

A NEW LARVA OF THE GENUS *LEPTUS* LATREILLE, 1796 (ACARI: ERYTHRAEIDAE) PARASITIC ON A SPIDER FROM RWANDA**A. Fain¹ and R. Jocqué²**

1. Institut royal des Sciences naturelles de Belgique, rue Vautier 29, B-1040 Bruxelles, Belgium. 2. Musée royal de l'Afrique centrale, B-3080 Tervuren, Belgium. Fax- 32-2-646-4433.

SUMMARY -The larva of *Leptus rwandae* n. sp. (Acari: Erythraeidae) is described from a spider, *Systemoplacis* sp. (Zodariidae), from Rwanda. A list of the mite species recorded from spiders throughout the world is provided. (*Key words*: Taxonomy. Larva. *Leptus*. Acari -Erythraeidae. Acari parasitic. Araneae.)

RÉSUMÉ - La larve de *Leptus rwandae* n. sp. (Acari: Erythraeidae), est décrite; elle avait été récoltée sur une Araignée, *Systemoplacis* sp. (Zodariidae), du Rwanda. Une liste de toutes les espèces d'acariens signalées jusqu'ici sur les Araignées dans le monde, est donnée. (*Mots clé*: Taxonomie. Larve. *Leptus*. Acari -Erythraeidae. Parasite. Araneae.)

INTRODUCTION

Until now, five species of larval *Leptus* (Acari: Erythraeidae) have been described from spiders, two of which are from Japan and three from the U.S.A., South Africa and England, respectively. A list of these species has been provided by Welbourn and Young (1988).

We describe here the larva of a new species of *Leptus* collected by R. J. on a spider, *Systemoplacis* sp. (Zodariidae), from Rwanda. The holotype is deposited in the Museum de l'Afrique Centrale, Tervuren. A list of all the mite species reported from spiders is given.

The measurements used here are in micrometers (μm). Standard data follows Southcott (1961, 1988 and 1992) except for the measurements of the solenidia (see Table I).

Remarks on some characters in the genus *Leptus*

1. **The term ASBM** - Fain and Elsen (1987) introduced a new measurement (ASBM) to the metric data proposed by Southcott (1961). The ASBM was defined as follows: "La distance entre la base des sensillas antérieures et le bord antérieur du scutum sur la ligne médiane" (= distance between the centers of anterior sensilla and the anterior border of the scutum on the median line). This measurement provided a good estimation of the cur-

vature of the anterior border of the scutum. Southcott (1988 and subsequent papers) adopted this new character but he misinterpreted the original definition given by Fain *et al.* He defined ASBM as the "distance between anterior end of dorsal scutum to centre of anterior edge of scutum" (Southcott, 1992). These definitions are not identical and the new definition leads to confusion. It is, however, possible to calculate the distance ASBM *sensu* Fain and Elsen (1987) by the following operation: ASBM = ASBa - ASBM *sensu* Southcott.

2. **Famulus of tibia I** - Fain (1992) suggested that in the trombidiids the short seta situated on tibia I close to the apical solenidion is a famulus (ϵ) and not a simple seta κ . We think now that this famulus is also present in the Erythraeidae, particularly in the genus *Leptus*. This short seta is homologous with the famulus of tibia I described by Grandjean (1938) in the Tydeidae, Ereyneidae and Eupodidae. According to this author: "Le petit poil du tibia I est remarquable par sa constance. J'ai fait observer qu'il existe toujours dès la larve. Corrélativement il ne manque jamais chez les Tydeidae, et même, d'après les espèces que j'ai vues, chez les Ereyneidae et les Eupodidae. On se tromperait donc fortement si l'on assimilait ce poil à un poil ordinaire dont la taille s'amointrit et qui serait sur le point de disparaître. Il vaut mieux le comparer à un famulus" (Grandjean, 1938: p. 599, Figs. 1-2).

Fain (1985) showed that this small seta is present in all the species and in all the stages (larva, nymph and adults) of Ereyenetidae. In this family, this famulus is always closely associated with the apico-dorsal solenidion of tibia I and forms part of the "ereynetal organ" (Fain and Camerik, 1994).

