Gruber, Jurgen, and Glenn S. Hunt, 1973. *Nelima doriae* (Canestrini), a south European harvestman in Australia and New Zealand (Arachnida, Opiliones, Phalangiidae). *Records of the Australian Museum* 28(16): 383–392. [13 July 1973].

doi:10.3853/j.0067-1975.28.1973.405

ISSN 0067-1975

Published by the Australian Museum, Sydney

Nelima Doriae (Canestrini), a South European Harvestman in Australia and New Zealand (Arachnida, Opiliones, Phalangiidae)

By JÜRGEN GRUBER, Naturhistorisches Museum Wien, Austria, and GLENN S. HUNT,

School of Zoology, University of New South Wales, Sydney

Figures 1–4. Manuscript received, 6th March, 1972

SYNOPSIS

Nelima doriae (Canestrini) (Phalangiidae, Leiobuninae), a southern European harvestman, has been introduced to Australia and New Zealand. Previously it had been described as a new endemic Australian species, *Nelima dunni* Forster. Later it was wrongly made the type of a new monotypic genus, *Nodala* Forster (subfamily Megalopsalinae).

General comparisons are made between introduced and European populations. The introduced populations seem to resemble the Italian-Jugoslavian forms most closely. Significant differences in leg and scute length in Australian forms are noted.

Harvestmen species transported by human agency from one country to another are tabulated along with notes on their adopted habitats. European species in the subfamily Phalangiinae (Phalangiidae) are most often involved, with transport either occurring within the north-temperate zone or across the tropics with invasion of the south-temperate zone.

INTRODUCTION

Many animals have been transported by man from one country to another, often accidentally and without his knowledge. Some have been regarded as endemic and redescribed as "new species".

An example is the phalangiid harvestman, *Nelima doriae* (Canestrini), a south European species introduced to Australia and New Zealand but described as a new species, *Nodala dunni*, by Forster (1947; 1949).

An examination by the authors of Forster's types plus additional material from both hemispheres has shown these two nominal species to represent different populations of the same species.

Family **PHALANGIIDAE**

Subfamily **LEIOBUNINAE**

Genus **Nelima** Roewer, 1910

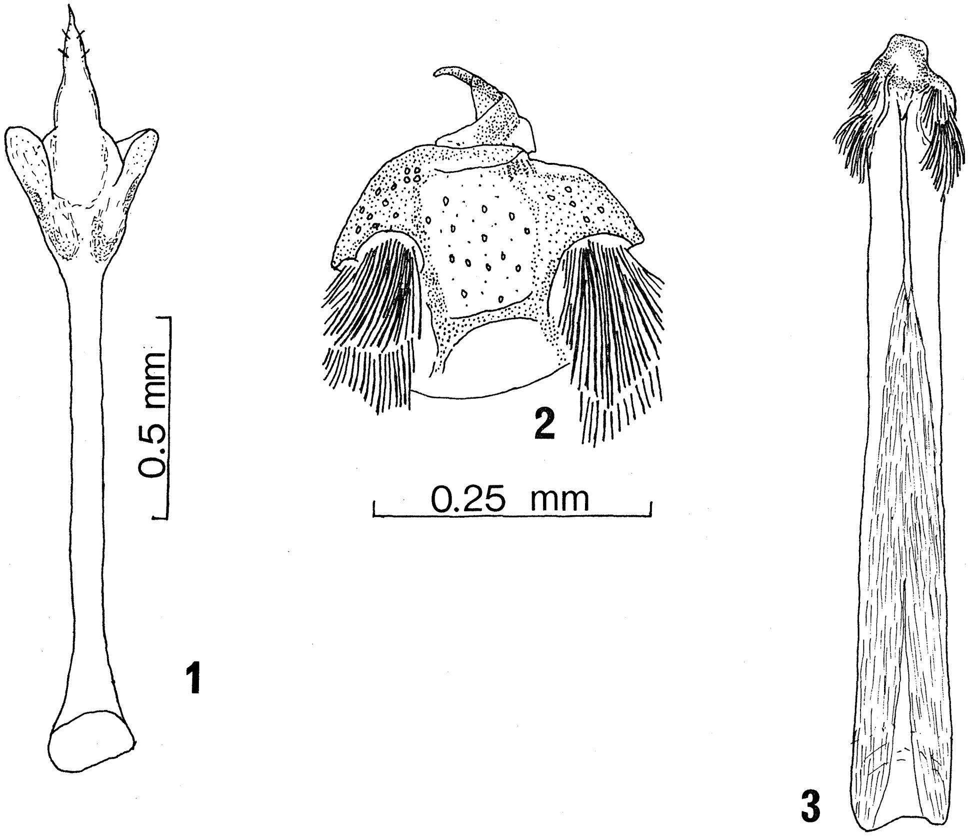
Nelima Roewer, 1910: 238.—Roewer, 1923: 910.—Martens, 1969: 395.

