amblydromella* (*Aphanoseia*) *perforata* (Athias-Henriot) Denmark and Welbourn 2002: 308. *Neoseiulella perforata* (Athias-Henriot) Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147.

Adult female (Figure 36a – e)

Dorsal shield (Figure 36a) — Dorsal shield distinctly reticulated throughout: length 380; width 191 (at level of s4) and 182 (at level of Z1). Six pairs of circular solenostomes on the dorsal shield: gd1, gd2, gd5, gd6, gd8, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 slightly serrated: j1 21 (20 – 22); j3 21 (20 – 22); j4 13; j5 12 (11 – 13); j6 14 (13 – 14); J2 17 (14 – 19); J5 13; z2 13 (12 – 13); z3 20 (18 – 20); z4 21 (20 – 21); z5 13 (12 – 14); Z1 19 (17 – 20); Z4 34 (33 – 34); Z5 52 (50 – 53); s4 23 (22 – 23); s6 24 (21 – 26); S2 29 (27 – 30); S4 31 (29 – 33); S5 29 (27 – 30); sub-lateral setae r3 24 (23 – 25) and R1 22 (20 – 23). Peritreme extending anteriorly to the level of j3 or between z2-j3.

Ventral shields (Figure 36b) — Sternal shield 68 long and 66 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets and with a pair of small poroids accompanying ST4. Genital shield 128 long and 61 wide (at level of ST5), smooth. Platelets or genital sigilla separating between genital and ventrianal shields not discernible. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield 136 long and 108 (105 – 110) wide (at level of ZV2), distinctly reticulated throughout, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 46 (44 – 48) long, smooth. Primary metapodal plate or inguinal sigillum 31 long and 5 wide.

Spermatheca (Figure 36c) — Cervix 11 long, U-shaped.

Chelicera (Figure 36d) — One tooth and a *pilus dentilis* on the fixed digit. Movable digit 32 (30 – 33) long, edentate.

Legs (Figure 36e) — Measurements of legs: leg I 328 (325 – 330); leg II 271 (266 – 275); leg III 270 (266 – 274); leg IV 362 (358 – 366). Eight setae (2-2/1, 2/0-1) on the genu II. One pointed macroseta, 33 (32 – 33) long, on the basitarsus IV.

Material examined — Two female syntypes deposited in the Laboratoire de Zoologie, Muséum National d'Histoire Naturelle, Paris, France.

Adult male (Figure 36f, g)

Dorsal shield chaetotaxy similar to but smaller than the female. Ventrianal shield 114 (110-118) long and 138 (135-140) wide distinctly reticulated, bearing 6 pairs of preanal setae without solenostomes. Spermatodactyl L-shaped. This description is based on one male syntype specimen.

Previous reports — *N. perforata* is only known from the West-Palearctic area. Countries from which this species was reported are: Algeria (Athias-Henriot 1960), Morocco (Denmark and Bounfour 1989) and Spain (Chant and Yoshida-Shaul 1989). It was collected on various plants (13 botanical families): *Adenostoma* sp. (Rosaceae); *Asparagus acutifolius* L. (Liliaceae); *Astericus maritimus* L., *Dittrichia graveolens* (L.) Greuter, *Dittrichia viscosa*, *Galactites tomentosa* Moench, *Pulicaria sicula* (L.) Moris (Asteraceae); *Beta vulgaris* L. (Amaranthaceae); *Cistus monspeliensis* (Cistaceae); *Daucus carota* subsp. *maximus* (Desf.) Ball (Apiaceae); *Fraxinus* sp. (Oleaceae); *Lotus creticus*, *Ononis alba* subsp. *monophylla* (Desf.) Murb., *Trifolium pratense* (Fabaceae); *Plantago lagopus* L. (Plantaginaceae); *Ricinus communis* (L.) (Euphorbiaceae); *Ridolfia sege-*

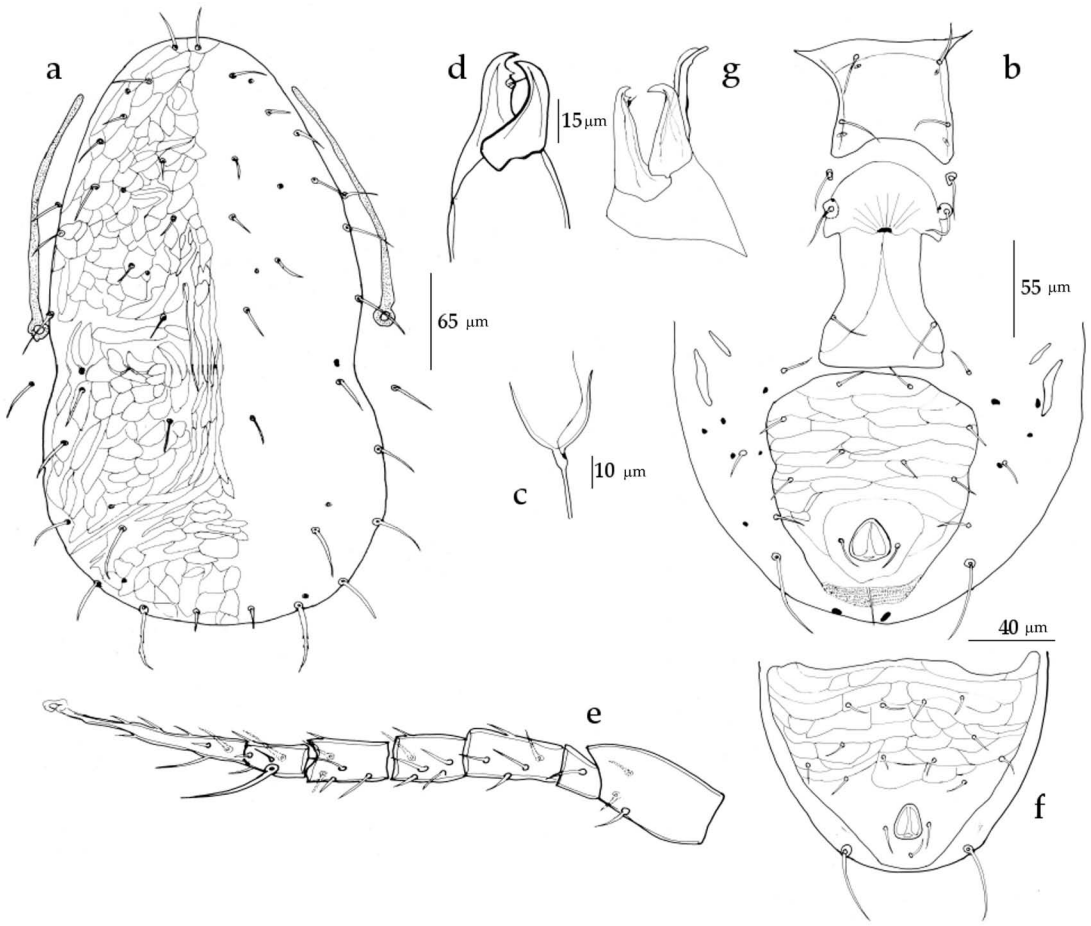

FIGURE 36: *Neoseiulella perforata* (Athias-Henriot). Female (syntype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV. Male (syntype): f – ventrianal shield; g – spermatodactyl.

tum (L.) Moris (Ericaceae); *Stachys ocymastrum* (L.) Briq. (Lamiaceae); *Verbascum sinuatum* L. (Scrophulariaceae).