3. **Solenidia of legs in the genus *Leptus*** - Tibia I bears 2 solenidia (rarely more): φIa (apical) and φIb (slightly more basal); the most apical is flanked by a famulus ϵ . Tibia II also bears two solenidia an apical (φIIa) and a basal (φIIb). Tibia III has one basal solenidion (φIII) as does genu I (σ).

***Leptus rwandae* nov. spec.**

Larva, holotype (Figs. 1-9) - Standard data given in Table I. Length of idiosoma 295, width 195. In the paratype 270 x 160. *Dorsum* - scutum distinctly wider than long, ratio length: width = 0.8 in holotype and 0.74 in paratype. There are 50 thickly barbed setae behind the scutum. *Venter* - with 2 pairs of setae between coxae II and III set on a transverse line. Opisthogaster with 20 barbed setae. *Gnathosoma* - genu and femur of palps with

1 barbed seta each. Tarsus with 2 solenidia (1 basal and 1 apical) and 5 pectinate and 1 smooth thin setae. Legs (number of normal setae): Trochanters 1-1-1; Femora 7-7-6; Genua 8-8-8; Tibia 13-13-15. Tarsi I and II each with 2 eupathidia. Tarsus III with 1 eupathidia.

Status of *Leptus rwandae* - This new species resemble superficially *L. galerucae* Feider, 1967. It is, however, distinct from this species in the following characters: Scutum much smaller, AL, PL and leg segments much shorter (see metric data of *L. galerucae* in Southcott, 1992).

L. rwandae is closer to *L. cavernicola* Fain and Elsen, 1987, described from a cave in Rwanda. It is distinguished from this species by several characters (see Table I): scutum distinctly wider than long (ratio L x W = 0.8, instead of 1.04 in *L. cavernicola*); setae 'Oc' much shorter, AW and PW longer, PL shorter, some leg segments (TiIII and FeIII) distinctly shorter, StI, StII and $\varphi IIIa$ about twice shorter, ωI and ωII strongly unequal (equal in *L. cavernicola*); the four setae located between coxae II and III placed along a single transverse row (these setae form two transverse rows in *L. cavernicola*).

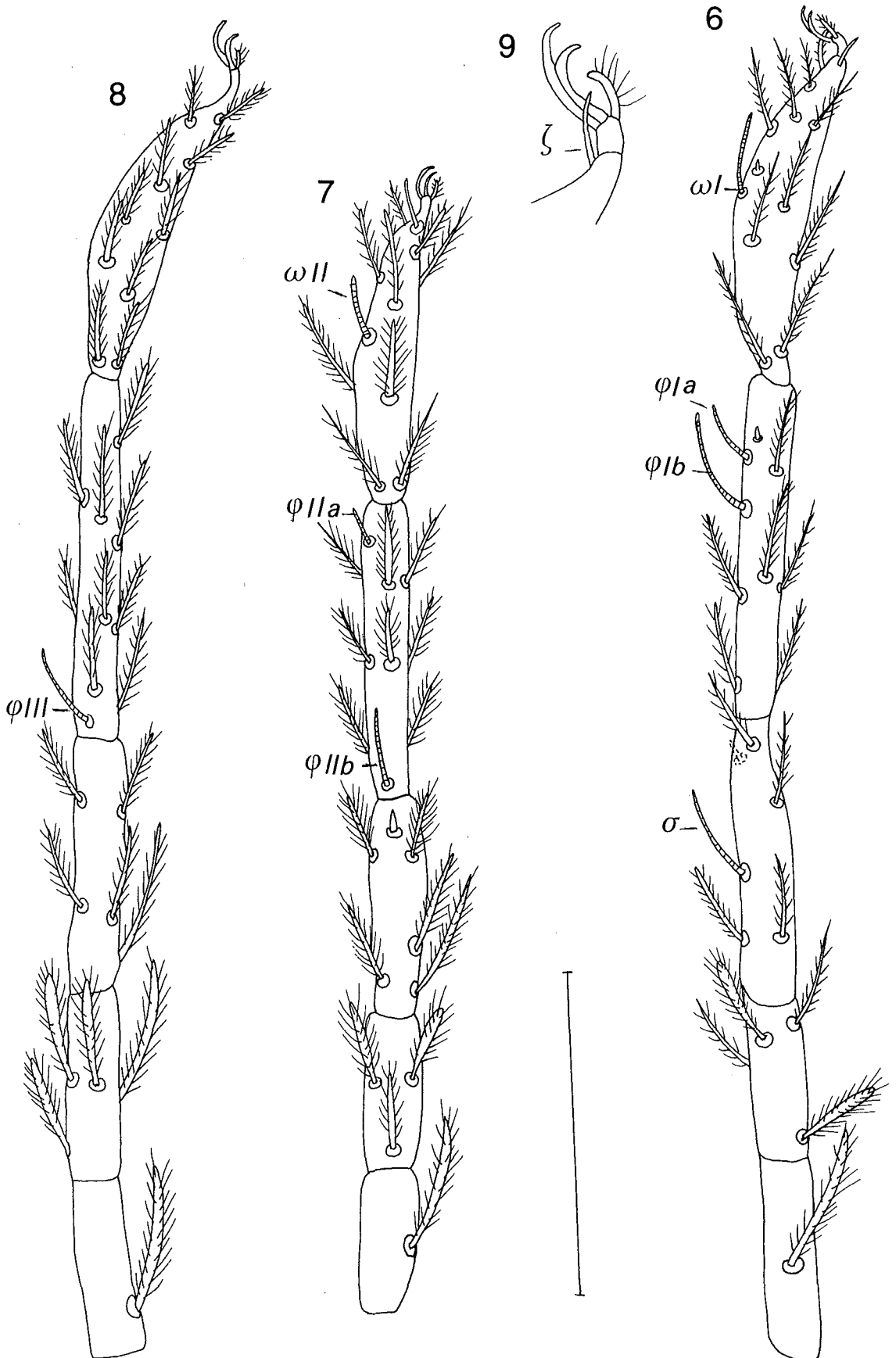
A third species, *L. atticolus* Lawrence (1940), described from a spider, *Saitis* sp. (Salticidae), from Natal,

