

## THE SPIDER MITE FAMILY TETRANYCHIDAE (ACARI) IN NEW SOUTH WALES

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**ABSTRACT**—Examination of 251 samples, collected mainly on cultivated plants and weeds in New South Wales, led to the identification of 25 species of Tetranychidae belonging to nine different genera. Five of these mites are reported for the first time from the Australian continent: *Aplonobia citri*, *Schizotetranychus celarius*, *Oligonychus grypus*, *O. tiwakae* and *Tetranychus lombardinii*. Five others, already known from Australia, are recorded for the first time from New South Wales: *Eotetranychus hudsoni*, *E. lomandrae*, *Oligonychus brevipodus*, *O. ununguis* and *Tetranychus neocaledonicus*. In addition, in the genus *Bryobia*, misidentifications are corrected for *Bryobia rubrioculus*, *B. praetiosa sensu stricto* and *B. cristata*.

### INTRODUCTION

The taxonomy of the Australian spider mites is still rather poorly known. Early publications of Rainbow (1906), Berlese (1910) and Froggatt (1921 and 1922) were followed by Womersley's work (1940) which was regarded as authoritative for many years. Later, his work was in turn superseded, and research was conducted in Tasmania by Miller (1966) and in Queensland by Davis (1962 to 1969). Until now, information from New South Wales was very scarce and fragmentary, despite the fact that spider mites may cause so much damage to crops in this State that frequent acaricide spraying and sophisticated biological control methods are necessary to control them.

By the identification of 251 samples, mostly from collections belonging to the Entomology Branch of the BCRI, we have now established the presence in New South Wales of 25 species of Tetranychidae belonging to nine different genera. Most of these tetranychid mites were collected between 1924 and 1980 on cultivated plants and weeds of economic importance in the State. As these hosts are generally plants that were introduced into Australia, it is likely that collecting on Australian native plants would yield a larger number of original species.

Abbreviated is: BCRI, Biological and Chemical Research Institute, Rydalmere.

### Family TETRANYCHIDAE Donnadieu

Tetranyctes Donnadieu, 1875: 9.

Tetranychidae Murray, 1877: 93; Tuttle and Baker, 1968: 1.

Members of the family Tetranychidae possess long recurved whip-like movable chelae set in the stylophore formed by the basal segments of the chelicerae; the fourth palpal segment bears a strong claw; the claws are provided with tenent hairs; the empodium may or may not have tenent hairs; tarsi I and II, and sometimes the tibiae, usually bear duplex setae.

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## Key to genera recorded from New South Wales

1. Empodium with tenent hairs. . . . . 2
- Empodium without tenent hairs. . . . . 5
2. True claws uncinat, propodosoma with prominent lobes over the rostrum. . . . . *Bryobia*
- True claws pad-like, propodosoma without prominent lobes over the rostrum. . . . . 3
3. Empodium pad-like, dorsal body setae set on tubercles. . . . . *Aplonobia*
- Empodium uncinat. . . . . 4
4. Dorsal body setae set on tubercles. . . . . *Tetranychina*
- Dorsal body setae not set on tubercles. . . . . *Petrobia*
5. Two pairs of para-anal setae. . . . . 6
- One pair of para-anal setae. . . . . 8
6. Empodium claw-like with three pairs of proximoventral hairs. . . . . *Panonychus*
- Empodium without proximoventral hairs. . . . . 7
7. Empodium split into two claw-like structures. . . . . *Schizotetranychus*
- Empodium split distally into three pairs of hairs. . . . . *Eotetranychus*
8. Empodium claw-like with proximoventral hairs. . . . . *Oligonychus*
- Empodium split distally, usually into three pairs of hairs. . . . . *Tetranychus*

## 1. GENUS BRYOBIA KOCH

*Bryobia* Koch, 1836: 8; Pritchard and Baker, 1955: 14; Manson, 1967: 76; Meyer-Smith, 1974: 13.

TYPE SPECIES—*Bryobia praetiosa* Koch.

Males of the genus *Bryobia* have four pairs of propodosomal setae, two pairs of which are situated on four propodosomal lobes. The true claws are uncinat and possess tenent hairs; the empodium is pad-like and has tenent hairs.

The taxonomy of this group is very confused: for instance, in Australia, Womersley (1940) identified every mite with four propodosomal lobes as *B. praetiosa*.

Although the dorsal setae of the larvae are of great significance in species separation, we here propose for the four taxa so far found in N.S.W., a key to the females based on the shape of the propodosomal lobes, the chaetotaxy of the legs and the characteristics of the duplex setae of tarsus IV.

*BRYOBIA* KOCH

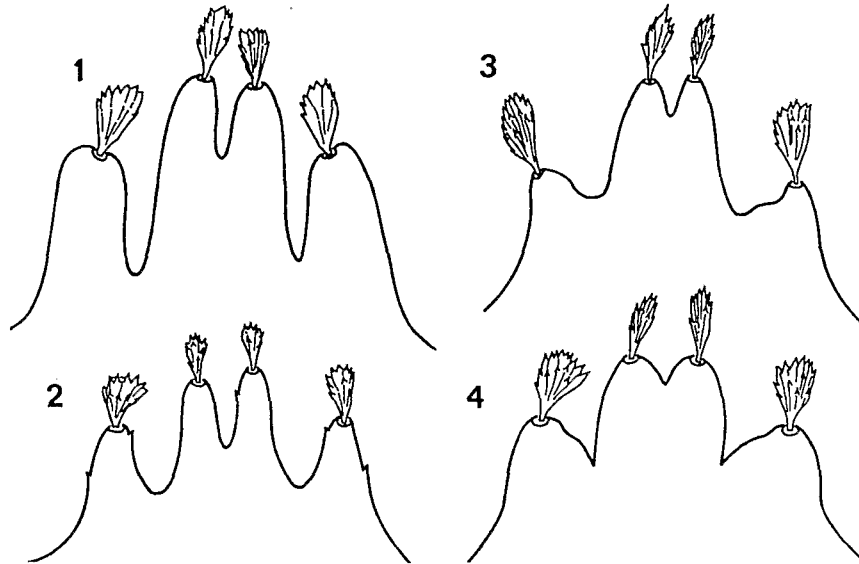
## Key to Species (Females)

1. Outer propodosomal lobes large and teat like, femur I with 24-26 setae. . . . . *repensi* Manson
- Outer propodosomal lobes not teat like, femur I with 16-21 setae. . . . . 2
2. Tarsus IV with setae of the duplex well separated, outer propodosomal lobes cone-shaped and having spine-like outgrowths. . . . . *rubrioculus* (Scheuten)
- Tarsus IV with setae of the duplex arising from a common base, outer propodosomal lobes more or less triangular. . . . . 3
3. Indentation between the outer and inner lobes relatively wide. . . . . *praetiosa* Koch
- Indentation between the outer and inner lobes forming an acute angle. . . . . *cristata* (Duges)

1. *Bryobia repensi* Manson  
(Fig. 1)

*Bryobia repensi* Manson, 1967: 91.

