Acarologia is proudly non-profit, with no page charges and free open access

Please help us maintain this system by encouraging your institutes to subscribe to the print version of the journal and by sending us your high quality research on the Acari.

Subscriptions: Year 2019 (Volume 59): 450 €
http://www1.montpellier.inra.fr/CBGP/acarologia/subscribe.php
Previous volumes (2010-2017): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

Acarologia is under free license and distributed under the terms of the Creative Commons-BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.
PHYTOSEIID MITES OF MOROCCO, WITH DESCRIPTIONS OF TWO NEW SPECIES AND NOTES ON THE GENERA KUZINELLUS, TYPHLOCTONUS AND TYPHLODROMUS (ACARI : PHYTOSEIIDAE)

BY J. A. MCMURTRY * and MALIKA BOUNFOUR **

Collections of Phytoseiidae were made in various parts of Morocco during April and May of 1982 during a survey for natural enemies of phytophagous mites on citrus for possible introduction into California for biological control of pest mites. Some additional collections were made in 1985-86. Of the 17 species reported in this paper, two are described as new and 11 are known from neighboring Algeria, from long-term studies by C. ATHIAS-HENRIOT.

All measurements are in microns, showing means and ranges. The setal nomenclature follows that of CHANT & HANSELL (1971), ROWELL et al. (1978) and CHANT & YOSHIDA SHAUL (1978).

Genus Kuzinellus Wainstein

Paraseiulus (Kuzinellus), KARG, 1983 : 322.
Typhlodromus ecclesiasticus group, CHANT and YOSHIDA-SHAUL, 1986 : 447.

We consider the genus Kuzinellus to be equivalent to the ecclesiasticus species group, characterized by CHANT & YOSHIDA-SHAUL (1986). This genus is distinguished from Paraseiulus Muma as defined by WAINSTEIN (1976) by the shape of the ventrianal shield and by the presence of 4, rather than 2, pairs of setae on that shield. We consider Paraseiulus to be equivalent to the soleiger species group, defined

* Department of Entomology, University of California, Riverside, CA 92521 USA.
** Service de la Protection de Végétaux, D.P.V.C.T.R.F., B.P. 1308, Rabat, Morocco.

by Chant & Yoshida-Shaul (1982). Unlike Parasellus, which seems to be a uniform, natural grouping, Kuzinellus probably is not a single natural assemblage of species (e.g. contrast K. kuzini (Wainstein) with K. ecclesiasticus (DeLeon) or K. prunusus (van der Merwe)).

Kuzinellus saharae

McMurtry and Bounfour n. sp.

Female: (Figs. 1-4) (7 specimens measured).

Dorsal shield 326 (300-354) long, 152 (144-174) wide at level of s4, reticulated over entire surface, with 18 pairs of setae, the bases of which arise from tubercules. Sensillae and glandular openings difficult to discern. Setae j1 20 (18-22), j3 32 (30-36), j4 29 (26-30), j5 31 (30-36), j6 47 (44-48), J2 54 (48-60), J5 7-8, z2 27 (24-30), z3 31 (27-36), z4 32 (30-36), z5 36 (36-37), z6 40 (31-42), Z4 59 (54-60), Z5 58 (54-60), s4 37 (36-38), s6 44 (42-48), S2 53 (48-56), S4 51 (48-56), S5 42 (36-46); r3 29 (28-30) and R1 37 (36-39), both on membrane adjacent to dorsal shield. Peritreme extending anteriorly almost to level of setae j1.

Figs 1-4: Kuzinellus saharae n. sp., female.
1. — Dorsal shield; 2. — Ventral surface; 3. — Spermatheca; 4. — Chelicera.
Sternal and genital shields weakly sclerotized, ill-defined; ventrianal shield width 57 (48-65) at widest anterior level (at ZV2), 44 (42-45) at narrowest level (near middle) and 58 (54-60) at level of anus. Four pairs of preanal setae on shield (one pair, JV3, missing on one specimen). Ventrolateral setae ZV1, ZV3, JV4 and JV5 present; JV5 48 (45-52). Length of primary metapodal plate 35, width 3.