Table I. Metric data of the larvae of *Leptus atticolus* Lawrence, *L. cavernicola* Fain and *L. rwandae* n. sp. Remark - The symbol ASBM is that proposed by Fain & Elsen (1987).

	<i>L. atticolus</i>	<i>L. cavernicola</i>	<i>L. rwandae</i> n. sp.			<i>L. atticolus</i>	<i>L. cavernicola</i>	<i>L. rwandae</i> n. sp.	
	Holotype	Holotype	Holotype	Paratype		Holotype	Holotype	Holotype	Paratype
<i>Characters</i>					<i>Characters</i>				
AW	78	57	69	78	TaII	110	80	85	86
PW	96	75	84	90	TiIII	132	105	85	87
SBa	12	9	12	12	GeII	94	76	71	69
SBp	15	12	13	12	FeII	144	122	91	90
ASBa	30	23	10	10	TaIII	-	87	91	92
ASBM	21	22	11	12	TiIII	180	141	119	117
ISD	63	48	49	53	GeIII	96	80	75	75
L	101	84	72	74	FeIII	175	139	118	122
W	102	81	90	93	StI	30	50	26	26
AAS	32	24	29	30	StII	28	45	26	27
A-P	20	12	16	15	CxI	60	68	53	52
AL	52	45	42	40	CxII	26	22	18	17
PL	40 (inc.)	60	50	48	CxIII	40	46	29	28
ASE	-	-	-	-	<i>Solenidia</i>				
PSE	-	58	48	40	ωI	27	30	25	26
DS	36-48	36-57	30-39	26-38	ωII	18	30	18	18
'Oc'	40	54	33	33	φIa	23	28	20	18
TaI	120	90	100-105	102	φIb	31	44	36	36
TiI	153	108	105	108	φIIa	12	18	8-9	9
GeI	110	80	87	85	φIIb	22	26	25	26
FeI	160	120	118	120	φIII	24	25	29	27
					σI	24	30	30	29



Figs. 1-5. *Leptus rwandae* n. sp. (Larva) - 1. dorsal view, 2. ventral view, 3. palptibia and palptarsus, 4. anterior surface of a dorsal seta of idiosoma, 5. posterior surface of same seta as in Fig. 4 (setae erected). Scale line 100 μ m (Figs. 1-2).



Figs. 6-9. *Leptus rwandae* n. sp. (Larva) - 6. leg I (dorso-lateral view), 7. leg II (dorsal view), 8. leg III (dorso-lateral view), 9. apical region of leg I, enlarged. Scale line 100 μ m (Figs. 6 to 8).