Nodala Forster, 1949: 70; new synonym.

Forster (1947) described *Nelima dunni*, the first Australian representative of the predominantly holarctic subfamily Leiobuninae. All specimens examined were collected in the Melbourne suburban area, Victoria. In 1949, he removed this species from the Leiobuninae and made it the type of a monotypic genus, *Nodala*, within his newly described subfamily Megalopsalinae. No clear reason was given for this transfer, and it would appear that Forster had to stretch his subfamily concept to accommodate *Nodala* alongside the quite distinctive *Megalopsalis* Roewer and *Spinicrus* Forster. Several characters clearly distinguish *Nodala:* sexual dimorphism in dorsal segmentation is strong, with males having a distinct abdominal scute; the chelicerae lack pronounced sexual dimorphism, being short in both sexes; the dentition of the cheliceral cutting edges is relatively even; and the maxillary lobes of leg 2 have a different orientation (cf. fig. 5 in Forster (1947) with figs 2, 6, and 15 in Forster (1949)). The most fundamental differences, however, are in spiracle and genital morphology. The *Nodala* abdominal spiracle is equipped with the typical phalangiid entapophysis which is lacking in *Spinicrus* and *Megalopsalis*. The penis in *Nodala* has a leiobunine form (fig. 1). In *Spinicrus* and *Megalopsalis*, however, the penis lacks subterminal accessory hairs on the glans, usually possesses two large ventrolateral pairs of bristle groups at the base of the glans (fig. 3), and has undergone torsion. This torsion, characteristic of both New Zealand and Australian Megalopsalinae, produces varying degrees of asymmetry in the distal parts of the organ, including asymmetry in size of the bristle groups, and twists the glans distally into the form of a right-handed spiral (fig. 2).

There can be no doubt that *Nodala dunni* does not belong in the Megalopsalinae. Forster was originally correct in placing *dunni* in the leiobunine genus *Nelima* and thus *Nodala* must be sunk in synonymy.

Australian and New Zealand representatives of *Nelima dunni* were compared by the authors with other species in the genus *Nelima*. *N. dunni* proves to be a junior synonym for the south European-Mediterranean species, *N. doriae* (Canestrini).



Text Figure 1. Male genitalia. Fig. 1, penis of Sydney specimen of *N. doriae*, ventral view; fig. 2, penis of *Spinicrus stewarti* Forster, ventro-apical view; fig. 3, ventral, showing internal musculature of penis shaft. Figs. 1 and 3 at same scale.

A detailed redescription of *N. doriae* is not attempted here; this should be based on larger samples from populations in both hemispheres than are available to the present study. Instead, general comparison is made between the European, Australian and New Zealand forms. In the Synonymy reference is restricted to the more important papers.

Nelima doriae (Canestrini)

Lejobunum Doriae Canestrini, 1871: 384.

Leiobunum Doriae.—Canestrini, 1872: 16.

Nelima doriae.—Roewer, 1910: 244; 1923: 913.—Brown & Sankey, 1950: 867.—Martens, 1966: 360; 1969: 398.

Nelima doriai.—Marcellino, 1970: 294.

Nelima dunni Forster, 1947: 174; new synonym.

Nodala dunni.—Forster, 1949: 70; new synonym.

External characters.—Most specimens from introduced populations show striking similarity in colour pattern to the Italian forms: male specimens show faint paired brown patches on tergal areas 1 and 2 (cf. Martens, 1969, Fig. 6). Denticulation of the body, eyemound, legs and pedipalps in general matches descriptions of *N. doriae* specimens. There is, however, wide variation in both European and introduced populations. This is particularly so for the pedipalp, notably in proximoventral denticulation of the tarsus (variation both between and within individuals). The Sydney specimens appear to have less denticulation on pedipalps than others and analysis of larger samples could show meaningful trends.