This species was described from New Zealand where it occurs on such low growing plants as grass, clover and strawberry. It was recorded in N.S.W. on pasture by Hamilton (1972) from slides identified by C.V.G. Morgan.



Figs. 1-4. Genus *Bryobia*, propodosomal lobes of females: (1) *B. repensi*; (2) *B. rubrioculus*; (3) *B. praetiosa*; (4) *B. cristata*.

We examined specimens collected on *Amaranthus* sp. in 1934 and identified as *Bryobia praetiosa* Koch by Womersley (1940). It is, in fact, *B. repensi*.

In the larvae, the dorsal body setae are typical in that the dorsocentral hysterosomals and the anterior member of the posterior dorsolaterals are smaller than the other dorsal setae.

The mite feeds mainly on the upper leaf surface and may cause severe bleaching of the blade. According to Hamilton (1972), the development of heavy infestations is favoured by extremely dry weather.

Males are unknown.

COLLECTIONS EXAMINED—*Amaranthus* sp., Sydney, 14.vi.1934; *Lolium perenne* L., ryegrass, Rydalmere, 28.vii.1967; Kangaroo Valley, 19.ix.1968 (N.L. Boomer); *Medicago sativa* L., lucerne, Curlwaa, 18.ix.1929; Mudgee, 23.iv.1941 (C.R. Wallace).

## 2. *Bryobia rubrioculus* (Scheuten) (Fig. 2)

*Sannio rubrioculus* Scheuten, 1857: 104.

*Bryobia rubrioculus* (Scheuten) Van Eynhoven, 1956: 45; Meyer-Smith, 1974: 23.

*Bryobia rubrioculus* is a pest of many deciduous fruit trees in temperate areas throughout the world. In Australia, it was recorded from Tasmania by Miller (1966); from Western Australia, South Australia and Victoria by Womersley (1940); and from Queensland by Bengston (1960) (under the name *Bryobia praetiosa* Koch). Often cited as *Bryobia* sp., it is, to our knowledge, the first record from N.S.W. under the name *Bryobia rubrioculus*. The dorsal body setae of larvae are large, broadly clavate and serrate.

*B. rubrioculus* may damage the leaves and flower buds, hindering the opening of the flowers. Later in summer the injury causes the foliage to become lighter in color.

Males are unknown and the reproduction is based on thelytokous parthenogenesis.

COLLECTIONS EXAMINED—*Amygdalus communis* L., almond, Griffith, 22.x.1957, *Amygdalus persica* L., peach, Leeton, 15.vii.1927; *Prunus domestica* L., plum, Bathurst, 8.iii.1967; Batlow, 26.i.1965; Leeton, 9.ii.1934; Orange, 6.xii.1954; *Pyrus japonica* Thunb., japonica, Leeton, 23.ii.1977; *Pyrus malus* L., apple, Bathurst, 28.i.1971; Leeton, 24.x.1929; Wellington, 10.xi.1939; *Ulmus* sp., elm, Mudgee, 9.i.1980 (J. Gutierrez).

3. *Bryobia praetiosa* Koch  
(Fig. 3)

*Bryobia praetiosa* Koch, 1836: 8; Pritchard and Baker, 1955: 14; Meyer-Smith, 1974: 20.

*Bryobia praetiosa* feeds generally on herbaceous plants in many temperate countries. It seldom occurs on trees. Known from Tasmania (Miller, 1966), it was recorded from Western Australia, South Australia and Victoria by Womersley (1940), but the identifications of the latter author are uncertain at the specific level.

The dorsal body setae of larvae are long, slender and serrate.

Large populations of this species may damage clovers, lucerne and ryegrass, causing the foliage to turn yellow and to wilt.

COLLECTIONS EXAMINED—*Brassica rapa* var. *silvestris* (Lam.) Briggs, wild turnip, Merah North, 11.vii.1967; Moree, 11.vii.1967; *Malva parviflora* L., marshmallow, Leeton, 31.viii.1949; *Medicago sativa* L., lucerne, Merah North, 11.vii.1967; *Trifolium* sp., clover, Rydalmere, 12.ix.1967.

4. *Bryobia cristata* (Duges)  
(Fig. 4)

*Tetranychus cristatus* Duges, 1834: 15.

*Bryobia cristata* (Duges) Van Eynhoven, 1956: 45; Meyer-Smith, 1974: 17.

*Bryobia cristata* occurs in Europe, North Africa, Japan and New Zealand on herbaceous plants. It is sometimes found on fruit trees. It is often collected in cracks in the walls of houses or in crevices of tree trunks, where all stages hibernate. The only reference to the existence of this mite in Australia is from Jeppson *et al.* (1975), but this record is incomplete.

The dorsal body setae of larvae are slender and needle like.

COLLECTIONS EXAMINED—Infesting garden stocks, Tumbi Umbi, 14.v.1947 (P.C. Hely); several other specimens were collected in September and in October: Ashfield, 14.x.1924; Croydon, 24.x.1940; Sydney, 19.x.1939, 11.ix.1946 and 23.x.1962; Willoughby, 30.x.1935.

2. GENUS *APLONOBIA* WOMERSLEY

*Aplonobia* Womersley, 1940: 252; Pritchard and Baker, 1955: 58.

TYPE SPECIES—*Aplonobia histricina* (Berlese).

The true claws and the empodia are pad-like. The true claws bear two tenent hairs and the empodia bear two rows of ventrally directed tenent hairs. On the dorsum, there are three pairs of propodosomal setae and ten pairs of hysterosomal setae, all set on strong tubercles and well separated.

The taxonomic position of the species of this genus appears very confused in Australia.

In 1910, from females collected on fruit trees in N.S.W. (Froggatt coll.), Berlese described a new species of Prostigmata under the name of *Tetranychopsis histricina*.

In 1940, Womersley described a mite living on *Oxalis cernua* Thunb., under the name of *Aplonobia oxalis*, in several localities of South Australia, Balaklava, and in N.S.W. at Bathurst.

In 1955, Pritchard and Baker, from Australian specimens (D.G. Swan coll.), made a new combination and redescribed *Aplonobia histricina* (Berlese). They regarded *A. oxalis* as a synonym of *A. histricina*.

We studied two slides of Womersley's original collection, one from Balaklava (24.vii.1933) and one from Bathurst (27.iv.1939). On the first was one female which agrees with Pritchard and Baker's description of *A. histricina* (Berlese), on the second were three females which are *A. citri* Meyer-Smith. Without a full revision of the genus *Aplonobia*, it is difficult to evaluate critically the redescription of Pritchard and Baker and the very clear descriptions of Meyer-Smith (1974). We consider that the two species present in Australia may be separated as follows:

- Females with dorsal body setae about as long as intervals between them and tapering distally; tarsus I with 33 setae..... *A. histricina*
- Females with dorsal body setae longer than intervals between them and broadened distally; tarsus I with 28 setae ..... *A. citri*

Applying these criteria to the specimens we saw, *A. histricina* (Berlese) Pritchard and Baker is present in South Australia, whereas *A. citri* Meyer-Smith is present in N.S.W.