Table II. List of the species phoretic or parasitic on spiders (partly from Welbourn & Young, 1988).

Mite species	Host		Country	Reference
	Species	Family or order		
PROSTIGMATA				
Erythraeidae				
<i>Charletonia aranea</i>	?	Araneae	India	Southcott, 1966
<i>C. philometra</i> Southcott	?	Philodromidae (immat.)	U.S.A.	Southcott, 1991
<i>C. miyazakii</i> (Kawashima)	<i>Theridion</i> sp.	Theridiidae	Japan	Kawashima, 1958
<i>Charletonia</i> sp.	?	Araneae	U.S.A. (IL)	Welbourn & Young, 1988
	<i>Philoponella oweni</i> (Chamberlin)	Uloboridae	U.S.A. (AZ)	Welbourn & Young, 1988
<i>Lasioerythraeus johnstoni</i> Welbourn & Young	?	Linyphiidae	U.S.A. (MS)	Welbourn & Young, 1987
<i>Lasioerythraeus</i> sp.	?	Agelenidae, Cybaeinae (immat.)	Chile	Welbourn & Young, 1988
	?	Anyphaenidae (immat.)	Chile	Welbourn & Young, 1988
<i>Leptus atticolus</i> Lawrence	<i>Saitis</i> sp.	Salticidae	South Africa	Lawrence, 1940
<i>L. gifuensis</i> Kawashima	<i>Lycosa</i> sp.	Lycosidae	Japan	Kawashima, 1958
<i>L. hidakai</i> Kawashima	<i>Chiracanthium</i> sp.	Clubionidae	Japan	Kawashima, 1958
<i>L. ignotus</i> (Oudemans)	<i>Pachygnatha clercki</i> Sundeval	Araneidae	England	Parker, 1962
<i>L. rwandae</i> Fain & Jocqué, 1996	<i>Systemoplacis</i> sp.	Zodariidae	Rwanda	present paper
<i>Leptus</i> sp.	<i>Pardosa</i> sp.	Lycosidae	U.S.A. (CT)	Sorkin, 1982
	<i>Philodromus imbecillus</i> Keyserling	Philodromidae	U.S.A. (TX)	Cokendolpher <i>et al.</i> , 1979
Undetermined genus	<i>Diaea</i> sp.	Thomisidae	New Zealand	Forster & Forster, 1973
Trombidiidae				
<i>Allothrombium fuliginosum</i> (Hermann)	<i>Lycosa amentata</i> (Clerck)	Lycosidae	England	Parker, 1965
<i>Clinotrombium antares</i> Southcott	?	Linyphiidae	S. Australia	Southcott, 1986
	?	?	W. Australia	Fain, 1991a
<i>C. bellator</i> Southcott	?	Salticidae (imm.)	Australia	Southcott, 1986
<i>C. metae</i> (Boshell & Kerr.) (n. comb.)	<i>Pirata</i> sp.	Lycosidae	Panama	Michener, 1946
<i>Dinothrombium southcotti</i> Fain	Unidentified spider	?	Australia	Fain, 1991a
<i>Trombidium poriceps</i> (Oudemans)	<i>Zygiella x-notata</i> (Clerck)	Araneidae	Switzerland	André, 1931
	<i>Nuctenea umbratica</i> (Clerck)	Araneidae	Switzerland	André, 1931
	<i>Araneus diadematus</i> Clerck	Araneidae	Switzerland	André, 1931
	<i>Dolomedes fimbriatus</i> Clerck	Pisauridae	Netherlands	Oudemans, 1912
	<i>Linyphia</i> sp.	Linyphiidae	Netherlands	Oudemans, 1897
<i>Trombidium</i> sp.	<i>Agelenopsis</i> sp. (imm.)	Agelenidae	U.S.A. (ME)	Welbourn & Young, 1988
	<i>Tegenaria domestica</i> (Clerck)	Agelenidae	U.S.A. (ME)	Welbourn & Young, 1988
	?	Araneae	Canada	Welbourn, 1983
	<i>Clubiona moestra</i> Banks	Clubionidae	Canada	Welbourn, 1983

Table II. (Continued)