Spermatheca small, indistinct; cervix narrow (1 μ), parallel-sided but flared at distal end, 9-12 long. Fixed digit of chelicera 31, with 3 teeth; movable digit 30, with 1 tooth. Legs without macrosetae. Chetotaxy of Ge II 2, 1, 1; Ge III 1, 2, 1, 1; Ti II 1, 1-2, 1; Ti III 1, 1-2, 1.

Male: Unknown.

Locality and type material: Holotype female, in U.S. National Museum of Natural History (USNMNH), and 2 paratype females, in University of California, Riverside, Division of Biological Control (UCR) from olive, Olea europaea, Zagora, Morocco 11-V-82. Four additional paratype females (in UCR) from Cupressus, same location and date.

Remarks: K. saharae resembles K. kuzini (Wainstein) but can be distinguished from that species by the longer setae on the dorsal shield (CHANT & YOSHIDA SHAIL, 1986), by having 1 rather than 2 teeth on the movable digit of the chelicera, and by the narrow, tubular rather than saccular cervix of the spermatheca.

This species is also similar to K. sennarensis (ElBadry) but that species has R1 inserted on the dorsal shield rather than on the lateral integument (ElBadry, 1967; CHANT & YOSHIDA SHAIL, 1986). Also, in CHANT & YOSHIDA SHAIL’s redescription, which was not based on type material, the cervix of the spermatheca of K. sennarensis is considerably longer than in K. saharae.

Genus Typhloctonus Muma


Most species placed in this genus by DENMARK & RATHER (1984) have one or no macrosetae on leg IV, fewer than 6 teeth on the fixed digit of the chelicera, all of which are distal to the pilus dentilis, and the spermatheca with a cup-shaped (often shallow) cervix (saccular in tiliarum), in addition to the presence of seta Z1. Exceptions are: T. myopori Collyer, which has multideterminate chelicerae, and 3 long macrosetae on leg IV (we believe this species should be grouped with T. cottieri Collyer, which DENMARK & RATHER (1984) place in Tasminodromus Wainstein); T. prunus Denmark and Rather from India; and T. vollsella Chaudhri from Pakistan. The last 2 species have 3 “knobbed, bacillate” macrosetae on leg IV.

Typhloctonus perforatus (Athias-Henriot) New Combination

Specimen examined: Morocco: El Jadida, 28-IV-82, 1 female, from Ricinus communis.

Previous records: Algeria (ATHIAS-HENRIOT, 1960a).

Remarks: The setal measurements of our specimens are close to those given by ATHIAS-HENRIOT (1960a) for specimens from Algeria. This species is included in Typhloctonus, based on the generic description of DENMARK & RATHER (1984), although these authors did not list it in their review of the genus.

Typhlodromus Scheuten

Typhlodromus Scheuten, 1857: 111.

We here include species of typhlodromine mites that have setae S2, S4 and R1 (Typhlodromus sensu SCHUSTER & PRITCHARD, 1963; KOLODOCHKA 1978; and KARG, 1983) as well as those species which have setae S5 in addition to the above named setae (Anthoseius DeLeon sensu KOLODOCHKA, 1978 and KARG, 1983; or Amblydromella Muma sensu DENMARK & MUMA, 1973). Because some of these species seem to differ only in the presence or
absence of seta $S_5$ (e.g. Typhlodromus athenas Swirski & Ragusa, 1976; and T. atticus Swirski & Ragusa, 1976), we consider both of these groups of species to be Typhlodromus. Except for the presence of $S_5$, some species considered to be Amblydromella (or Anthoseius) are closer to species lacking $S_5$ (Typhlodromus s.s.) than they are to many of the species with $S_5$ present. In fact, it is conceivable that this character is subject to intraspecific variation.

Typhlodromus athenas Swirski and Ragusa

Specimens examined: Morocco: Beni Melal, 4-V-82, 3 females, from Malva sp., 2 females, from olive; Italy: Polizzi Generosa (PA), 7-XII-73, 1 female, from olive; Greece: Athens (Kifissia), 14-IV-80, 1 female, from olive.