Neoseiulella runiacus (Kolodochka) (Figure 37)

Typhloctonus runiacus Kolodochka 1980: 64-65; Denmark and Rather 1984: 75-76; Moraes *et al.* 1986: 233; Kolodochka 2009: 488-489. *Typhlodromus runiacus* (Kolodochka) Chant and Yoshida-Shaul 1989: 1015-1017. *Neoseiulella* (*Typhloctona*) *runiaca* (Kolodochka) Denmark and Rather 1996: 63-64. *Neoseiulella runiaca* (Kolodochka) Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147.

Adult female (Figure 37a – d)

Dorsal shield (Figure 37a) — Dorsal shield heavily reticulated throughout: length 382; width 220 (at level of s4), 271 (at level of Z1). Four pairs of large solenostomes on the dorsal shield: gd2, gd5, gd6, and gd9. No poroid visible. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except J5 and Z5 serrated. Most dorsal setae thick and on tubercles: j1 18; j3 23; j4 18; j5 18; j6 28; J2 32; J5 17; z2 17; z3 26; z4 25; z5 20; Z1 30; Z4 39; Z5 44; s4 27; s6 28; S2 31; S4 26; S5 24; sub-lateral setae r3 22 and R1 15. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 37b) — Sternal shield 51 long and 64 wide (at level of ST2), smooth, with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 are inserted on separates

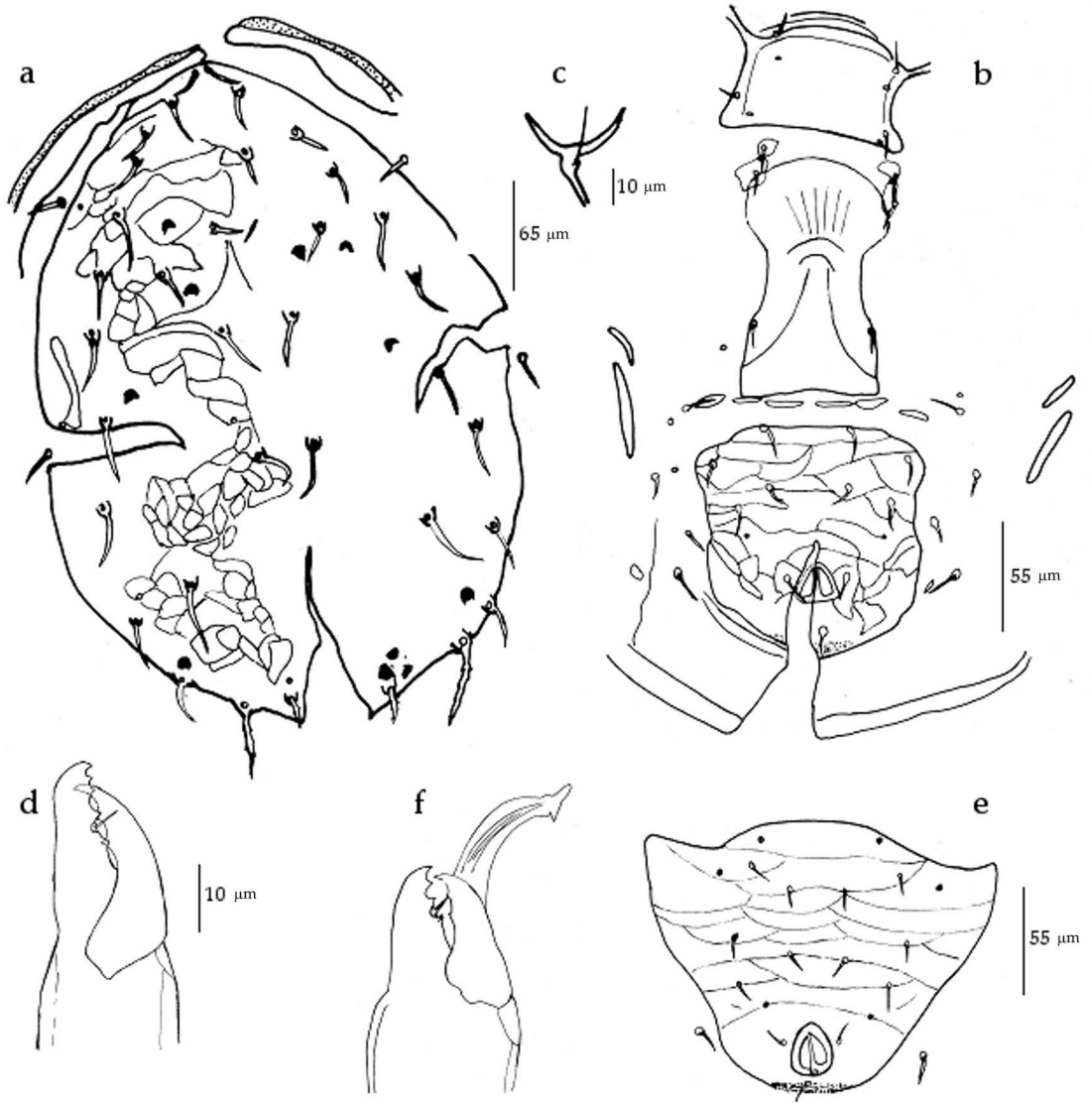

FIGURE 37: *Neoseiulella runiacus* (Kolodochka). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera. Male (paratype): e – ventrianal shield; f – spermatodactyl.

platelets and a pair of small poroids accompanying ST4. Genital shield 136 long and 67 wide (at level of ST5), smooth. Six elongate platelets or genital sigilla situated between genital and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 2 pairs of poroids around the genital shield. Ventrianal shield subquadrate-shaped, 110 long and 108 wide (at level of ZV2), distinctly reticulated, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of circular solenostomes *gv3* posterior to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 16 long, smooth. Primary metapodal plate or inguinal sigillum 45 long and 4 wide.

Spermatheca (Figure 37c) — Cervix 9 long, cup-shaped.

Chelicera (Figure 37d) — Four teeth and a *pilus dentilis* on the fixed digit. Movable digit 23 long, bidentate.

Legs — Measurements of legs: leg I 250; leg II

230; leg III 240; leg IV 300. Seven setae (2-2/0, 2/0-1) on the genu II. No macroseta on legs.

Material examined — The female holotype deposited in the ASU, Institute of Zoology, Academy of Sciences, Kiev, Ukraine.