Undetermined genus	<i>Phrurolithus minimus</i> (Koch)	Clubionidae	Spain	Parker & Roberts, 1974
	<i>Pardosa hortensis</i> (Thoule)	Lycosidae	Spain	Parker & Roberts, 1974
	<i>Neostothis gigas</i> Vellard	Barychelidae	Brasil	Vellard, 1934
Microtrombidiidae				
Microtrombidiinae				
<i>Willungella leei</i> Southcott	?	Araneae	S. Australia	Southcott, 1994
Eutrombidiinae				
<i>Verdunella lockleii</i> (Welbourn & Young)	<i>Ceraticelus emertoni</i> (Cambridge)	Linyphiidae	U.S.A. (MS)	Welbourn & Young, 1988
	<i>Oxyopes salticus</i> Hentz	Oxyopidae	U.S.A. (MS)	Welbourn & Young, 1988
<i>Spinnitrombium kenyense</i> Fain & Jocqué	<i>Metaleptyphantes perexiguus</i> (Sim & Fage)	Linyphiidae	Kenya	Fain & Jocqué, 1996
MESOSTIGMATA				
Laelapidae				
? <i>Copriphis (Pelethipis) bristowi</i> Finnegan	<i>Liphistius malayanus</i> Abraham	Liphistiidae	Malaysia	Finnegan, 1933
<i>Junghia (Junghia) selenocosmia</i> Oudemans	<i>Selenocosmia javanensis</i> (Walck.)	Theraphosidae	Indonesia (Sumatra)	Oudemans, 1932
<i>L. (L.) minor</i> Fain	<i>Selenocosmia javanensis</i> (Walck.)	Theraphosidae	Indonesia (Java)	Fain, 1989
<i>L. (Metaljunghia) rainbowi</i> Domrow	?	Araneae	S. Australia	Domrow, 1975
<i>L. (M.) novaecaledoniae</i> Fain	<i>Barychelus</i> sp.	Barychelidae	New Caledonia	Fain, 1991b
<i>L. (M.) pulleinei</i> Womersley	<i>Selenocosmia starlingi</i> Hogg	Theraphosidae	S. Australia	Womersley, 1956; Fain, 1991b
	<i>Aname</i> sp.	Nemesiidae	S. Australia	Domrow, 1975
	<i>Encyocrypta</i> sp.	Barychelidae	New Caledonia	Fain, 1991b
<i>L. (M.) aname</i> Fain	<i>Aname diversicolor</i> Hogg	Nemesiidae	W. Australia	Fain, 1991a, c
	<i>Aname</i> sp.	Nemesiidae	S. Australia	Domrow, 1975
<i>L. (M.) hoggi</i> Domrow	<i>Aganippe subtristis</i> Pickard-Cambridge	Idiopidae	S. Australia	Domrow, 1975
	<i>Eucyrtops</i> sp.	Idiopidae	W. Australia	Fain, 1991a
<i>L. (M.) africana</i> Fain	Mygalomorph spider	?	Zaire	Fain, 1991c
ASTIGMATA				
Acaridae				
<i>Caloglyphus</i> sp. (deutonymph)	<i>Aname diversicolor</i> (Hogg)	Nemesiidae	W. Australia	Fain, 1991a

also resembles our species. Through the kindness of Dr. Michelle Hamer, Curator of Arthropod Studies, Museum of Natal, we examined the holotype of this species. This specimen is labelled "*Leptus atticolus* Law. Typus Nm 1239". In addition to the holotype we also received 3 paratypes from the same host and 4 larvae from *Rhamsinitis fissidens* (an Opilion) and assigned by Lawrence to the same species. All these specimens in liquid preservative are strongly macerated and very transparent. We can notice, however, that they resemble very closely the holotype of *L. atticolus* by the lengths of the legs, the number and length of the idiosomal setae and the metric data of the shield. In a paratype the AL is 48, the PL 50 to 60,

and the tarsus III 120 long.

The holotype of *L. atticolus* is strongly flattened but most of the characters are still recognizable. The sensillae and PL are lost or incomplete. There are 2 pairs of setae between coxae II and III, a medial pair more posterior than the lateral pair. Number of idiosomal setae difficult to count with certainty. There are about 25 to 30 dorsal pairs and 10 to 13 pairs of opisthogastric setae. Distance between $\varphi 1a$ and $\varphi 1b$ 27; ωI and ωII are inserted in the apical half of the tarsi. Table I gives the metric data. In *L. atticolus* the legs are significantly longer than in *L. cavernicola* and *L. rwandae*.