Previous records: Greece (Swirski & Ragusa, 1976).

Remarks: Setal measurements of 3 specimens (means and ranges) are as follows: $j_1$ 24 (24-25), $j_3$ 29 (28-30), $j_4$ 18 (17-18), $j_5$ 19 (18-20), $j_6$ 23 (22-24), $j_2$ 25 (24-26), $j_5$ 8-9, $z_2$ 19 (18-20), $z_3$ 25 (24-26), $z_4$ 24, $z_5$ 18, $Z_4$ 48, $Z_5$ 60 (57-61), $s_4$ 29 (28-30), $s_6$ 31 (30-32), $S_2$ 33 (30-36), $S_4$ 34 (30-36), $S_5$ 23 (21-24), $r_2$ 28 (27-30), $R_1$ 27 (24-32), ST IV 47 (44-48); dorsal shield 358 (348-366) long 186 (180-192) wide. Lengths of setae and dorsal shield are all somewhat greater for Morocco specimens, compared to those recorded by Swirski & Ragusa (1976) for specimens from Greece. No other differences were noted between specimens from the two areas.

Typhlodromus ilicis Athias-Henriot

Specimens examined: Morocco: Azilal, 1 female, 5-V-82, from Quercus.

Previous records: Algeria (Athias-Henriot, 1960a).

Remarks: Besides the holotype, also from Quercus, this is the only other record of this characteristic species, which has a small ventrianal shield bearing only 2 pairs of preanal setae.

Typhlodromus laurentii Ragusa and Swirski

Specimens examined: Morocco: Marrakech, 6-V-82, 4 females, from olive; Beni Melal, 4-V-82, 8 females, from olive, 3 females, from Cupressus sp.; Taraudant, 5-V-86, 1 female, from Cynodon dactylon. Italy: Palermo, 17-X-79, 1 female, from Ilex aquifolium.

Previous records: Italy (Ragusa & Swirski, 1978).

Remarks: Measurements of setae were made on 13 specimens from 3 locations in Morocco, and the means corresponded very closely to the values given for type material from Italy (Ragusa & Swirski, 1978).
Typhlodromus phialatus Athias-Henriot

Typhlodromus phialatus Athias-Henriot, 1960a: 100.

Specimens examined: Morocco: Sidi Bennour, 29-IV-82, 2 females, from weed in citrus orchard; Ait Melloul (near Agadir), V-1-86, 1 female, from Argania spinosa.

Previous records: Algeria (Athias-Henriot, 1960a); USSR (Wainstein 1975; Kołodochka, 1978, 1980, 1981); Israel (Swirski & Amitai, 1984); Jordan Valley (Amitai & Swirski, 1978); Spain (Ferragut et al., 1983).


Genus Neoseiulus Hughes


Neoseiulus stolidus Chaudhri


Specimens examined: Morocco: Beni Melal, 4-V-82, 3 females, from Hordeum sp.; Taroudant, 5-V-86, 1 female, from Cynodon dactylon; Turkey: Balcali, 1-III-81, 3 females, from Phaseolus sp.

Previous records: Pakistan (Chaudhri, 1968).

Remarks: Our specimens conform closely to Chaudhri's description, including the setal measurements, and also to specimens from Turkey, collected by E. Sekeroğlu and loaned by H. A. Denmark. Attempts to borrow the holotype were unsuccessful and there are no paratypes deposited in the British Museum and USNMNH as indicated in Chaudhri's paper.

Typhlodromus cucumeris (Oudemans) New Combination

Typhlodromus cucumeris Oudemans, 1930: 69.

Specimens examined: Morocco: El Jadida, 29-IV-82, 1 female, from strawberry; Azemour, 30-IV-82, 2 females, from Ricinus communis; USA — California: El Toro (Orange County), 11-V-65, 3 females, from strawberry.

Previous records: Numerous records, including Europe, Middle East, North Africa, Asia, North America, Australia (Moraes, et al., 1986).

Remarks: The Morocco specimens conform closely to the redescriptions of Schuster & Pritchard (1963) and Schicha (1976) for N. cucumeris.