Adult male (Figure 37e-f)

Dorsal shield similar to but smaller than female. Ventrianal shield 120 long and 142 wide, distinctly reticulated and bearing 5 pairs of preanal setae and three pair of poroids. Spermatodactyl L-shaped. This description is based on a paratype specimen.

Previous reports — The type specimens of *N. runiacus* were collected from Zakarpattia region (Ukraine) on *Alnus viridis* (Chaix) DC. (Betulaceae) and *Fagus silvatica* L. (Fagaceae) (Kolodochka 1980, 2009). Chant and Yoshida-Shaul (1989) indicated that a specimen originally identified as *Typhlodromus aceri*, collected in the Lake District (UK), was in fact *N. runiacus.*

Remarks — *N. runiacus* is similar to *N. sexapori*. Except for characteristics of dorsal setae (thick on *N. runiacus*; simple on *N. sexapori*), the nature of J5 (serrated on *N. runiacus*; smooth on *N. sexapori*), and the length of the peritreme (extending to the level of j1 on *N. runiacus*; extending to the level between z2-j3 on *N. sexapori*), all other morphological characters are similar. As several authors have already shown the importance of such characters for species differentiation (Athias-Henriot 1977; Chant and Yoshida-Shaul 1983; Chant and McMurtry 1994; Ragusa and Tsolakis 1998; Swirski *et al*. 1998; Chant and McMurtry 2007), we consider that *N. runiacus* and *N. sexapori* are two valid species.

Neoseiulella spaini (Collyer) (Figure 38)

Typhlodromus spaini Collyer 1982: 189; Schicha 1987: 134-135; Chant and Yoshida-Shaul 1989: 1024-1026. *Neoseiulella* (*Typhloctona*) *spaini* (Collyer) Denmark and Rather 1996: 73-74. *Neoseiulella spaini* (Collyer) Moraes *et al.* 1986: 202; Moraes *et al.* 2004: 295; Chant and McMurtry 2007: 147.

Adult female (Figure 38a – d)

Dorsal shield (Figure 38a) — Dorsal shield distinctly reticulated along the lateral area: length 412; width 209 (at level of s4) and 218 (at level of Z1). Six pairs of solenostomes on the dorsal shield: gd1, gd2, gd4, gd5, gd6, and gd9. One pair of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 slightly serrated: j1 25; j3 26; j4 11; j5 11; j6 15; J2 16; J5 12; z2 10; z3 16; z4 17; z5 11; Z1 15; Z4 31; Z5 48; s4 23; s6 23; S2 20; S4 17; S5 17; sublateral setae r3 20 and R1 16. Peritreme extending anteriorly to the level between j1-j3.

Ventral shields (Figure 38b) — Sternal shield 84 long and 91 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. Metasternal setae (ST4) inserted on separate platelets with a pair of small poroids. Genital shield 126 long and 72 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 3 pairs of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 140 long and 118 wide (at level of ZV2), is smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of small and circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 44 long, smooth. Primary metapodal plate or inguinal sigillum 35 long and 8 wide.

Spermatheca (Figure 38c) — Cervix 8 long, cup-shaped.

Chelicera (Figure 38d) — Five teeth and a *pilus dentilis* on the fixed digit. Movable digit 33 long, bidentate.

Legs (Figure 38e) — Measurements of legs: leg I 368; leg II 322; leg III 320; leg IV 412. Eight setae (2-2/1, 2/0-1) on the genu II. Three knobbed macrosetae, 30, 28 and 54 long, on the genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland, New Zealand.

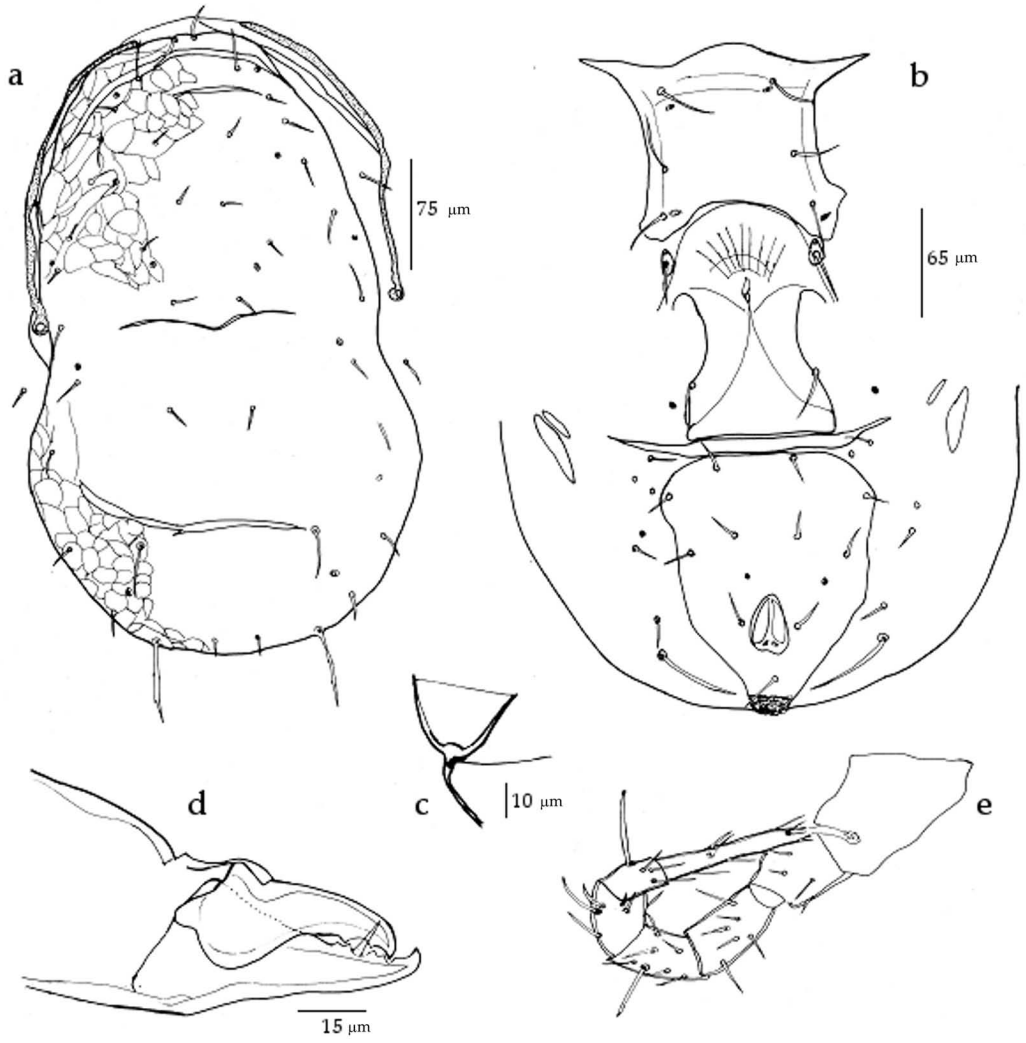

FIGURE 38: *Neoseiulella spaini* (Collyer). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Adult male

Described by Collyer (1982) and Denmark and Rather (1996). We were not able to borrow the male type specimen of this species.