#### 5. *Aplonobia citri* Meyer-Smith

*Aplonobia citri* Meyer-Smith, 1974: 103.

The chaetotaxy of the legs I-IV of the Australian specimens is the following: coxa 2-2-1-1; trochanter 1-1-1-1; femur 9-6-5-5; genu 6-5-6-6; tibia 15-9-9-9; tarsus 28-18-15-15.

*A. citri* has only been recorded from South Africa (Meyer-Smith 1974), where it was collected on the bark of citrus trees which were covered with eggs of this mite.

Males are unknown.

COLLECTIONS EXAMINED—*Amygdalus persica* L., peach, Bathurst, 27.iv.1939 (H. Womersley); *Citrus limon* (L.) Burm., lemon, Gosford, 14.ii.1947 (S.L. Alman).

### 3. GENUS *TETRANYCHINA* BANKS

*Tetranychina* Banks, 1917: 195; McGregor, 1950: 360; Meyer-Smith, 1974: 131.

TYPE SPECIES—*Tetranychina apicalis* Banks.

In the genus *Tetranychina*, the three pairs of propodosomal setae, the one pair of humeral setae and the nine pairs of hysterosomal, or only some opisthosomal setae, are set on tubercles. The peritremes are hooked distally and do not protrude.

#### 6. *Tetranychina harti* (Ewing)

*Neophyllobius harti* Ewing, 1909: 405.

*Tetranychina harti* (Ewing) Banks, 1917: 195.

*Tenuicrus errabundus* Womersley, 1940: 251.

In the females, the leg I is longer than the body and the fifth pair of dorsocentral setae are shorter than the other dorsal hysterosomal setae.

This species occurs throughout the world on *Oxalis* spp. and Womersley (1940) recorded it under the name *Tenuicrus errabundus* from a specimen collected on the ground at Concord West (N.S.W.), 27.iii.1935.

COLLECTIONS EXAMINED—*Oxalis* sp.: Rydalmere, 18.vi.1968 (F.A. Gibson); Sydney, 13.ii.1948 and 16.ii.1950 (S.L. Alman); Woolwich, 13.i.1980 (J. Gutierrez).

### 4. GENUS *PETROBIA* Murray

*Petrobia* Murray, 1877: 118; Womersley, 1940: 254.

TYPE SPECIES—*Petrobia latens* (Muller).

The three pairs of propodosomal setae, the one pair of humeral setae and the nine pairs of hysterosomal setae are not set on tubercles.

In the sub-genus *Petrobia sensu stricto*, the peritremes are anastomosing.

#### 7. *Petrobia (Petrobia) latens*

*Acarus latens* Muller, 1776: 187.

*Petrobia latens* (Muller) Oudemans, 1915: 44; Womersley, 1940: 254.

*P. latens*, also known in Australia as the brown wheat mite, belongs to the sub-genus *Petrobia s. str.* and may be recognized by having dorsal setae shorter than the distance between their bases.

Recorded by Womersley (1940) from N.S.W. (on wheat: Inverell, 10.x.1929), it is a dry weather pest. It may cause damage to grain and several vegetable crops.

The males are unknown and the females which reproduce parthenogenetically lay their eggs on the soil and under stones.

COLLECTIONS EXAMINED—*Avena sativa* L., oats, Ashford, 10.viii.1970 (M. Gavin); *Echinochloa crusgalli* (L.) Beauv., cockspur grass, Cowra, 12.x.1965; grass, Inverell, 23.ii.1959; Orange, 14.x.1957; on ground at Moree, 28.ix.1977 and in a paddock at East Guyong, 10.xi.1980 (B. Gordon).

#### 5. GENUS *PANONYCHUS* YOKOYAMA

*Panonychus* Yokoyama, 1929: 531; Ehara, 1956: 499.

*Metatetranychus* Oudemans, 1931a: 199.

TYPE SPECIES—*Panonychus mori* Yokoyama, 1929 (= *Tetranychus citri* McGregor, 1916).

In the genus *Panonychus* the empodium is claw-like with three pairs of proximoventral setae and the dorsal setae are set on strong tubercles.

Two species occur in N.S.W.:

- The females have fifth pair of dorsocentrals and fourth pair of dorsolaterals equal in length; pest of citrus. . . . . *P. citri*
- The females have fifth pair of dorsocentrals about one third the length of fourth pair of dorsocentrals; pest of deciduous trees. . . . . *P. ulmi*

#### 8. *Panonychus citri* (McGregor)

*Tetranychus citri* McGregor, 1916: 284.

*Metatetranychus citri* (McGregor), Reck, 1941: 831.

*Panonychus citri* (McGregor), Ehara, 1956: 500.

*Panonychus citri* is a worldwide pest of citrus.

In Australia it was recorded from Queensland, but Davis (1968c) demonstrated that the specimens collected from this State are in fact *Panonychus elongatus* Manson. In N.S.W., *P. citri* was recently identified by Gibson (1968).

The distal part of the aedeagus is sigmoid and tapering; it is about one and a half times as long as the dorsal margin of the shaft.

The live females are dark red to purplish in color.

COLLECTIONS EXAMINED—All the specimens examined from N.S.W. were collected on *Citrus* trees: Ourimbah, 14.ix.1976 (L. Brown) and Oct. 1976 (L. Brown) and Oct. 1976 (G.D. Bennet); Oxford Falls, 4.x.1966 (G. Snowball) and 8.v.1968 (F.A. Gibson); Somersby, 3.iv.1968 (J.G. Gellatley), 18.viii.1971 (J.G. Gellatley) and June 1976 (E. Schicha).

#### 9. *Panonychus ulmi* (Koch)

*Tetranychus ulmi* Koch, 1836: 11.

*Metatetranychus ulmi* (Koch) Oudemans, 1931a: 198.

*Panonychus ulmi* (Koch) Wainstein, 1960: 202.

A pest of deciduous fruit orchards in most temperate countries, *P. ulmi* was recorded on apples from Tasmania by Womersley (1940) and Miller (1966), from Queensland by Bengston (1960) and from N.S.W. by Schicha (1975). It developed a strong resistance to pesticides.

The distal part of the aedeagus is sigmoid but not as tapering as in *P. citri*.

The live females are brick red with whitish tubercles at the bases of the dorsal body setae. The adults may feed on both leaf surfaces.

COLLECTIONS EXAMINED—*Prunus domestica* L., plum, Orange, 6.xii.1954; *Pyrus malus* L., apple, Armidale, 23.iv.1971 (E. Schicha); Bathurst, 28.i.1971 (E. Schicha); Batlow 25.xi.1970 (E. Schicha); Cardeaux River, 25.i.1980 (E. Gladman).