Genital morphology.—Penis (fig. 1) closely resembles that of the Jugoslavian form (cf. Martens, 1969, figs. 17, 18)*. It differs strongly from that in the Spanish and Moroccan forms (cf. Martens, figs. 19–22) where the penis shaft is more expanded basally and the basal opening almost triangular.

Metrics.—Measurements vary considerably between populations. For example, leg 1 femur length of males is plotted against scute length (midpoint anterior margin of dorsum to midpoint posterior margin of tergal area 5) on a log-log scale (fig. 4). Summary statistics for these measurements and the ratio between them are given in table 1. The sample from each locality is compared with both the Sydney and Edwardstown samples using a *t*-test of difference between the two means. In comparisons involving the Kangaroo Valley and Chioggia samples (single specimens only) the traditional *t*-test was used but with the single specimen not contributing to degrees of freedom or variance. This test was also used for femur 1 length and ratio means in comparing the Sydney and Edwardstown samples (variances not significantly different). In other comparisons, inequality of variance was assumed and the "approximate *t*-test" used.

Significant differences are indicated in Table 1. Larger samples could reveal further significant differences. The fact that three of the six specimens from Crete fall outside the 95% equal frequency ellipse for the Sydney form (in which 95% of individuals in the Sydney population would be expected to lie) is very suggestive in this regard (Fig. 4).

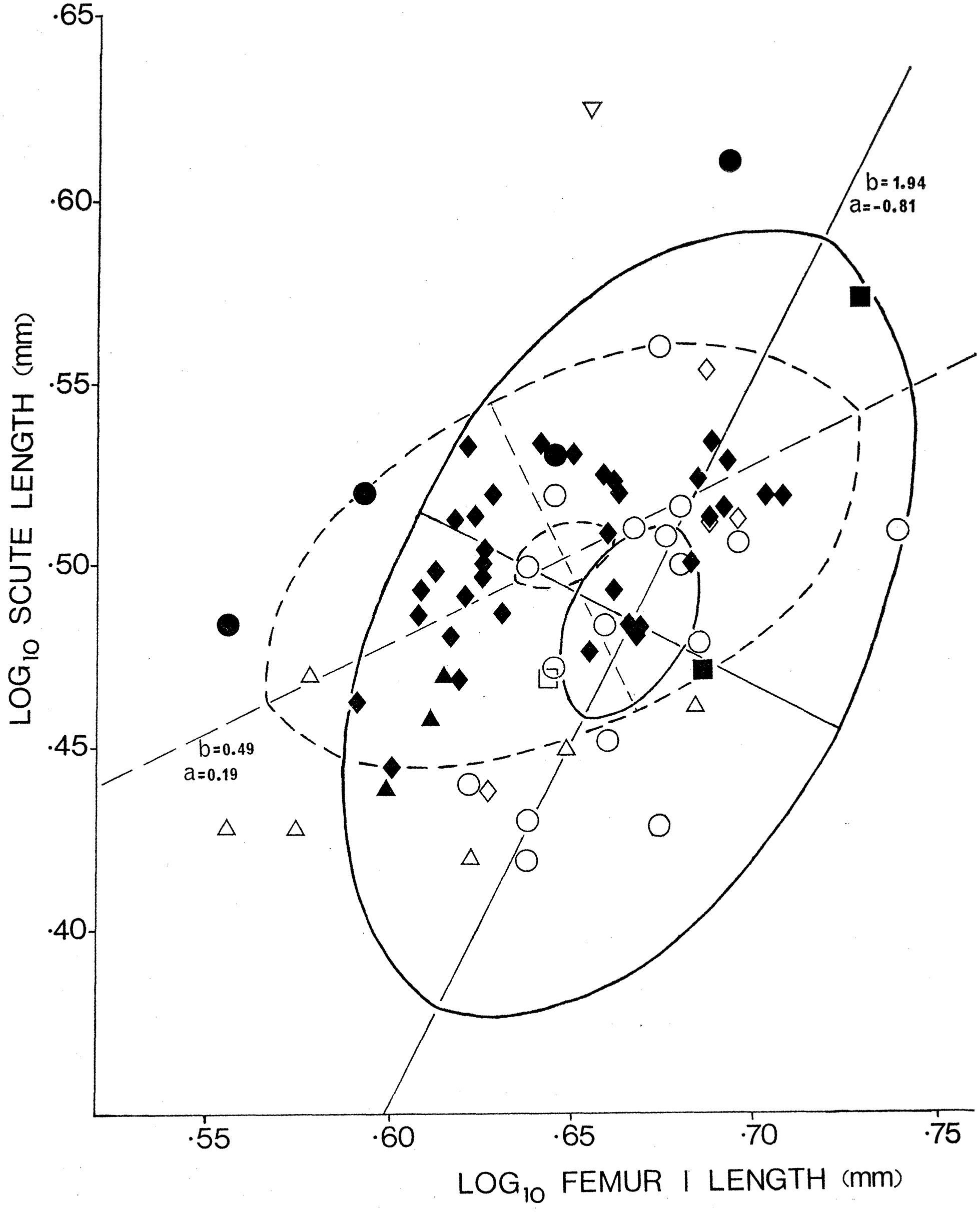
Scute length variance in the Sydney sample is significantly different ($p < 0.001$) from the Edwardstown sample, partly explaining the difference in slope of the correlation ellipse principal axes (fig. 4).