Previous reports — *N. spaini* is only known from New Zealand (Collyer 1982; Schicha 1987). The female holotype, paratypes and other specimens of this species are reported on *Olearia colensoi* (Asteraceae) at Ruahine Range and Urewera National Park.

Neoseiulella splendida Ferragut and Peña-Estevez (Figure 39)

Neoseiulella splendida Ferragut and Peña-Estevez 2003: 161-164; Moraes *et al.* 2004: 295; Moraza and Peña-Estevez 2006: 58; Chant and McMurtry 2007: 147.

Adult female (Figure 39a – e)

Dorsal shield (Figure 39a) — Dorsal shield heavily reticulated: length 361 (352 – 369); width 189 (181 – 196) (at level of s4) and 195 (193 – 197) (at level of Z1). Seven pairs of solenostomes on the dorsal shield: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. Fer-

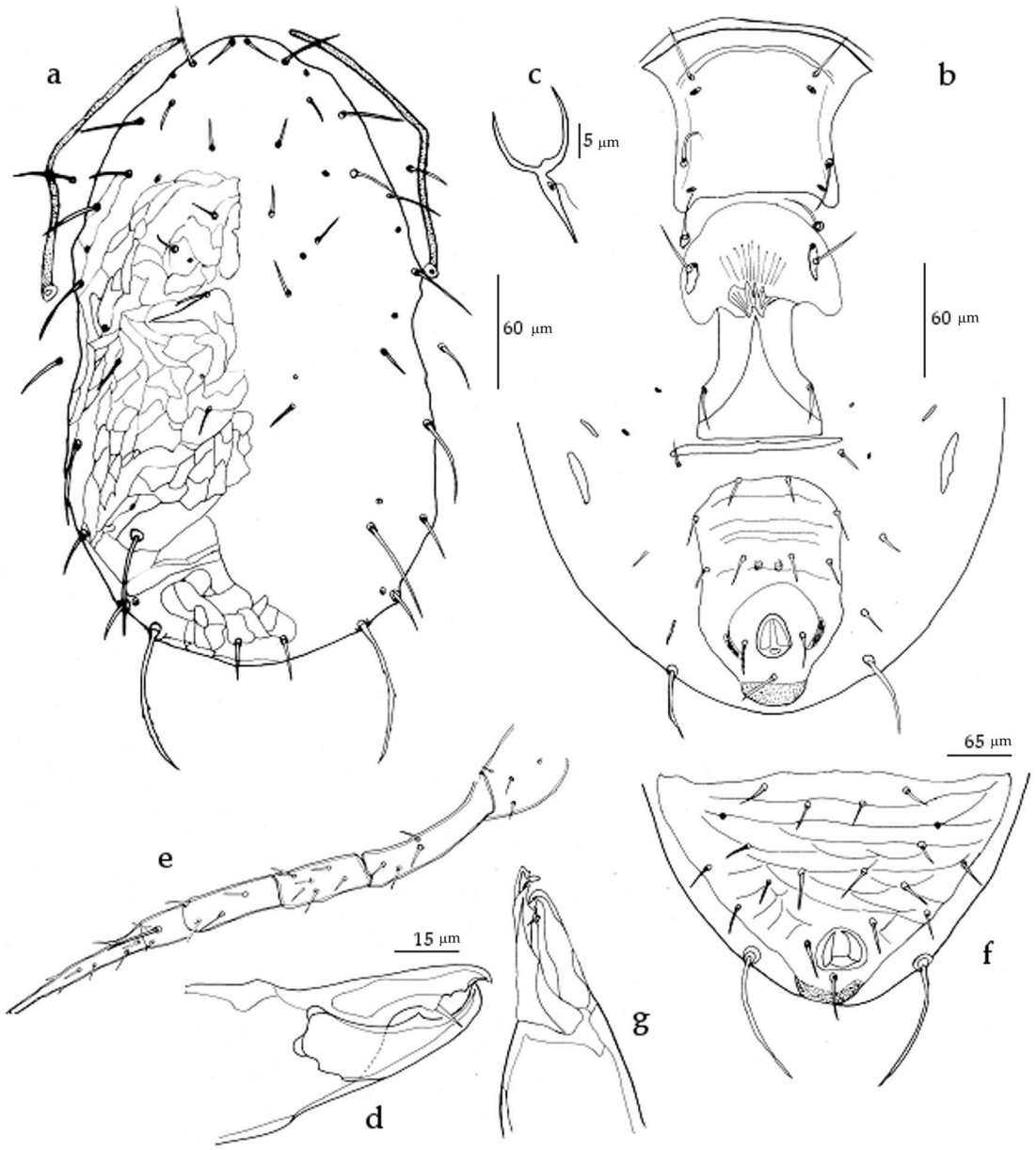

FIGURE 39: *Neoseiulella splendida* Ferragut and Peña-Estevez. Female (paratype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV. Male (paratype): f – ventrianal shield; g – spermatodactyl.

ragut and Peña-Estevez (2003) noted the presence of only six pairs of solenostomes (gd1, gd2, gd5, gd6, gd8, and gd9). However, on their drawings a pair of solenostomes corresponding to the position of gd4 (according Athias-Henriot [1975] and Swirski *et al.* [1998]) is present. One pair of poroids. Sublateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth except Z5 slightly serrated: j1 26 (23 – 28); j3 34 (32 – 35); j4 16; j5 16 (15 – 16); j6 18 (17 – 19); J2 19 (18 – 20); J5 17; z2 17 (16 – 17); z3 34 (33 – 35); z4 24; z5 16 (15 – 17); Z1 20 (19 – 20); Z4 62 (61 – 62); Z5 78; s4 34 (32 – 35); s6 40 (37 – 43); S2 41 (37 – 45); S4 27 (26 – 28); S5 26 (24 – 28); sub-lateral setae r3 30 (29 – 30) and R1 27 (25 – 29). Peritreme extending anteriorly to the level between j1-j3.

Ventral shields (Figure 39b) — Sternal shield 69 (68 – 70) long and 69 (68 – 70) wide (at level of ST2), smooth with two pairs of setae (ST1 and ST2) and two pairs of poroids. ST3 and ST4 on separate platelets and a pair of small poroids accompanying ST4. Genital shield 125 long, 68 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla (folded in the specimen examined) between genital shield and ventrianal shields. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield elongated with conspicuous waist, much longer than wide, 134 (124 – 143) long and 86 (82 – 89) wide (at level of ZV2), faintly striate, with four pairs of preanal setae (JV1, JV2 JV3 and ZV2) and with a pair of circular solenostomes *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 50 (44 – 56) long, smooth. Primary metapodal plate or inguinal sigillum 31 (26 – 35) long and 6 (5 – 7) wide.