#### 6. GENUS *SCHIZOTETRANYCHUS* TRAGARDH

*Schizotetranychus* Tragardh, 1915: 277.

TYPE SPECIES—*Schizotetranychus schizopus* Tragardh.

Mites of the genus *Schizotetranychus* have the proximal pair of empodial hairs strongly developed to form a bifid claw. The other two pairs of empodial hairs are minute or (apparently) absent. The duplex setae on tarsus I are set distally and close together.

Three *Schizotetranychus* were recorded from Queensland by Davis (1969a and b). In N.S.W. we found a fourth species.

#### 10. *Schizotetranychus celarius* (Banks)

*Stigmaeopsis celarius* Banks, 1917: 196.

*Schizotetranychus celarius* (Banks) McGregor, 1950: 308.

This is the first record of this mite in Australia. It is known from the U.S.A. (Pritchard and Baker 1955) and from Japan and Hong Kong (Ehara and Lee 1971). It feeds primarily on bamboo, but has also been collected on rice and sugar cane. It forms restricted colonies on the under surface of the leaves causing marked white spots.

COLLECTION EXAMINED—*Phyllostachys nigra* Monroe, Rydalmere, 29.x.1979 (M. Elshafie).

#### 7. GENUS *EOTETRANYCHUS* OUDEMANS

*Eotetranychus* Oudemans, 1931b: 224.

TYPE SPECIES—*Trombidium tiliarum* Hermann.

In *Eotetranychus*, two pairs of para-anal setae are present and the empodium consists of three pairs of hairs. The duplex setae on tarsus I are set distally and close together.

This is the first record of this genus for N.S.W. and two species were collected:

- Aedeagus with dorsally directed part about as long as the dorsal margin of the shaft, with tip slightly sigmoid and evenly tapering. . . . . *E. hudsoni*
- Aedeagus with dorsally directed part about one and a half as long as the dorsal margin of the shaft, with tip very finely tapered and needle-like. . . . . *E. lomandrae*

11. *Eotetranychus hudsoni* Miller

*Eotetranychus hudsoni* Miller, 1966: 62.

Described from Tasmania, this species was also recorded from Queensland by Davis (1968e). It occurs only on one host plant: *Lomandra longifolia* Labill.

COLLECTION EXAMINED—*Lomandra longifolia*, Woolwich, 23.i.1980 (J. Gutierrez).

12. *Eotetranychus lomandrae* Davis

*Eotetranychus lomandrae* Davis, 1968c: 69.

*E. lomandrae* was only recorded from Queensland on *Lomandra laxa* (R. Br.) and on *Lomandra longifolia* Labill. (Davis 1968b and 1968e).

COLLECTION EXAMINED—*Lomandra longifolia*, Berry, 7.i.1980 (J. Gutierrez).

8. GENUS *OLIGONYCHUS* BERLESE

*Oligonychus* Berlese, 1886: 24; Pritchard and Baker, 1955: 270; Tuttle and Baker, 1968: 116.

TYPE SPECIES—*Heteronychus brevipodus* Targioni Tozzetti.

Mites of the genus *Oligonychus* have one pair of para-anal setae and the empodium has a strong claw which is as long as, or longer, than the proximoventral hairs.

Of the seven species of this genus collected in N.S.W., four belong to the sub-genus *Reckiella* Tuttle and Baker, and three to the sub-genus *Oligonychus* Berlese *sensu stricto*.

In *Oligonychus s. str.*, the hysterosomal striae are transverse, the dorsal setae are longer than the distance between their bases, the aedeagus is downturned. *Reckiella* species are morphologically very similar and live generally on Gramineae: the hysterosomal striae are transverse, except between the fourth pair of dorsocentral setae; the aedeagus is upturned; and the empodium I of males consists of one claw and one pair of proximoventral spurs.

Key to species of *Oligonychus* (males)

1. Aedeagus bent ventrad, empodium I composed of one claw and of proximoventral setae. . . . . 2 (*Oligonychus s. str.*)
- Aedeagus bent dorsad, empodium I composed of one claw and one pair of proximoventral spurs (generally on grasses). . . . . 4 (*Reckiella*)
2. Distal part of the aedeagus bent at obtuse angle to the shaft (on oaks). . . . . *brevipodus*
- Distal part of the aedeagus bent at right angles to the shaft. . . . . 3
3. Distal end of the aedeagus tapering gradually to a slender tip (on conifers). . . . . *ununguis*
- Distal end of the aedeagus narrowing abruptly to a slender tip (on other plants). . . . . *coffae*
4. Distal end of the aedeagus enlarged. . . . . *tiwakae*
- Distal end of the aedeagus tapering. . . . . 5
5. Dorsal directed part of the aedeagus long and strongly sigmoid. . . . . *grypus*
- Dorsal directed part of the aedeagus shorter and with an axis at a slightly acute angle to the main shaft. . . . . 6
6. Distal end of the aedeagus narrowing abruptly to a slender tip. . . . . *digitatus*
- Distal end of the aedeagus tapering gradually to an acute tip. . . . . *araneum*



13. *Oligonychus (Oligonychus) brevipodus* (Targioni Tozzetti)  
(Fig. 5)

*Heteronychus ?brevipodus* Targioni Tozzetti, 1878: 255.  
*Oligonychus brevipodus?* (Targioni Tozzetti) Miller, 1966: 63.  
*Oligonychus quercinus* Hirst, 1920: 59.

Targioni Tozzetti described *O. brevipodus* from one nymph collected on holly oak, so that the specific identity of this mite is in doubt (Pritchard and Baker 1955; Miller 1966). *O. brevipodus* is collected only on oak leaves.

The specimens we have examined from N.S.W. correspond with the description of those collected by Miller (1966) in Tasmania, themselves similar to *Oligonychus quercinus* Berlese from England, studied by Hirst (1920). They are also identical with the material we have seen from New Zealand (Auckland, 30.i.1977) and from The Netherlands (Amsterdam, viii.1969).

In Australia, *O. brevipodus* was probably introduced from Europe with its host plant.

The aedeagus is bent dorsad at an obtuse angle to the shaft and narrows to a slender tip. The peritremes are straight and end in a simple bulb. Tibia I is provided with seven tactile setae.

The adults are small and the live females are greenish yellow with dark nutrition spots on each side of the hysterosoma.

COLLECTIONS EXAMINED—*Quercus* sp., Glenfield, 6.v.1979 (N. Roxborough).

14. *Oligonychus (Oligonychus) ununguis* (Jacobi)  
(Fig. 6)

*Tetranychus ununguis* Jacobi, 1905: 239.  
*Paratetranychus ununguis* (Jacobi), Womersley, 1940: 258.  
*Oligonychus ununguis* (Jacobi), Hirst, 1920: 59.