Finnegan (1933) described a new mite *Copriphhis (Pelethiphis) bristowi* (or ? *bristowei*) Finnegan from a spider, *Liphistius malayanus*, from Malaysia. Welbourn and Young (1988) assumed that these mites more likely belong to the genus *Ljunghia* Oudemans.

We have reexamined the types of this species. They are in very poor condition and it is not possible to ascertain that they belong to the genus *Ljunghia*. The type male has a very long sternigenital shield which is fused with the anal shield. In the males of the five species of *Ljunghia (selenocosmia, pulleinei, hoggi, minor and novecaledoniae)* that we have examined, the sternigenital shield is short and remains far from the anal shield. We think, therefore, that the species of Finnegan does not belong to the genus *Ljunghia*.

ACKNOWLEDGEMENTS

We thank Dr. Michelle Hamer, Curator of the Department of Arthropod Studies, Natal Museum, South Africa, for the loan of the type of *Leptus atticohus* Lawrence. We also are grateful to Dr. Ann Baker, Department of Acarology, Museum of Natural History, London, who sent us the types of *Copriphhis (Pelethiphis) bristowi* Finnegan for our study.

REFERENCES

- André, M. 1931. Nouvelles observations sur la larve du *Thrombidium holosericeum* Linné. Bull. Soc. ent. Fr. 1931: 259-261.
- Banks, N. 1896. New North American spiders and mites; Trans. Americ. entomol. Soc. 23: 57-77.
- Cokendolpher, J.C., N.V. Horner and D.T. Jennings. 1979. Crab spiders of North-Central Texas (Araneae: Philodromidae & Thomisidae). J. Kansas Entomol. Soc. 54: 723-734.
- Domrow, R. 1975. *Ljunghia* Oudemans (Acari: Dermanyssidae) a genus parasitic on mygalomorph spiders. Rec. S. Aust. Mus. 17: 31-39.
- Fain, A. 1985. Nouvelles observations sur l'organe ereyretal et les solenidions chez les Ereyretidae (Acari, Prostigmata). Bull. Anns Soc. r. belg Ent. 121: 247-260.
- Fain, A. 1989. Notes on the genus *Ljunghia* Oudemans, 1932 (Acari, Mesostigmata) associated with mygalomorph spiders from the Oriental and Australian regions. Bull. Inst. r. Sci. nat. Belg., Entomol. 59: 157-160.
- Fain, A. 1991a. Notes on mites parasitic or phoretic on Australian centipedes, spiders and scorpions. Rec. West. Aust. Mus. 15: 69-82.
- Fain, A. 1991b. A new species of *Ljunghia* Oudemans, 1932 (Acari: Laelapidae) from a New Caledonian spider. Bull. Inst. r. Sci. nat. Belg., Entomol. 61: 199-205.
- Fain, A. 1991c. Notes on some new parasitic mites (Acari: Mesostigmata) from Afrotropical region. Bull. Inst. r. Sci. nat. Belg., Entomol. 61: 183-191.
- Fain, A. and A.M. Camerik. 1994. Notes on mites of the genus *Ereyretes* Berlese (Acari, Ereyretidae) with description of five new species from South Africa. Bull. Inst. r. Sci. nat. Belg., Ent., 64: 145-164.
- Fain, A. and P. Elsen. 1987. Observations sur les larves du genre *Leptus* Latreille, 1795 (Acari, Erythraeidae) d'Afrique Centrale. Rev. Zool. afr., 101: 103-123.
- Fain, A. and R. Jocqué. 1996. A new genus and species of larval Eutrombidiinae Thor, 1935 (Acari: Microtrombidiidae) from an Afrotropical Spider. Internat. J. Acarol. 22(1): 11-16.
- Finnegan, S. 1933. A new species of mite parasitic on the spider *Liphistius malayanus* Abraham, from Malaya. Proc. Zool. Soc. London 1933: 413-417.
- Forster, R.R. and L.M. Forster. 1973. New Zealand Spiders, an Introduction. Collins, Auckland, 254 pp.
- Grandjean, F. 1938. Observations sur les Tydeidae (1^{ère} Série). Bull. Museum, 2^e Sér., Tome x, n° 4: 377-384.
- Kawashima, K. 1958. Studies on larval erythraeid mites parasitic on arthropods from Japan (Acarina: Erythraeidae). Kyushu J. Med. Sci. 9: 190-211.
- Lawrence, R.F. 1940. New larval forms of South African mites from arthropod hosts. Ann. Natal Mus., 9: 401-408.
- Oudemans, A.C. 1897. List of Dutch Acari Latr. Fifth Part: *Trombidides* Leach. Tijdschr. v. Entomol. 40: 117-135.
- Oudemans, A.C. 1912. Die bis jetzt bekannten Larven von Thrombidiidae und Erythraeidae. Zool. Jb. Abt. 1 Suppl. XIV n°1, 230 pp.
- Oudemans, A.C. 1932. Opus 550. Tijdschr. v. Entomol. Suppl. LXXV: 202-210.
- Parker, J.R. 1962. Ectoparasitic mites on spiders. Entomol. Mon. Mag. 98: 264.
- Parker, J.R. 1965. More records of mites as ectoparasites on spiders. British Spider Study Group Bull. 25: 6.
- Parker, J.R. and M.J. Roberts. 1982. Internal and external parasites of the spider *Pardosa hortensis* (Thorell) (Araneae: Lycosidae). Bull. Brit. Arachnol. Soc. 3: 82-84.
- Sorkin, L.N. 1982. Parasites of *Pardosa* Wolf spiders (Acarina, Erythraeidae; Insecta, Hymenoptera; Araneae, Lycosidae). American Arachnol. 26: 6.
- Southcott, R.V. 1961. Studies on the systematics and biology of the Erythraeoidea (Acarina), with a critical revision of the genera and subfamilies. Austral. J. Zool., 9: 367-610.
- Southcott, R.V. 1966. Revision of the genus *Charletonia* Oudemans (Acarina: Erythraeidae). Austral. J. Zool. Suppl. 14: 687-819.