Spermatheca (Figure 39c) — Cervix 4 (3 – 4) long, U-shaped.

Chelicera (Figure 39d) — Two teeth and a *pilus dentilis* on the fixed digit. Movable digit 36 (34 – 38) long, unidentate.

Legs (Figure 39e) — Measurements of legs: leg I 332 (331 – 333); leg II 286 (279 – 292); leg III 284 (276 – 292); leg IV 392 (383 – 401). Seven setae (2-2/0, 2/0-1) on the genu II. One pointed macroseta, 47 (46 – 48) long, on the basitarsus IV.

Material examined — Four female paratypes deposited in the Department of Agroforestal Ecosystems, Universidad Politécnica de Valencia, Spain.

Adult male (Figure 39f, g)

Dorsal shield — dorsal shield similar to but smaller than the female. Sub-lateral seta R1 inserted on the dorsal shield (different from the female, on which R1 inserted on lateral margin). Ventrianal shield 140 long and 135 wide, distinctly reticulated, bearing seven pairs of preanal setae with a pair of poroids (Figure 39 f). Spermatodactyl L-shaped (Figure 39 g). This description is based on a paratype specimen.

Previous reports — *N. splendida* is only known from Canary Islands. Plants on which this species was reported are: *Argyranthemum lidii* Humphries, *A. escarrei* (Svent.) Humphries, *Cynara cardunculus*, *Nauplius stenophyllus* (Link) Webb and Berth., *Schizogyne glaberrima* DC., *Sonchus brachylobus* Webb and Berthel (Asteraceae); *Hypericum reflexum* L.f. (Hypericaceae); *Pennisetum setaceum* (Forssk.) Chiov. (Poaceae); *Suaeda vera* J.F.Gmel., *S. vermiculata* Forssk. ex J.F.Gmel. (Chenopodiaceae).

Remarks — *N. splendida* is similar to *N. litoralis*. However these two species differ by the following characters: gd4 presence/ absence (present on *N. splendida*; absent on *N. litoralis*); j3, z3, Z4, Z5, s4, and s6 lengths; the length of the peritreme (extending between j1-j3 on *N. splendida*; extending between z2-j3 on *N. litoralis*). Moreover, the males of these two species differ in the number of setae on the ventrianal shield (seven pairs on *N. splendida*, six on *N. litoralis*). These two species seem thus to be separate entities. However, further experiments would be useful in order to conclude on the reliability of these morphological characters in species identification.

Neoseiulella steeli (Schicha and McMurtry) (Figure 40)

Typhlodromus steeli Schicha and McMurtry 1986: 181-183; Schicha 1987: 133-134; Chant and Yoshida-Shaul 1989: 1029-1030. *Neoseiulella* (*Typhloctona*) *steeli* (Schicha and McMurtry) Denmark and Rather 1996: 74-75. *Neoseiulella steeli* (Schicha and McMurtry) Chant and McMurtry 1994: 248; Moraes *et al.* 2004: 295-296; Chant and McMurtry 2007: 147.

Adult female (Figure 40a – d)

Dorsal shield (Figure 40a) — Dorsal shield lightly reticulated along the lateral area: length 426; width 250 (at level of s4) and 246 (at level of Z1). Five pairs of solenostomes: gd1, gd2, gd4, gd6, and gd9. Three pairs of poroids. Sub-lateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except for Z5 slightly serrated: j1 26; j3 36; j4 13; j5 11; j6 15; J2 16; J5 11; z2 13; z3 18; z4 18; z5 12; Z1 19; Z4 42; Z5 82; s4 21; s6 17; S2 17; S4 15; S5 16; sub-lateral setae r3 20

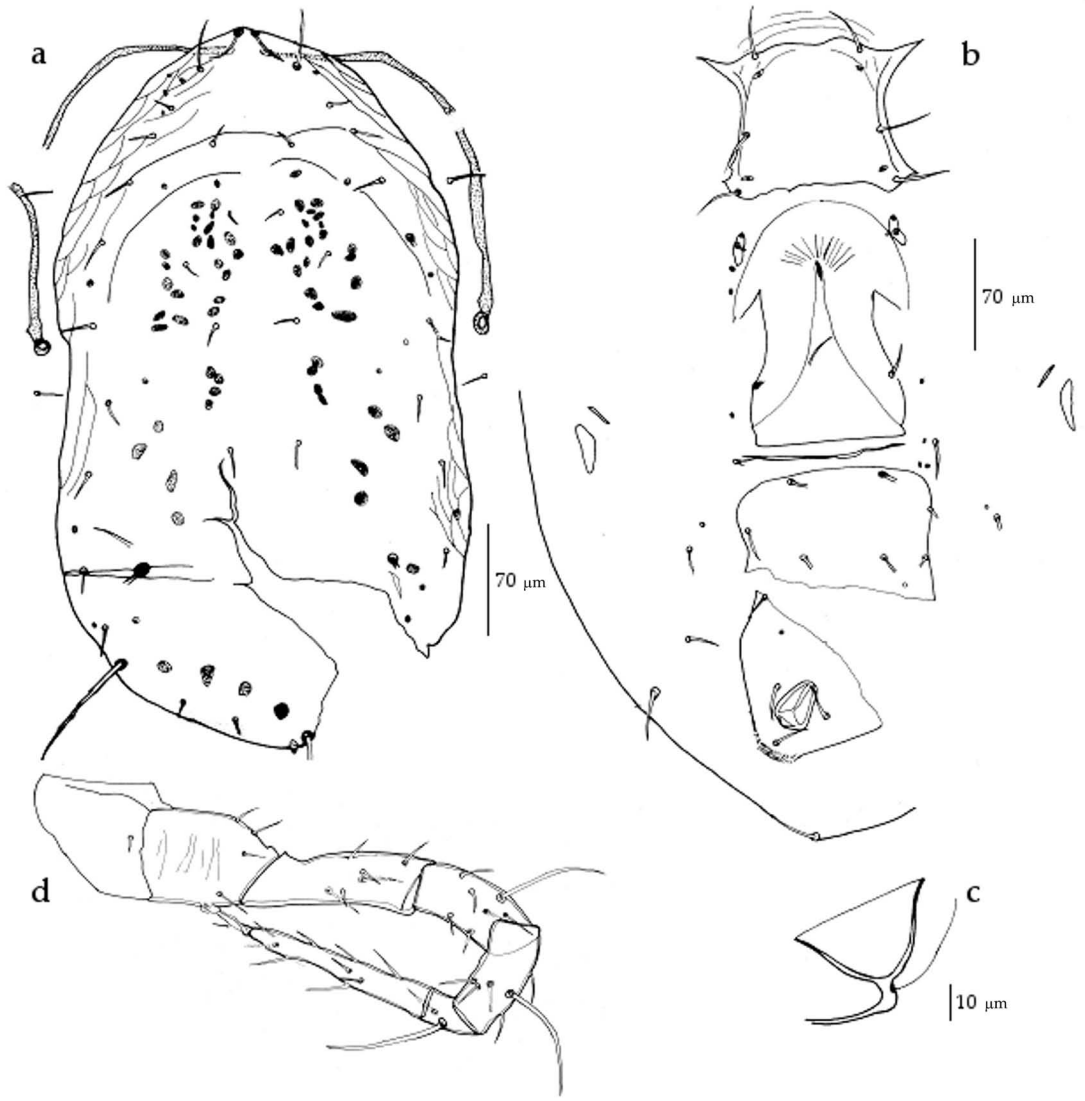

FIGURE 40: *Neoseiulella steeli* (Schicha and McMurtry). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – leg IV.

and R1 15. Presence of numerous small visible muscles marks (sigilles) on the dorsal shield. Peritreme extending anteriorly to the level of j1.