Remarks.—As our European material of *N. doriae* is limited and Martens (1969) allows considerable variation in his description of the species, general identity only can be shown between the Australian-New Zealand populations and those of the southern European-Mediterranean region. The Australian populations, however, appear to resemble the Italian-Jugoslavian ones closely and differ most strongly from the Spanish-Moroccan forms.

A detailed study of variation between the various isolated populations in this species could be of considerable interest.

---

* Figs 15, 17, 19 and 21 in Martens (1969) are of ventral surface, not dorsal as indicated in the caption.



Text-figure 2. Fig. 4. Log-log scattergram of scute length and femur length for samples from several populations of *N. doriae*. The inner and outer ellipses are respectively the 95% confidence region for the bivariate mean and the 95% equal frequency ellipse for the Edwardstown (ellipses with broken boundaries) and Sydney population samples. Slopes and *y*-intercepts of the principal axes are shown. Open circles, triangles, inverted triangle, square and diamonds represent Sydney, Crete, Kangaroo Valley, Italy and Underdale specimens; solid circles, triangles, squares and diamonds represent Melbourne, Leongatha, Dargaville and Edwardstown.

Material examined

Europe

Italy: 1♂, 1♀, Chioggia, 5–7.ix.1960, Kritscher, (Naturhistorisches Museum Wien—N.M.W.).

Greece.—Crete: 6♂, 10♀, 6 juv., Aghia Pelagia, 25.iv.1965, Paget, Kritscher & Bilek (N.M.W.).

Australia

New South Wales, Sydney: 2♂, 1♀, North Sydney, 22.i.1968, G. S. Hunt (N.M.W.); 4♂, 7♀, 8 juv., same data, author's (G.S.H.) personal collection; 2♂, 2 juv., 9.vii.1970, G. S. Hunt (G.S.H.); 4♀, 5 juv., Neutral Bay, 29.i.1968, G. S. Hunt (G.S.H.); 1♀, 2 juv., 30.i.1968, G. S. Hunt (G.S.H.); 1♀, Ryde, 12.xi.1969, H. Brammel (G.S.H.); 30♂, 4♀, 3 juv., Ermington, 11.iii.1955, P. Goodwin (Australian Museum, Sydney—A.M.); 1♀, Cammeray, summer, 1970, J. E. Mumford (G.S.H.); 1♀, Kensington, University of N.S.W., 20.ii.1971, G. S. Hunt (G.S.H.); 6♂, 10♀, 10 juv., Brighton-Le-Sands, March, 1959 Mrs. E. McLure, (A.M.); 1♀, Bexley, 16.xi.1947 (H. Hughes), (A.M.)

Kangaroo Valley (via Nowra): 1♂, half way up climb out of Valley, Fitzroy Falls Road, summer, 1971, R. Mascord (Mascord Coll., A.M.).

Victoria, Melbourne: Holotype male and allotype female of *Nelima dunni* Forster, Carnegie, 10.viii.1946, R. A. Dunn (A.M. Cat. No. K67728); paratype male of *N. dunni*, same data (National Museum of Victoria, Melbourne—N.M.); paratype male and female of *N. dunni*, same data (Dominion Museum, N.Z., Reg. Entry 2/62); Moreland, 24.v.1951, C. Wentworth (N.M.); 3♂, 8♀, 3 juv., Learmont, 13.xii.1966, A. Neboiss (N.M.); 2♂, 1♀, Hawthorn South, 22.iv.1952, J. Roff (N.M).