- Southcott, R.V. 1986. Studies on the taxonomy and biology of the subfamily Trombidiinae (Acarina: Trombidiidae) with a critical revision of the genera. *Austral. J. Zool. Suppl.* 123: 1-116.
- Southcott, R.V. 1988. Two new larval ectoparasitic mites (Acarina: Erythraeidae) from Sri Lankan tetrigid grasshoppers. *Ent. Scand. Suppl.*, 30: 151-159.
- Southcott, R.V. 1991. A further revision of *Charletonia* (Acarina: Erythraeidae) based on larvae, protonymphs and deutonymphs. *Invertebr. Taxon.* 5: 61-131.
- Southcott, R.V. 1992. Revision of the larvae of *Leptus* Latreille (Acarina: Erythraeidae) of Europe and North America, with descriptions of post-larval instars. *Zool. J. Linn. Soc.*, 105: 1-153.
- Southcott, R.V. 1994. Revision of the larvae of the Microtrombidiinae (Acarina: Microtrombidiidae) with notes on life histories. *Zoologica. Original Abhandlungen aus dem Gesamtgebiet der Zoologie.* W. Funke und F. Schaller (Eds). E. Schweizerbart'sche Verlagsbuchhandlung (Nägele u. Obermiller). Stuttgart 144:1-155.
- Vellard, J. 1934. Notes sur quelques parasites de Mygales sud-américaines. *Bull. Soc. Zool. France* 59: 293-295.
- Welbourn, W.C. 1983. Potential use of trombidioid and erythraeid mites as biological control agents of insect pests. pp. 103-140. *In: Biological Control of Pests by Mites* (M.A. Hoy, G.L. Cunningham and L. Knutson eds), Univ. California (Berkeley) Agri. Exp. Stn. Spec. Publ. 3304: 1-185.
- Welbourn, W.C. and O.P. Young. 1988. Mites parasitic on spiders, with a description of a new species of *Eutrombidium* (Acari, Eutrombidiidae). *J. Arachnol.* 16: 375-385.
- Young, O.P. and W.C. Welbourn. 1987. Biology of *Lasioerythraeus johnstoni* (Acarina: Erythraeidae), ectoparasitic and predaceous on the tarnished plant bug, *Lygus lineolaris* (Hemiptera: Miridae) and other arthropods. *Ann. Entomol. Soc. America*, 80: 243-250.