Ventral shields (Figure 40b) — Sternal shield 82 long and 85 wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 139 long and 86 wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields folded under the genital shield. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield subtriangular-shaped, 144 long and 113 wide (at level of ZV2), smooth, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and a pair of small and circular solenostomes *gv3* posteromediad to JV3. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 28 long, smooth. Primary metapodal plate or inguinal sigillum 30 long and 7

wide.

Spermatheca (Figure 40c) — Cervix 9 long, cup-shaped.

Chelicera — Dentition of the chelicera not discernible on the specimen examined. Schicha and McMurtry (1986) mentioned the presence of ten teeth and a *pilus dentilis* on the fixed digit of the chelicera, and of three teeth on the movable digit (32 long).

Legs (Figure 40d) — Measurements of legs: leg I 408; leg II 360; leg III 341; leg IV 444. Eight setae (2-2/1, 2/0-1) on the genu II. Two macrosetae, 31 and 30 long, on the genu and tibia III. Three other pointed macrosetae, 56, 64 and 55 long, are observed on the genu, tibia and basitarsus IV, respectively.

Material examined — The female holotype deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

Described by Schicha and McMurtry (1986) and Denmark and Rather (1996). We were not able to borrow the male type specimen of this species.

Previous reports — *N. steeli* is only known from Stirling Range Parc National (Australia), on *Eucalyptus* sp. (Myrtaceae).

***Neoseiulella steveni* (Schicha) (Figure 41)**

Typhlodromus steveni Schicha 1987: 135-136; Chant and Yoshida-Shaul 1989: 1026-1028. *Neoseiulella* (*Typhloctona*) *steveni* (Schicha) Denmark and Rather 1996: 64-66. *Neoseiulella steveni* (Schicha) Moraes *et al.* 2004: 296; Chant and McMurtry 2007: 147.

Adult female (Figure 41a – e)

Dorsal shield (Figure 41a) — Dorsal shield smooth, except for the lateral area of the podosoma lightly reticulated: length 359 (344 – 373); width 175 (166 – 183) (at level of s4) and 190 (183 – 197) (at level of Z1). Seven pairs of solenostomes: gd1, gd2, gd4, gd5, gd6, gd8, and gd9. No poroid visible. Sublateral setae (r3 and R1) on the lateral margin. Dorsal shield bearing 19 pairs of setae, all smooth, except Z5 slightly serrated: j1 24 (34 – 24); j3 31 (31 – 32); j4 17 (15 – 18); j5 16 (15 – 17); j6 17 (16 – 18); J2 21 (20 – 22); J5 11 (10 – 12); z2 18 (16 – 19); z3 33 (30 – 35); z4 30 (29 – 30); z5 18 (17 – 18); Z1 20 (18 – 21); Z4 52 (50 – 53); Z5 74 (72 – 75); s4 38 (37 – 39); s6 43 (40 – 45); S2 46 (44 – 48); S4 25 (23 – 26); S5 25 (23 – 26); sub-lateral setae r3 28 (27 – 28) and R1 20 (19 – 21). Peritreme extending anteriorly to the level between j1-j3.

Ventral shields (Figure 41b) — Sternal shield 73 (66 – 80) long and 77 (75 – 79) wide (at level of ST2), smooth, with three pairs of setae (ST1, ST2 and ST3) and two pairs of poroids. A pair of metasternal setae (ST4) on separate platelets accompanied by a pair of small poroids. Genital shield 128 (124 – 131) long and 63 (61 – 65) wide (at level of ST5), smooth. Four elongate platelets or genital sigilla separating genital and ventrianal shields not discernible in the specimen examined. One pair of poroids close to the genital shield (ST 5) and 1 pair of poroids around the genital shield. Ventrianal shield 124 (121 – 126) long and 98 (94 – 101) wide (at level of ZV2), smooth to faintly striate, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and without solenostome *gv3*. Four pairs of caudoventral setae (ZV1, ZV3, JV4 and JV5) on the integument surrounding the ventrianal shield. JV5 49 (47 – 51) long, smooth. Primary metapodal plate or inguinal sigillum 29 (28 – 30) long and 5 wide. In a paratype specimen: secondary metapodal plate or inguinal sigillum 21 long and 3 wide.

Spermatheca (Figure 41c) — Cervix 4 long, U-shaped.

Chelicera (Figure 41d) — Six teeth and a *pilus dentilis* observed on the fixed digit. Movable digit 29 (27 – 31) long, bidentate.

Legs (Figure 41e) — Measurements of legs: leg I 369 (364 – 374); leg II 339 (328 – 350); leg III 298 (294 – 302); leg IV 434 (422 – 443). Eight setae (2-2/1, 2/0-1) on the genu II. One pointed macroseta 48 (42 – 54) long, on the basitarsus IV.