Genus Kampimodromus Nesbitt


Kampimodromus hmiminai

McMurry & Bounfour n. sp.

Female: (Figs. 5-8) (10 specimens measured). Dorsal shield 321 (302-336) long, 167 (152-180) wide, lightly sclerotized, with faint reticulations in lateral areas and creases in central areas, with 16 pairs of setae. Setae j1 18 (17-19), j3 40 (36-48), j4 14 (12-16), j5 11 (10-12), j6 16 (12-18), j7 12 (10-14), j5 6, z2 30 (26-36), z4 48 (44-52), z5 14 (10-17), z1 12 (10-16), z4 79 (72-86), Z5 71 (64-80), s4 67 (60-74), S2 76 (72-86), 55 12 (10-14). Setae r3 39 (36-42), inserted on membranous cuticle next to dorsal shield (except for 1 specimen, which has setae inserted on dorsal shield); R1 28 (24-36), inserted on membrane. Setae j4 through j6, J2, J5, z5, Z1 and S5 smooth, all others distinctly serrated. Peritreme 109 (92-118), extending approximately to level of base of setae z2.
Sternal shield weakly sclerotized, ill-defined, genital shield width at level of setae 55 (48-60); ventrianal shield oval, 84 (78-88) long, 46 (40-48) wide at level of anal opening, bearing only 1 pair of preanal setae (Jv2); Jv1, Zv2, as well as the usual Zv1, Zv3, Jv4 and Jv5 present on membrane surrounding shield; Jv5 serrated, 29 long. Primary metapodal plate 29 long, 2-3 wide.

Cervix of spermatheca bowl-shaped (poculiform), atrium distinct. Fixed digit of chelicera 23, with apical tooth plus 3 small teeth near distal end; movable digit edentate, 23. Small macroseta only on tarsus IV, 24 (20-30) long. Chetotaxy of GeII 2, 2-2, 1; Ge III 1, 2-2, 1; Ti II 1, 1-2, 1; Ti III 1, 1-2, 1.

Male: Unknown.

Locality and type material: Holotype female (in USNMNH) from fig leaf, Sidi-Bennour, Morocco,
29-IV-82. Six paratypes (in University of California, Riverside, Division of Biological Control), same data. Three additional paratypes from fig, Agdz (near Zagora), 11-V-82, and one paratype from fig, Taliouine, 12-V-82, all in UCR. Also collected in El Hajeb on fig.

Remarks: The placement of this species in the genus Kampimodromus is considered provisional, as the genus needs to be redefined. The new species seems most closely related to K. aberrans (Oudemans) in sharing the following characters: (1) similar dorsal shield chetotaxy (S4 absent); (2) setae J1, J3, z2, z4, Z4, Z5, s4 and S2 strongly serrated; (3) bowl-shaped cervix of the spermatheca and small, distinct atrium; (4) small cheliceral digits, with only about 3 teeth on the fixed digit, all distal to the pilus dentilis. Amblyseius (Kampimodromus) maritimus Ehara and K. hevae (Oudemans) are similar in all of the above characters except (1), as they also lack seta J2. Z1 is also serrated on maritimus. K. langei Wainstein & Arutunjan apparently has all dorsal shield setae serrated. Amblyseius trichopilus Blommers differs in character (1) in that S4 is present. K. hmininai n. sp. differs from all of these similar species in having an oval-shaped ventrianal shield with only one pair of preanal setae rather than a long, narrow shield with 3 pairs of preanal setae.

Genus Proprioseiopsis Muma


Proprioseiopsis messor (Wainstein) New Combination

Typhlodromus messor Wainstein 1960 : 668.

Specimens examined: Morocco: Beni Melal, 5-V-82, 1 female, from Hordeum sp.; 1 female, from "ornamental".

Previous records: USSR (Wainstein, 1960; Livshitz & Kuznetsov, 1972); Algeria (Athias-Henriot, 1961); Australia (Schicha. 1983); East Germany (Karg, 1965); Israel (Swirski & Amital, 1965, 1968; Amitai & Swirski, 1978); Italy (Athias-Henriot, 1961; Ragusa, 1977); South Africa (Athias-Henriot, 1966); Spain (Athias-Henriot, 1966).