Leongatha: 3♂, 1 juv., 13.ix.1966, Mrs Lyndon (N.M.).

South Australia, Adelaide: 1♂, 1♀, 1 juv., 16.vi.1963; 2♀, 12.iv.1964; 2♂, 1 juv., 19.iv.1964; 2♂, 1♀, 29–30.viii.1964; 3♀, 5 juv., xii, 1964; 3♂, 3♀, 19 juv., 22.i.1965; Underdale, G. F. Gross (South Australian Museum, Adelaide—S.A.M.).

Edwardstown (near Adelaide): 35♂, 27♀, 38 juv., 4.iv.1972, D. C. Lee (S.A.M.).

Mt Gambier: 1♂, 30. vii. 1971, N. Poulter (S.A.M.).

New Zealand.—Dargaville: 2♂, 6.i.1967, R. R. Forster (Otago Museum).

Auckland: 1♀, Papatoetoe, 2.ix.1966, K. A. J. Wise (Auckland Museum).

NOTES ON BIOLOGY

Australian forms of *N. doriae* are restricted to culturally disturbed habitats. The endemic *Spinicrus* and *Megalopsalis*, however, are rarely found in these habitats, and then mostly in moist sheltered situations adjacent to natural bush.

N. doriae seems widespread in Sydney and Melbourne. A favoured habitat is behind grass growing against walls and fences, frequently in open situations exposed to the sun for much of the day. Individuals are often found in buildings, expecially damp garages and sheds, with bodies and legs pressed tightly against the walls. They are sometimes found in houses, especially early in the morning.

In Sydney, adults and juveniles can be collected throughout winter but, as in most phalangiids, there is an increase in numbers during spring and early summer and a decrease in autumn and winter. More than one generation per year probably occur and this may in part explain the success of this species in unstable urban environments (cf. *Phalangium opilio*, Clingenpeel and Edgar (1966)).

DISTRIBUTION OF *NELIMA DORIAE*

A distribution map for the primary (European) range is given by Martens (1969) but does not include recent records in Sicily (Marcellino, 1970). Although knowledge of this distribution is incomplete, most populations occur in Italy and Jugoslavia with outliers in Caucasia (*N. pisarskii* of Staręga, 1966), Spain and Morocco. The species is believed to have been introduced to Crete (Martens, 1969).

Occurrences in Australia and New Zealand are secondary. The time and method of introduction are not known. Judging from Dunn's (1946) remarks, the species was well established in Melbourne by that year. The earliest record for Sydney is 1947. Introduction to New Zealand appears to have been more recent, and probably via Australia. The species is now well established in the Auckland district (R. R. Forster, pers. comm.).

The species does not appear to have been introduced to Brisbane (B. Cantrell, pers. comm.), Perth and Hobart.

KNOWN INTRODUCTIONS OF HARVESTMEN

There are numerous reports inferring the introduction of harvestmen from one country to another by human agency. Some of these may be suspect due to misidentification or false locality records. As usual, marked separation from the normal distribution of the species together with ecological data, especially an association with man or culturally disturbed habitats, may be taken as evidence for secondary range extensions. Most cases concern species of the north-temperate zone, transport either occurring within the zone or across the tropics with subsequent invasion of the south-temperate zone.

The majority involved are long-legged epigean species belonging to the family Phalangiidae (suborder Palpatores), especially the subfamily Phalangiinae (table 2). There are only two known introductions of short-legged cryptozoic species (listed at bottom of table 2), including the only representative from the suborder Laniatores.

Apart from *N. doriae*, two species of harvestmen are known to have been introduced to the Australian-New Zealand region: *Opilio parietinus* in Tasmania (Hickman, 1957) and *Phalangium opilio* in New Zealand (Forster, 1962; Forster and Forster, 1970). Both are found in disturbed habitats and have not been collected in natural bush.

ACKNOWLEDGMENTS

We wish to thank the Directors of several museums for loan of material, especially Dr R. R. Forster, Otago Museum, for drawing our attention to the existence of *N. doriae* in New Zealand. We are grateful to Mr D. C. Lee, Curator of Arachnids and Crustacea, South Australian Museum, who made a special collection of South Australian material.