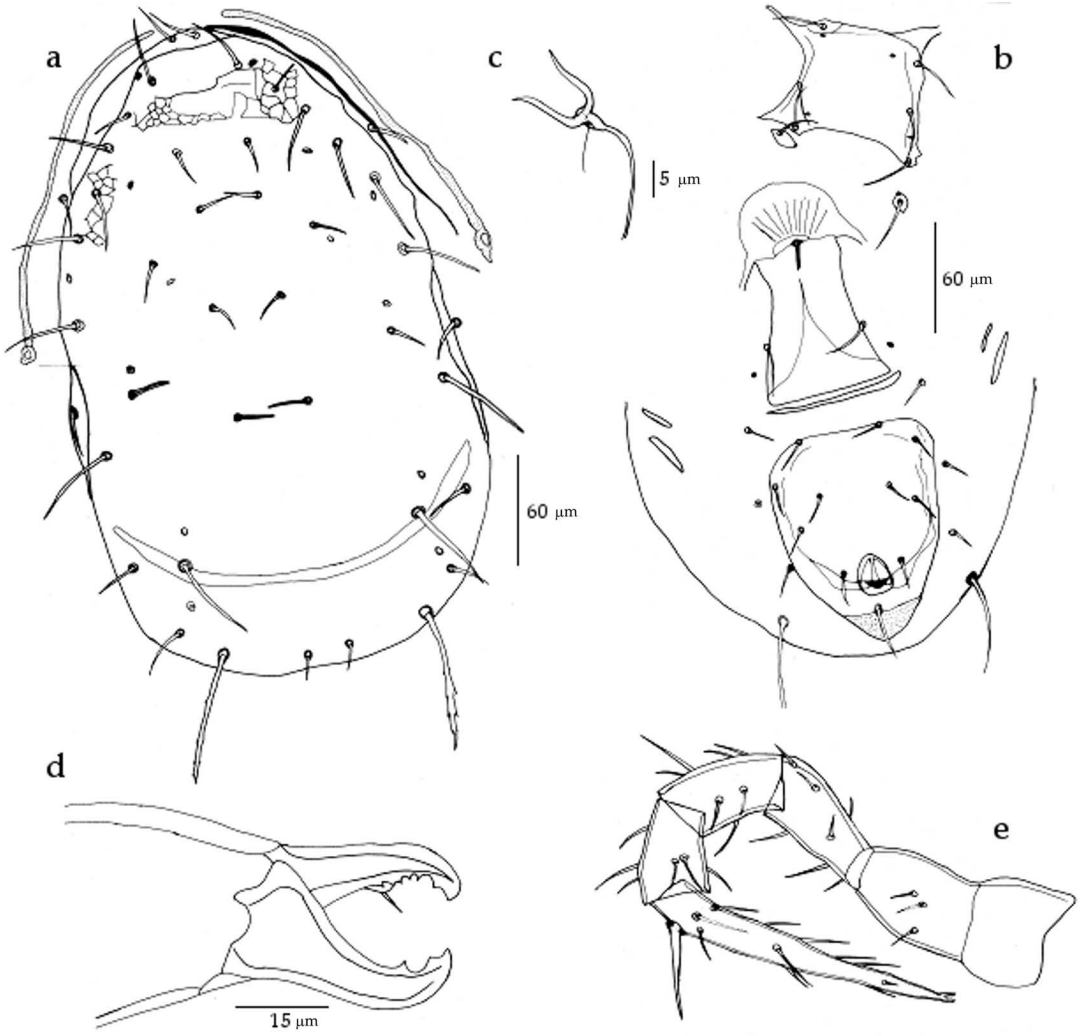

FIGURE 41: *Neoseiulella steveni* (Schicha). Female (holotype): a – dorsal shield; b – ventral shields; c – spermatheca; d – chelicera; e – leg IV.

Material examined — The female holotype and two female paratypes deposited in NSW Department of Primary Industries, Agricultural Scientific Collections Unit (Acarology), Orange Agricultural Institute, Australia.

Adult male

Described by Schicha (1987) and Denmark and Rather (1996). We were not able to borrow the male type specimens of this species.

Previous reports — *N. steveni* is only known from New South Wales (Australia), on *Banksia* sp. (Proteaceae).

Key to adult females of the genus *Neoseiulella* Muma

1. Ventrianal shield with three pairs of preanal setae (JV3 absent) 2
— Ventrianal shield with four pairs of preanal setae (JV3 present) 11

2(1). Caudoventral setae JV4 present 3
— Caudoventral setae JV4 absent; dorsal shield with four pairs of solenostomes (gd2, gd4, gd5, gd6); spermatheca with U-shaped cervix; ventrianal shield with a pair of solenostomes; macrosetae

on genu and tibia III, genu, tibia and basitarsus IV ... . *N. oleariae*

3(2). Presence of solenostomes on the ventrianal shield (*gv3*), genu II with seven setae (2-2/0, 2/0-1) 4
— Absence of solenostomes on the ventrianal shield (*gv3*); genu II with eight setae (2-2/1, 2/0-1); legs without macrosetae; tuberculous ornaments with large glands cover the dorsal shield ..... *N. coreen*

4(3). Leg IV with three macrosetae, on genu, tibia and basitarsus 5
— Leg IV with two thick and short macrosetae, on genu and basitarsus, tibia IV without macroseta; all dorsal and sub-lateral setae inserted to tubercles; spermatheca with shallowly cup-shaped .... *N. elaeocarpi*

5(4). Dorsal shield with four pairs of solenostomes: gd2, gd4, gd6, gd9 (gd1, gd5, and gd8 absent); fixed digit without *pilus dentilis* 6
— Dorsal shield with more than four pairs of solenostomes: gd2, gd4, gd6 and gd9 always present; gd1, gd5 and gd8 present or absent 7

6(5). Most dorsal setae inserted on tubercles; spermatheca with U-shaped cervix; fixed digit with nine teeth; leg III with one macroseta, on genu .... *N. corrugata*
All dorsal setae not inserted on tubercles; spermatheca with shallowly cup-shaped cervix; fixed digit with twelve teeth; leg III with two macrosetae, on genu and tibia ..... *N. dachanti*

7(5). Dorsal shield with six pairs of solenostomes . 8
— Dorsal shield with five pairs of solenostomes . . 9

8(7). gd1 present, gd5 absent, gd2, gd4, gd6, gd8, and gd9 present; Z4 and Z5 very long (120 μm and 230 μm respectively), most of the other dorsal setae very short (5-15 μm long) ..... *N. cottieri*
— gd1 absent, gd5 present, gd2, gd4, gd6,gd8, gd9 present; Z4 and Z5 greatly shorter (about 60 and 90 μm respectively) ..... *N. ashleyae*

9(7). Leg III without macroseta 10
— Leg III with macrosetae on genu and tibia .... *N. manuka*e = *N. glenfieldensis*

10(9). Dorsal shield heavily reticulated; ventrianal shield with a large pair of solenostomes mediad to JV2 ..... *N. nesbitti = N. armidalensis*
— Dorsal shield lightly reticulated; ventrianal shield with a small pair of solenotomes posterior to JV2 ..... *N. novaezealandiae*

11(1). Absence of macroseta on the leg IV 12
— Presence of at least one macroseta on the leg IV 19

12(11). Seven setae on the genu II 13
— Eight setae on the genu II 18

13(12). One pair of solenostomes (gd8) on the dorsal shield ..... *N. compta*
— More than one pair of solenostomes on the dorsal shield 14

14(13). Three pairs of solenostomes (gd2, gd6, gd9) on the dorsal shield ..... *N. tuberculata*
— More than three pairs of solenostomes on the dorsal shield 15

15(14). Five solenostomes (gd1, gd2, gd6, gd8, gd9) on the dorsal shield .... *N. aceri = N. squamiger = N. aceris*
— Four solenostomes (gd2, gd5, gd6, gd9) on the dorsal shield 16

16(15). Peritreme reaching level of j1 .... *N. runiacus*
— Peritreme reaching level between j3 and z2 ... 17