Amblyseius italicus (Chant)

Typhlodromus (Amblyseius) italicus Chant, 1959 : 70.

Specimens examined: Italy (intercepted at New York, USA), 12-IX-50, 4 female syntypes (holotype not indicated) from beech leaves; Morocco: El Jadida, 29-IV-82, 2 females, from cucumber leaves in greenhouse.

Supplementary description: Based on 4 syntypes. Dorsal shield smooth, 440 (420-450) long, setae J1 38 (36-42), J3 58 (50-62), z2 32 (28-36), z4 42 (36-48), Z4 100 (96-108), ZS 225 (216-228), s4 120 (108-126), all other setae on dorsal shield minute (10 μm or less); r3 26, R1 20.

Genital shield width 84 (1 specimen measured); ventrianal shield length 127, anterior width 66, narrowest width (just in front of level of setae JV2) 54, width at level of anus 88; JV1 and JV2 only preanal setae on ventrianal shield, setae ZV2 on membrane along with ZV1, ZV3, JV4 and JV5. Posterior margin of sternal shield straight, except for small lateral lobes, on which setae STIII are inserted.

Six teeth plus pilus dentilis on fixed digit of chelicera, 4 teeth on movable digit. Cervix of spermatheca funnel-shaped, tubular at base (Fig. 9), atrium indistinct. Macrosetae on GeIV 107 (96-114), TiV 71 (68-72), TiV 83 (78-81). Macrosetae also present on Ge I, II, III.

Amblyseius graminis Chant


Typhlodromus (Amblyseius) graminis, Chant 1959 : 89.

Specimen examined: Morocco: El Jadida, 28-IV-82, 1 female, from Malva sp.

Previous records: England (Chant, 1956); Algeria (Athias-Henriot, 1961); USSR (Livshitz &
Kuznetzov, 1972); Poland (Wiackowski & Suski, 1963); Germany (Karg, 1965); Spain (Athias-Henriot, 1961). Additional references in Moraes et al. (1986).

Remarks: Measurements of various setae on the specimen from Morocco are: j1 29, j3 44, z2 26, z4 38, (Z4 broken), ZS 88, z4 56, z2 54, SgeIV 56, StIV 44, StIV 79. These measurements generally conform closely with those given by Athias-Henriot (1961) and Livshitz & Kuznetzov (1972), but differ from some of those given by Westerboer & Bernhard (1963).

Although this species is retained in Amblyseius in this paper, we recognize that it differs from Amblyseius s.s., as defined by Muma et al. (1970) and Danmark & Muma (1973) in having fewer than 8 teeth on the fixed digit of the chelicera, macrosetae absent on legs I-III, and no erect seta on basitarsus I.

Genus Phytoseiulus Evans

Phytoseiulus Evans 1952 : 397.

Phytoseiulus persimilis Athias-Henriot

Phytoseiulus riegi Deleón 1958 : 49.

Specimens examined: Morocco: Beni-Melal, 5-V-82, 5 females, from ornamental next to house; El Jadida, 29-IV-82, 1 female, from Capsicum frutescens in greenhouse, 1 female, from strawberry, 1 female, from Malva; Sidi Bennour, 29-IV-82, 1 female, from fig tree, 5 females from herbaceous plants in orchard.

Previous records: Algeria (Athias-Henriot, 1957), France, Tunisia (Rambier, 1972), Libya (Hessein, 1976); Lebanon (Dosse, 1967); Greece (Swirski & Raguza, 1977); Italy (Lombardini, 1959; McMurtry, 1977; Raguza, 1977); Israel (Amitai & Swirski, 1978); Chile (Dosse, 1958; Gonzalez, 1961); Australia (Goodwin & Schica, 1979); USA — California (McMurtry et al., 1978); South Africa (Meyer, 1981); Peru (Elbenhawy, 1979); Spain (Ferragut et al., 1983).