We also wish to thank Dr A. M. Richards, School of Zoology, University of New South Wales, for criticising the manuscript, and Mr M. R. B. Gray, Assistant Curator (Arachnology) at the Australian Museum, for assistance during research at the Museum.

REFERENCES

Balazuc, J., 1962. Troglobie des cavités artificielles. *Spelunca, Mém.* 2: 104–107.

Brown, D. G. and Sankey, J. H. P., 1950. The harvest-spider *Nelima silvatica* (Simon) in Great Britain. *Proc. zool. Soc. Lond.* 119 (4): 867–871.

Canestrini, G., 1871. Nuove specie di Opilionidi italiani. *Boll. Soc. ent. Ital.* 3: 381–385.

——— 1872. Gli Opilionidi italiani. *Annali Mus. civ. Stor. nat. Giacomo Doria* 2: 5–48.

Clingenpeel, L. W. and Edgar, A. L., 1966. Certain ecological aspects of *Phalangium opilio* (Arthropoda: Opiliones). *Pap. Mich. Acad. Sci.* 51: 119–126.

Dunn, R. A., 1946. Notes on Australian harvestmen. *Vict. Nat.*, 68 (7): 165–166.

Forster, R. R., 1947. A new harvestman of the subfamily Liobuninae from Australia. *Mem. natn. Mus. Vict.* (15): 174–177.

——— 1949. Australian Opiliones. *Mem. natn. Mus. Vict.* (16): 59–89.

——— 1962. A key to the New Zealand harvestmen—Part 1. *Tuatara* 10 (3): 129–137.

Forster, R. R. & Forster, L. M., 1970. *Small Land Animals of New Zealand.* John McIndoe, Dunedin. Pp. 175.

Gruber, J., 1964. Kritische und ergänzende Beobachtungen zur Opilioniden-fauna Österreichs (Arachniden). *Z. ArbGem. Öst. Ent.* 16 (1/3): 1–5.

Hackman, W., 1956. Phalangida (Opiliones) from Newfoundland. *Commentat. biol.* 15 (17): 1–9.

Hickman, V. V., 1957. Some Tasmanian harvestmen of the sub-order Palpatores. *Pap. Proc. R. Soc. Tasm.* 91: 65–79.

Kauri, H., 1963. Harvestmen (Opiliones) from the Azores (Report No. 27 from the Lund University Expedition to Madeira and the Azores in 1957). *Bolm Mus. munic. Funchal,* (15): 10–18.

Lawrence, R. F., 1959. Arachnides Opilions. *Faune Madagascar* 9: 1–121.

Marcellino, I., 1970. Su alcuni Opilioni (Arachnida) della Sicilia sud-orientale e centrale. *Boll. Sed. Accad. gioenia Sci. nat.* (IV), 10 (4): 283–308.

Martens, J., 1966. Zoologische Aufsammlungen auf Kreta. III. Opiliones. *Annln naturh. Mus. Wien* 69: 347–362.

——— 1969. Mittel- und südeuropäische Arten der Gattung *Nelima* (Arachnida: Opiliones: Leiobunidae). *Senckenberg. biol.* 50 (5/6): 395–415.

Muchmore, W. B., 1963. Two European arachnids new to the United States. *Ent. News,* 74 (8): 208–210.

Roewer, C. Fr., 1910. Revision der Opiliones Plagiostethi (=Opiliones Palpatores). 1. Teil: Familie der Phalangiidae (Subfamilien: Gagrellini, Liobunini, Leptobunini). *Abh. Geb. Naturw., Hamburg,* 19 (4): 1–294.

——— 1923. *Die Weberknechte der Erde.* G. Fischer, Jena. Pp. 1116.

Sankey, J. H. P. & Storey, M. W., 1969. *Dicranopalpus caudatus* Dresco (Arachnida, Opiliones), first records in Britain and France. *Entomologists' mon. Mag.*, 105: 106–107.

Spoek, G. L., 1963. The Opilionida (Arachnida) of the Netherlands. *Zool. Verh., Leiden* 63: 3–70.

Staręga, W., 1966. Beitrag zur Kenntnis der Weberknecht-Fauna (Opiliones) der Kaukasus-Länder. *Annls zool., Warsz.* 23 (13): 387–411.