Found on conifers in Europe, Japan and the United States, *O. ununguis* has been recorded in Australia by Womersley (1940) on *Pinus* sp.

The aedeagus is bent at right angles to the shaft and tapers gradually to a slender tip. There are seven setae on tibia I.

The live females are dark red and the males lighter in color. Heavy infestations of this mite are dangerous to seedlings and young trees: the needles dry and turn brown.

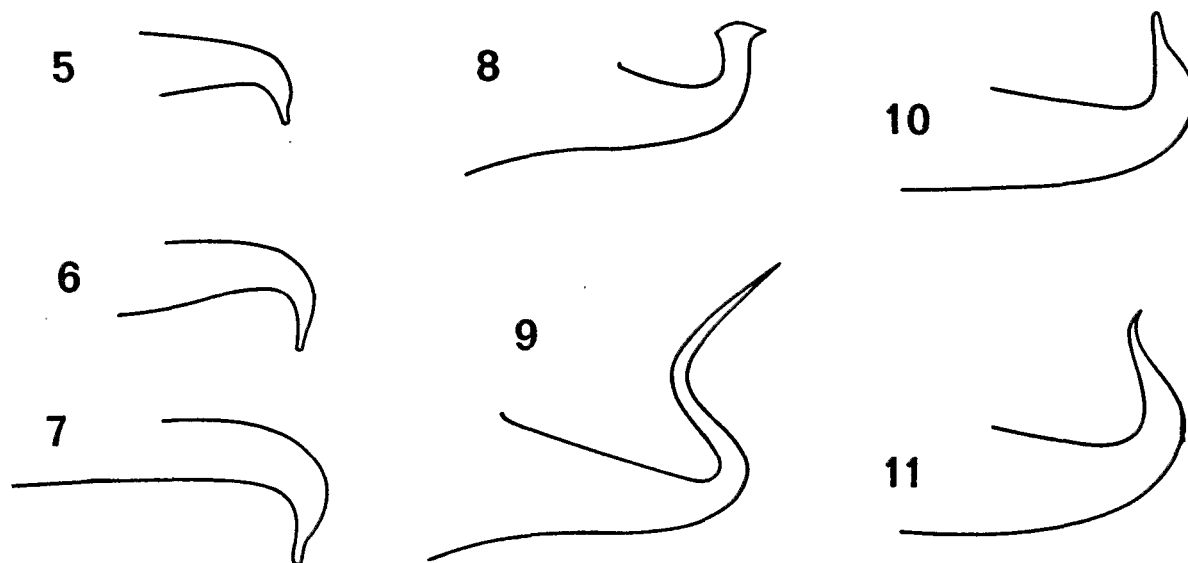
COLLECTIONS EXAMINED—*Cupressus* sp., cypress, Woolwich, 13.i.1980 (J. Gutierrez); *Juniperus* sp., juniper, Arcadia, 4.v.1950 (S.L. Alman); Rydalmere, 4.xi.1966; *Pinus* sp., pine, Bathurst, xii.1974 (E. Schicha); Gladesville, 30.v.1966.

15. *Oligonychus (Oligonychus) coffeae* (Nietner)  
(Fig. 7)

*Acarus coffeae* Nietner, 1861.  
*Oligonychus coffeae* (Nietner), Pritchard and Baker, 1955: 315.

A widespread species in the tropics, the tea red spider mite, *O. coffeae*, has been found in Queensland (Pritchard and Baker 1955). It was recorded in N.S.W. by Rand and Schicha (1981) from slides identified by the first author.

The aedeagus is bent at right angles to the shaft and narrows abruptly to a slender tip. Tibia I has seven tactile setae. The female tarsus I is provided with three tactile and one sensory seta proximal to the duplex setae.



Figs. 5-11. Genus *Oligonychus*, aedeagi: (5) *O. brevipodus*; (6) *O. ununguis*; (7) *O. coffeae*; (8) *O. tiwakae*; (9) *O. grypus*; (10) *O. digitatus*; (11) *O. araneum*.

*O. coffeae* lives generally on the upper face of the leaves. The females are dark red, the males lighter. This species recently appeared as a pest of avocado in N.S.W. where the outbreak coincided with hot, dry conditions.

COLLECTIONS EXAMINED—*Ceratopetalum gummiferum* Sm., Taree, 7.ix.1970; *Nephelium litchi* L., litchi, Alstonville, 30.viii.1976 (W.E. Wright); *Persea americana* Mill., avocado, Duranbah, 10.iv.1979 (J. Rand); *Tristania conferta* R. Br., brush box, Rydalmere, 24.x.1962.

16. *Oligonychus (Reckiella) tiwakae* Gutierrez  
(Fig. 8)

*Oligonychus tiwakae* Gutierrez, 1979: 360.

Described from New Caledonia on *Themeda* sp., this species was collected for the first time in Australia on *Imperata cylindrica* Beauv., Woolwich, 23.i.1980 (J. Gutierrez).

*O. tiwakae* is considered as belonging to the sub-genus *Reckiella* although all the hysterosomal striae are transverse. The aedeagus is upturned with a knob which has an axis parallel to that of the shaft. The knob forms an angulate anterior projection and an acute posterior projection. Tibia I has nine tactile setae.

The live females are greenish with three dark nutrition spots on each side of the hysterosoma. The males are yellow.

17. *Oligonychus (Reckiella) grypus* Baker and Pritchard  
(Fig. 9)

*Oligonychus grypus* Baker and Pritchard, 1960: 256.

Described from Central Africa on sugar cane, this species was collected in several countries of East Africa and in Madagascar, where it feeds on several grasses: maize, *Panicum*, *Pennisetum* etc. We recently identified samples from Papua New Guinea, on taro and elephant grass (*Pennisetum purpureum* Schumach.). Its range of distribution is probably very wide in the Indo-Pacific area.

The dorsal directed part of the aedeagus is long, tapering and strongly sigmoid. Tibia I has nine tactile setae.

The live females feed on the underside of leaves; they are green with dark spots on each side of the hysterosoma.

COLLECTION EXAMINED—*Saccharum officinarum* L., Sydney, i.1968.

18. *Oligonychus (Reckiella) digitatus* Davis  
(Fig. 10)

*Oligonychus digitatus* Davis, 1966: 569.

Described from Queensland, *O. digitatus* was recorded from N.S.W. by Davis (1966 and 1968d). It can cause severe damage to pasture grasses in Queensland, New South Wales and Victoria.

The distal part of the aedeagus forms a slightly acute angle with the main shaft and narrows abruptly to a slender tip. There are usually nine (sometimes ten) tactile setae on tibia I.

The females are yellow and in heavy infestations, produce dense webbing on the host plant.