17(16). Dorsal setae arising from tubercles, three teeth on the fixed digit of the chelicerae . *N. sexapori*
— Dorsal setae not arising from tubercles, seven teeth on the fixed digit of the chelicerae .... *N. arutunjani*

18(12). Dorsal shield setae long (i.e. Z4 = 73; Z5 = 67; S4 = 75), peritreme reaching level of j1 ..... *N. crassipilis*
— Dorsal shield setae shorter (i.e. Z4 = 38; Z5 = 44; S4 = 35), peritreme reaching level of z4 ..... *N. tiliarum = N. formosa*

19(11). One macroseta on the leg IV (on the basitarsus) 20
— Three macrosetae on the leg IV 29

20(19). Presence of solenostomes (*gv3*) on the ventrianal shield 21
— Absence of solenostomes (*gv3*) on the ventrianal shield 23

21(20). One pair of solenostome on the dorsal shield (gd9), peritreme reaching level of j1 ..... *N. celtis*
— More than one pair of solenostomes on the dorsal shield, peritreme reaching level of j3 22

22(21). Six pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd6, gd8, gd9), spermatheca with U-shaped cervix, setae on the dorsal shield longer (i.e. R1 = 41, S5 = 40, s6 = 43, s4 = 38, J2 = 36, j6 = 31) ..... *N. montforti*
— Seven pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd8, gd9), spermatheca with cup-shaped cervix, setae on the dorsal shield shorter (i.e. R1 = 25, S5 = 28, s6 = 26, s4 = 23, J2 = 15, j6 = 16) ..... *N. neoviniferae*

23(20). Six setae on the genu II ..... *N. carmeli*
— More than six setae on the genu II 24

24(23). Eight setae on the genu II 25
— Seven setae on the genu II 26

25(24). No tooth on the mobile digit of the chelicerae, one tooth on the fixed digit, six pairs of solenostomes on the dorsal shield (gd1, gd2, gd5, gd6, gd8, gd9), some setae shorter (Z4 = 34, Z5 = 52, s6 = 26, S2 = 29) ..... *N. perforata*
— Two teeth on the mobile digit of the chelicerae, six teeth on the fixed digit, seven pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd8, gd9), some setae longer (Z4 = 52, Z5 = 74, s6 = 43, S2 = 46) ..... *N. steveni*

26(24). Four pairs of solenostomes on the dorsal shield (gd2, gd6, gd8, gd9), spermatheca with cup-shaped cervix, one tooth on the fixed digit of the chelicerae ..... *N. elongata*
— More than four pairs of solenostomes on the dorsal shield, spermatheca with U-shaped cervix, two teeth on the fixed digit of the chelicerae 27

27(26). Six pairs of solenostomes on the dorsal shield (gd1, gd2, gd5, gd6, gd8, gd9) ..... *N. litoralis*
— Seven pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd8, gd9) ..... *N. splendida*

28(19). Absence of solenostomes (*gv3*) on the ventrianal shield ..... *N. cassiniae*
— Presence of solenostomes (*gv3*) on the ventrianal shield 29

29(28). Presence of at least one macroseta on the leg III 30
— Absence of macroseta on the leg III 32

30(29). One macroseta on the leg III (on the genu), spermatheca with U-shaped cervix, seven pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd8, gd9) ..... *N. ferraguti*
— More than one macroseta on the leg III, spermatheca with cup-shaped cervix, five pairs of solenostomes on the dorsal shield 31

31(30). Three macrosetae on the leg III (genu, tibia, basitarsus), eight teeth on the fixed digit of the chelicerae, one tooth on the mobile digit, some setae longer (i.e. z4 = 29, z3 = 32, j3 = 52) ..... *N. myopori*
— Two macrosetae on the leg III (genu, tibia), ten teeth on the fixed digit of the chelicerae, 3 teeth on the mobile digit, some setae shorter (i.e. z4 = 18, z3 = 18, j3 = 36) ..... *N. steeli*

32(29). Eight setae on the genu II 33
— Seven setae on the genu II 34

33(32). Dorsal seta lengths shorter (i.e. Z4 = 31, Z5 = 48, s4 = 23, s6 = 26, S2 = 20, S4 = 17, S5 = 17), six pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd9), spermatheca with cup-shaped cervix ..... *N. spaini*
— Dorsal seta lengths longer (i.e. Z4 = 88, Z5 = 117, s4 = 67, s6 = 71, S2 = 62, S4 = 63, S5 = 45), seven pairs of solenostomes on the dorsal shield (gd1, gd2, gd4, gd5, gd6, gd8, gd9), spermatheca with U-shaped cervix ..... *N. longiseta*

34(32). Three pairs of solenostomes on the dorsal shield 35
— Seven pairs of solenostomes on the dorsal shield 36

35(34). Presence of solenostomes gd2, gd8, gd9, spermatheca with cup-shaped cervix, some dorsal setae shorter (i.e. Z1 = 22, Z4 = 31, S2 = 31, S4 = 30, S5 = 23, J2 = 24) ..... *N. vollsela = N. transitans = N. prunus*
— Presence of solenostomes gd5, gd8, gd9, spermatheca with U-shaped cervix, some dorsal setae longer (i.e. Z1 = 43, Z4 = 60, S2 = 62, S4 = 55, S5 = 50, J2 = 55) ..... *N. elisae*

36(34). Two teeth on the mobile digit of the chelicerae, six teeth on the fixed digit, some different dorsal seta lengths (J5 = 32, S4 = 41, S5 = 30) ..... *N. canariensis*
— One tooth on the mobile digit of the chelicerae, two teeth on the fixed digit, some different dorsal seta lengths (J5 = 12, S4 = 61, S5 = 47) ..... *N. arinoi*

CONCLUSION

The present paper provides a homogenous taxonomic revision of nearly the totality of the species belonging to the genus *Neoseiulella* with an identification key of the adult females of valid species. This revision allows to redefine this genus, excluding three species, including an additional species *T.* (*A.*) *elisae* and discussing six synonymies. Further experiments, especially cross-breedings and molecular analyses are required to determine the reliability of some morphological characters considered to be important by some authors to discriminate between species (ex. ornamentation of dorsal and ventral shields; presence of certain dorsal and ventral solenostomes; length of the peritreme; chelicera dentition; the position and size of preanal solenostomes). This paper also provides complete biogeographic data sets (distribution and host plants) of all the species of the genus *Neoseiulella*. Eighteen species are reported from the West-Palearctic area; two of them (*N. aceri* and *N. tiliarum*) being also present in the Nearctic area; 15 species are reported from the Australasian area; one of them (*N. nesbitti*) being also present in the Oriental area. Three other species are reported from this latter area. These data associated to the ecological distribution (plant supports) could constitute the starting point for further analyses, especially biogeographic and phylogenetic analyses. The disjoint distribution of the species of the genus *Neoseiulella* questions actually the monophyly of this genus.

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