——— 1967. Einige Weberknecht-Arten (Opiliones) aus Israel. *Israel J. Zool.* 15, 1966: 57–63.

Table 1

Summary Statistics for Scute and Femur 1

Measurements for Males of *N. doriae*

		Sydney (N.S.W.)	Kangaroo Valley (N.S.W.)	Leongatha (Vic.)	Melbourne (Vic.)	Edwardstown (S.A.)	Underdale (S.A.)	Dargaville (N.Z.)	Aghia Pelagia (Crete)	Chioggia (Italy)
Sample size	*n*	17	1	3	4	35	4	2	6	1
Scute length (mm)	Significance $\bar{x}$ s^2 Range	3.066 0.074 2.63–3.64	*** +++ 4.22	2.857 0.010 2.75–2.95	3.455 0.189 3.05–4.07	3.183 0.026 2.78–3.41	3.213 0.120 2.75–3.59	3.340 0.304 2.95–3.73	+ 2.777 0.017 2.63–2.95	2.95 . . . .
Femur 1 length (mm)	do	4.650 0.096 4.20–5.52	4.53	* 4.067 0.006 3.98–4.13	4.228 0.348 3.60–4.95	4.468 0.111 3.92–5.13	4.753 0.114 4.25–4.98	5.140 0.135 4.88–5.40	4.090 0.200 3.60–4.73	4.40 . . . .
Ratio of scute to Femur 1 length	do	+++ 0.661 0.003 0.57–0.77	*** +++ 0.932	0.700 0.0001 0.69–0.71	* + 0.820 0.001 0.77–0.85	*** 0.715 0.002 0.64–0.81	0.675 0.002 0.65–0.74	0.645 0.004 0.60–0.69	0.683 0.005 0.61–0.78	0.670 . . . .

Significance of difference between mean and mean of Sydney sample or mean of Edwardstown sample:
* or +, $0.05 > p > 0.01$; *** or +++, $0.001 > p$

Correlation coefficients between scute and femur 1 length in Sydney and Edwardstown samples are respectively, 0.453 and 0.492.

Table 2

Known Introductions of Harvestmen (World Survey)

Species	Place(s) of Introduction	Adopted Habitat	Possible Place of Origin (and Nature of Habitat)	References
Suborder Palpatores Fam. Phalangiidae Subfam. Phalangiinae				
Opilio parietinus (DeGeer)	Wide holarctic distribution possibly due to transport by man. Tasmania.	Common on walls, fences and hedges.	Western Asia—Anatolia, Caucasia (under rocks and on tree trunks, rocks and shrubs).	Spoek (1963) Staręga (1966). Hickman (1957).
O. saxatilis C.L.K.	Israel.	Disturbed habitats.	Europe (field layer near ground, common in grass of coastal dunes).	Spoek (1963). Staręga (1967).
O. ruzizkai Šilhavý	Vienna district, Austria.	Lower vegetation and tree trunks in parks and woods.	South-east Europe.	Gruber (1964).
Phalangium opilio L.	Wide holarctic distribution possibly due to transport by man. New Zealand.	Fields, other open grassy areas, gardens.	Europe? (grass-lands, open habitats).	Spoek (1963). Hackman (1956). Clingenpeel and Edgar (1966). Forster (1962). Forster and Forster (1970).
Dicranopalpus caudatus Dresco	Hove and Bournemouth, southern England.	Privet and other bushes.	Iberian peninsula (generally low vegetation).	Sankey and Storey (1969).
Subfam. Leiobuninae *Nelima doriae* (Canestrini)	See text.			
Subfam. Sclerosomatinae *Homalenotus coriaceus* Simon	São Miguel (Azores)	Variety of habitats, disturbed and undisturbed.	Southern France, Iberian peninsula, Morocco (variety of exposed and even very dry habitats).	Kauri (1963).
Subfam. Gagrellinae *Strandia ceylonensis* (Karsch)	Mauritius and Reunion.	Littoral vegetation only.	Indian region.	Lawrence (1959).
Family Trogulidae *Trogulus tricarinatus* (L.)	Near Rochester, New York State.	Under logs in deciduous woodland.	Europe (leaf litter, under stones, etc., especially on calcareous soils).	Muchmore (1963).
Suborder Laniatores Family Phalangodidae *Scotolemon terricola* Simon	Catacombes de Chaillot (Paris).	Artificial caves.	Corsica.	Balazuc (1962).