Davis gave the following records for N.S.W. *Pennisetum clandestinum* Hochst., kikuyu grass, Auburn, 30.xi.1964 (F.A. Gibson); Narrabri, 1.iv.1965 (F.A. Gibson); Quirindi, 11.v.1965 (F.A. Gibson); *Stenotaphrum secundatum* (Walt.) Kuntze, buffalo grass, Blacktown, 17.xi.1948 (F.A. Gibson).

COLLECTIONS EXAMINED—*Cynodon dactylon* Pers., couch grass, Botanical Gardens, 10.i.1967; pasture grasses, Girraween, Nov. 1977 (P. Boniface); *Pennisetum clandestinum*, Auburn, 20.i.1965; Windsor, 20.x.1978 (R. Knott).

19. *Oligonychus (Reckiella) araneum* Davis  
(Fig. 11)

*Oligonychus araneum* Davis, 1968d: 123.

Described from Queensland where it was collected on several grasses, *O. araneum* was also recorded by Davis (1968d) from N.S.W. on *Stenotaphrum secundatum* (Walt.) Kuntze, buffalo grass, Blacktown, 17.xi.1948 (F.A. Gibson).

This species often occurs together with *O. digitatus* on the same host plant.

As in *O. digitatus*, the distal part of the aedeagus forms a slightly acute angle with the main shaft, but the tip is acute and tapers gradually. The tibia I usually has nine (sometimes eight) tactile setae.

The living females are yellowish or pale green with dark spots along each side of the hysterosoma; they spin copious webbing.

COLLECTION EXAMINED—*Pennisetum clandestinum* Hochst., kikuyu grass, at Yanco. 23.i.1942 (S.L. Alman).

9. GENUS *TETRANYCHUS* DUFOUR

*Tetranychus* Dufour, 1832: 276; Pritchard and Baker, 1955: 373; Tuttle and Baker, 1968: 124.

TYPE SPECIES—*Tetranychus lintearius* Dufour.

The genus *Tetranychus* may be recognized by its single pair of para-anal setae. The empodium is composed of three proximoventral hairs and when a mediadorsal spur is present, it is much shorter than the hairs. The duplex setae on tarsus I are widely separated. The aedeagus of the male always bends dorsad.

Mites of this genus live on the underside of leaves of angiosperms.

The six species recorded from N.S.W. belong to the sub-genus *Tetranychus sensu stricto* according to the classification proposed by Tuttle and Baker (1968): the dorsal striae of the female are longitudinal between the third and fourth pair of dorsocentral setae and form a diamond-shaped pattern between these setae.

Key to species of *Tetranychus* (males)

1. Empodium I with a mediodorsal spur minute or apparently absent. . . . . 2
- Empodium I with an obvious mediodorsal spur. . . . . 4
2. Empodium I with mediodorsal spur apparently absent, knob of the aedeagus over twice as wide as its stem. . . . . *lambi*
- Empodium I with mediodorsal spur minute. . . . . 3
3. Knob of the aedeagus berry-like, the rounded anterior projection more strongly developed than the posterior convexity. . . . . *neocaledonicus*
- Knob of the aedeagus with the anterior projection rounded and the posterior projection acute. . . *lombardinii*
4. Knob of the aedeagus large, with the anterior projection rounded and the posterior projection acute. . . . . *kanzawai*
- Knob of the aedeagus small. . . . . 5
5. Knob of the aedeagus rounded posteriorly and with an acute anterior projection. . . . . *ludeni*
- Knob of the aedeagus with the axis parallel to the axis of the shaft, the posterior projection no longer than the anterior projection. . . . . *urticae*

20. *Tetranychus lambi* Pritchard and Baker  
(Figs. 12, 13)

*Tetranychus lambi* Pritchard and Baker, 1955: 399; Manson, 1967: 591.

Described from New Zealand, *T. lambi* is widespread in the South Pacific islands (Gutierrez 1977) and has been recorded from Taiwan (Baker 1975). In Australia this species is known from numerous cultivated plants in Queensland (Davis 1968a) and from two species of native plants in Tasmania (Miller 1966).

The knob of the aedeagus has its axis parallel to that of the shaft; the knob is sharply angled anteriorly and beak-like posteriorly.

The adults are small compared to the adults of the other *Tetranychus* spp. The females are green with dark spots along each side of the hysterosoma. In N.S.W. it is a pest of several leguminous plants, strawberry and banana. On bananas in North Coast districts (N.S.W. Dept. Agric. 1975) heavy infestations cause flecking and mottling of the leaves, the mites also infesting the fruit, causing skin blemish and loss of market value.

COLLECTIONS EXAMINED—*Abutilon tubulosum* (A Cunn. ex Hook) Walp., Oberon, 8.i.1980 (J. Gutierrez); *Calathea crocata* E. Morr. and Joriss., Burbank, 7.iii.1975; *Cucurbita maxima* L., pumpkin, Coomealla, 4.iii.1957 (P.C. Hely); *Fragaria vesca* L., strawberry, Adamstown, 23.x.1967; *Glycine soja* (L.) S. and Z., soybeans, Camden, iv.1972; Narrabri, 14.ii.1968 (A.R.S.) and 4.v.1971; *Gossypium hirsutum* L., cotton, Narrabri, 11.ii.1977 (L.D. Tuart); Narromine, 24.iv.1967; *Kennedia rubicunda* Vent., dusky coral pea, Toronto, 11.i.1980 (J. Gutierrez); *Lobelia heterophylla* Labill., Denistone, 5.xii.1967; *Musa paradisiaca* L., banana, Carool, 13.vii.1959 (B.M. Braithwaite); Condong Range, viii.1959 (B.M. Braithwaite); Drydock, 1.v.1959 (B.M. Braithwaite); Duranbah, 7.i.1957 (B.M. Braithwaite); North Coast, 21.i.1965; *Oxalis* sp., sour-sob, Hawkesbury, 14.x.1976 (J. Pascal); *Phaseolus vulgaris* L., French bean, Patonga, 30.iv.1971; Sydney, 6.ii.1957 (F.A. Gibson); *Setaria italica* (L.) Beauv., foxtail millet, Beecroft, 9.xii.1964 and 20.i.1965 (F.A. Gibson); *Trifolium repens* L., white clover, Goulburn, 8.i.1980 (J. Gutierrez); Murwillumbah, 15.ix.1967; *Vicia* sp., vetches, Greenhills, 29.vi.1964 (B.M. Braithwaite).

21. *Tetranychus neocaledonicus* Andre  
(Figs. 14, 15)

*Tetranychus neocaledonicus* Andre, 1933: 302.

The vegetable mite, *T. neocaledonicus*, is a polyphagous and pantropical spider mite which was previously recorded in Australia from Queensland on a large range of host plants (Davis, 1968a). It is reported here for the first time from N.S.W.

The knob of the aedeagus is berry-like and very distinctive. The live females are bright red with paler legs; the males are greenish yellow.

Damage to economic plants is not very extensive in N.S.W. and this mite is probably restricted to the coastal area, where the temperature rarely falls below 10°C.