Remarks: Collection records suggest that P. persimilis is native to the Mediterranean region, possibly to North Africa. Its occurrence in other parts of the world probably is the result of introductions. P. persimilis is generally found only in coastal, subtropical environments. The collection from Beni-Melal, Morocco, a hot, dry area, was from plants next to a house in a shaded situation. Another unusual record is from an oasis in Tunisia, which also is probably a humid microenvironment (Rambier, 1972). In Morocco, P. persimilis was found naturally occurring in plastic greenhouses, apparently surviving pesticide treatments on cucumbers and sweet peppers.

Genus Euseius

Amblyseius (Amblyseius), section Euseius Wainstein 1962 : 15.
Amblyseius (Euseius), Deleón 1965b : 125.

Euseius scutalis (Athias-Henriot) New Combination

Amblyseius delhiensis Narayanan & Kaur, 1960 : 5.

Specimens examined: Morocco: More than 100 females from 29-IV-82 to 11-V-82 from the following plants and locations: Citrus from Beni Melal, Marrakech, Agadir; fig, apple, Datura stramonium, near Zagora; apricot, Zagora. Israel: Ein Gedi, 11-III-63, 1 female, from Calotropis sp.; Bet Dagan, 25-VIII-64, 2 females, from Persea americana; 2 females, from Ricinus communis. Jordan: Jordan Valley, 9-IV-84, 7 females, from Lantana.

Previous records: Based on synonomies given above and by Wysoki & Bolland (1983), E.
*Euseius scutalis* has a distribution extending from Spain, through North Africa and the Middle East, to India (see Bouffour & McMurtry, 1987, for additional references).

Remarks: *E. scutalis* was the main phytoseiid mite collected on citrus in the interior valleys (e.g. Marrakech, Beni Melal) and the relatively dry southern coast (Agadir). It was not collected in the more humid coastal areas, such as Kenitra and Rabat, where *E. stipulatus* was the dominant species. Its distribution extends to desert areas such as Zagora in Morocco, where it was collected on fruit trees, and the Dead Sea region of Israel, where it occurs on numerous species of plants (Swirski & Amitai, 1985).

*Euseius stipulatus* (Athias-Henriot)


**Species examined**: Morocco: Rabat, VI-82, 12 females, from *Persea americana*; 14 females, from *Citrus* spp.; 3 females, from *Datura* sp.; Kenitra, 24-IV-82, 14 females, from *Citrus*; Azemmour, 30-IV-82, 9 females, from *Citrus*; El Jadida, 28-IV-82, 11 females, from *Ricinus communis*; 1 female, from *Malva*.

**Previous records**: Algeria (Athias-Henriot, 1960b), Spain, Italy, Greece, Turkey (Ragusa & Swirski, 1976; Swirski & Ragusa, 1976; McMurtry, 1977; Ragusa, 1977); USA — California (Introduced) (McMurtry, 1977).

**Genus Iphiseius** Berlese


*Iphiseius degenerans* (Berlese)

**Seius degenerans** Berlese, 1889 : 9.

*Iphiseius degenerans*, Berlese, 1921 : 95; Evans, 1954 : 518.

**Specimens examined**: Morocco: Rabat, 8-V-82, 3 females, from *Citrus*.

**Previous records**: Numerous records from Africa, Middle East and southern Europe (Moraes et al., 1986).

Acknowledgments

Our thanks to the Institut National de la Recherche Agronomique, Rabat, Morocco, especially to M. Hmimina and A. S. Bennani for providing advice, facilities and transportation during the 1982 collecting trips, and to Mary McMurtry for assistance in collecting. We are grateful to E. Swirski, Volcani Center, Rohovot, Israel, for consultation and to L. A. Kolodchik, Academy of Sciences, Kiev, USSR, and H. A. Denmark, Florida Department of Agriculture and Consumer Services, Gainesville, for loan of specimens.

Literature Cited


Swirski (E.) & Amitai (S.), 1961. - Some phytoseiid mites (Acarina : Phytoseiidae) of Israel, with a descrip-


Paru en Mars 1989.