COLLECTIONS EXAMINED—*Annona muricata* L., custard apple tree, Alstonville, 1.ii.1979 (W.E. Wright); *Citrus* sp., Kenwal, 16.ix.1976 (P. Hemers) and Sydney, 13.ix.1964 (G.J. Snowball).

22. *Tetranychus lombardinii* Baker and Pritchard  
(Figs. 16, 17)

*Tetranychus lombardinii* Baker and Pritchard, 1960: 551.

Described from East Africa, *T. lombardinii* was collected in South Africa on a large range of plants (Meyer-Smith, 1974). The first author identified specimens from Kenya and Madagascar, on *Flagellaria indica* L. (Gutierrez 1974), and from Indonesia (Nov. 1977), on an unidentified plant (collected by P.A. Van der Laan). These records indicate that the range of distribution of *T. lombardinii* is probably very wide in the Indo-Pacific area.

In the male: the knob of the aedeagus has its axis nearly parallel to that of the shaft; the terminal sensillum of the palpus is about three times as long as broad; the empodium I consists of proximoventral spurs slender and tridigitate, and a tiny mediodorsal spur.

In the field, the females are dark red with dark spots on each side of the hysterosoma, the males are greenish yellow.

COLLECTION EXAMINED—*Passiflora* sp., Bayview (Sydney), 27.x.1976 (E. Schicha).

23. *Tetranychus kanzawai* Kishida  
(Figs. 18, 19)

*Tetranychus kanzawai* Kishida, 1927: 105; Meyer-Smith, 1974: 227.

*Tetranychus hydrangeae* Pritchard and Baker, 1955: 425.

*T. kanzawai*, which has a wide range of host plants in Japan, was imported, probably with *Hydrangea* plants, into most of the countries where this ornamental shrub is cultivated. In Australia it was previously known under the name *T. hydrangeae*, from Queensland (Davis 1968a) and from N.S.W. (N.S.W. Dept. Agric. 1975).

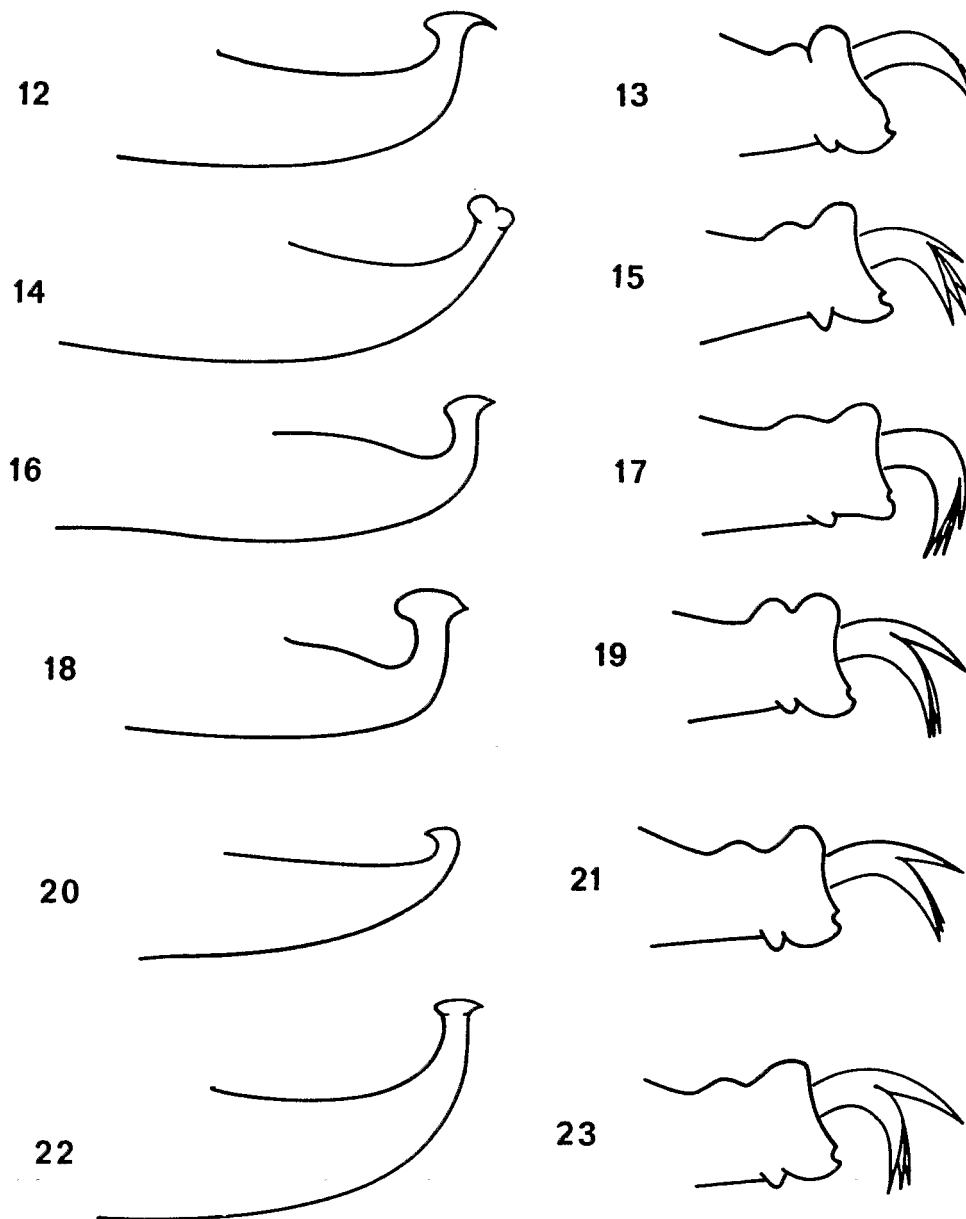
The knob of the aedeagus is large with a strong stem; its axis is parallel to that of the shaft. In the male, all the empodia have an obvious mediodorsal spur.

The females are carmine. Heavy infestations may cause severe injury to hydrangeas in coastal districts; the foliage becomes mottled and the flower heads are deformed and reduced in size.

COLLECTIONS EXAMINED—*Hydrangea macrophylla* (Thunb.) Ser., Gosford, 11.xii.1956 (P.C. Hely) and 14.xii.1963; Kingscliff, 1.xii.1967; Old Toongabbie, 5.i.1965; Woolwich, 13.i.1980 (J. Gutierrez); *Phaseolus* sp., beans, Rydalmere, ix.1976 (V. Edge); *Polyanthes* sp., Parkes, 9.xii.1966; Springwood, 28.xii.1966.

24. *Tetranychus ludeni* Zacher  
(Figs. 20, 21)

*Tetranychus ludeni* Zacher, 1913: 40.



Figs. 12-23. Genus *Tetranychus*: (12) *T. lambi*, aedeagus; (13) *T. lambi*, appendages of tarsus I of male; (14) *T. neocaledonicus*, aedeagus; (15) *T. neocaledonicus*, appendages of tarsus I of male; (16) *T. lombardinii*, aedeagus; (17) *T. lombardinii*, appendages of tarsus I of male; (18) *T. kanzawai*, aedeagus; (19) *T. kanzawai*, appendages of tarsus I of male; (20) *T. ludeni*, aedeagus; (21) *T. ludeni*, appendages of tarsus I of male; (22) *T. urticae*, aedeagus; (23) *T. urticae*, appendages of tarsus I of male.

*T. ludeni* is known out of doors from all the tropical areas and in greenhouses in temperate climate. In Australia, this species is distributed throughout coastal Queensland, where it is an important pest of cotton, beans and strawberry (Davis 1968a), and coastal N.S.W. (N.S.W. Dept. Agric. 1975). It has also been recorded from Tasmania (Miller 1966).

The knob of the aedeagus is small and scarcely larger than the stem; it has an acute anterior projection and no posterior angulation. In both sexes, the empodium of each leg is provided with a small mediodorsal spur.

The females are dark red; the males orange yellow. In N.S.W. it is injurious to cotton, market garden crops and ornamental Compositae; it often occurs in mixed populations with *T. urticae*. Moderate populations

may dry the foliage; heavy infestations can kill the plants.

COLLECTIONS EXAMINED—*Alocasia* sp., elephant's ear plant, Roseville, 18.i.1967; *Arctotheca calendula* (L.) Levyns, capeweed, Gosford, 23.ix.1976 (A. Beattie); *Armoracia rusticana* Gaertn., B. Meyer and Scherb., horseradish, Windsor, 26.i.1965; *Artocarpus incisa* L., bread fruit, Sydney, 13.ii.1967; *Bidens pilosa* L., cobbler's pegs, Gosford, 22.iii.1977 (A. Beattie); *Citrus* sp., Doyalson, 19.i.1977 (S. Goodwin); *Crotalaria* sp., Telopea, 31.x.1962 (F.A. Gibson); *Cucumis sativa* L., cucumber, Cecil Park, 9.xii.1966; Gosford, 17.xii.1962 (F.A. Gibson); Gunnedah, 27.i.1970 (C.W. Foster); Nelson Bay, 10.i.1980; Reserve Creek, 20.i.1959; Rozelle, 28.xii.1967; Sydney, 9.xii.1966; Windsor, 3.ii.1965; *Dahlia* sp., Armidale, 22.i.1965; Sydney, 25.i.1966 (F.A. Gibson); *Datura stramonium* L., thornapple, Wellington, 16.ix.1964; *Erigeron floribundus* Sch. Bip., Singleton, 10.i.1980 (J. Gutierrez); *Fragaria vesca* L., strawberry, Gosford, iii.1977 (S. Goodwin); Wahroonga, 23.vi.1965 (F.A. Gibson); *Gerbera* sp., Lismore, 10.i.1967; *Glycine javanica* L., glycine, Murwillumbah, 29.iv.1964 and 15.xii.1964; *Gossypium hirsutum* L., cotton, Cudgera, 17.i.1977 (A. Wilson); Narrabri, 11.ii.1977 (L.D. Tuart); Rydalmere, 28.ii.1968 (W. Wright); *Hibiscus* sp., Sydney, 18.viii.1971; *Ipomoea batatas* Lamk., sweet potato, Rydalmere, 30.ix.1975 (E. Schicha); *Ipomoea cairica* (L.) Sweet, coast morning glory, Hunters Hill, 16.ix.1966; *Malva parviflora* L., marshmallow, Telopea, 9.xi.1967; *Phaseolus vulgaris* L., French bean, Gosford, 9.i.1957 (J.G. Gellatley); Liverpool, 26.ii.1967; Maitland, 11.v.1964; Matcham, 20.vii.1964; Murwillumbah, xii.1960 (B.M. Braithwaite); Patonga, 30.iv.1971; Rydalmere, 21.xi.1967; Somersby, 22.xii.1967; Sydney, 27.i.1967; *Physalis minima* L., wild gooseberry, Karaak Flat, 14.xii.1966 (C.W. Foster); *Plumeria* sp., frangipani, Dundas, 5.v.1977 (G.R. Brown); *Pyrus malus* L., apple, Cardeaux River, 9.i.1980 (E. Gladman); Rydalmere, 29.xi.1967; *Ricinus communis* L., castor oil plant, Rydalmere, 22.xi.1967; *Salvia* sp., sage, Prospect, 8.xii.1966; *Sechium edule* (Jacq.) Sw., choko, Gosford, 7.i.1980 (P. Collins); *Tetrapanax papyriferum* C. Koch, Sydney, 18.viii.1971; *Trifolium repens* L., white clover, Murwillumbah, 15.ix.1967; Wollongbar, x.1957 (B.M. Braithwaite).

25. *Tetranychus urticae* Koch  
(Figs. 22, 23)

*Acarus telarius* Linnaeus, 1758: 616.

*Tetranychus telarius* (L.) Pritchard and Baker, 1955: 432.

*Tetranychus urticae* Koch, 1836: 10; Dupont, 1979: 297.

*Acarus cinnabarinus* Boisduval, 1867: 88.

*Tetranychus cinnabarinus* (Boisduval) Boudreaux, 1956: 43.

The two-spotted mite, *T. urticae*, forms a complex which is now considered to include *T. cinnabarinus* since the work of Dupont (1979). She emphasized that all the strains are morphologically very similar, recalled that the differences in colour are only due to differences in pigment quantities and demonstrated that there is gene flow between the carmine and the green forms.

The summer females have a dark spot on each side of the hysterosoma. Generally, the green forms are collected in cold and temperate climates whilst the carmine forms are found in warmer temperate zones and subtropics. The carmine forms are more or less active and reproduce all the year round, whereas the green forms have a diapause form yellowish-orange in color, which overwinters on the ground or in sheltered places such as crevices in bark.

*T. urticae* is cosmopolitan and extremely polyphagous; it is the most destructive spider mite occurring in Australia and its populations may quickly develop a resistance to pesticides. This species is recorded from each State of Australia except the Northern Territory (Womersley 1940; Bengston 1960; Miller 1966; Schicha 1975).

In N.S.W., Womersley gave the following records: on beans, Sydney, 18.vii.1934; on grape leaves (Sydney, 14.xii.1934); on rose leaves (Roseville, 9.vii.1934); on *Dahlia* (Sydney, 5.iv.1939). According to Schicha (1975), it is the principal mite pest of Bathurst apple orchards where the populations build up in November and December, reach a peak in January, fall to a low in February and rise to a second peak in March before declining again.

The knob of the aedeagus is small and set at a right angle to the stem; its axis is parallel to that of the shaft. In the male, the empodium I is provided with a strong mediodorsal spur and the mediodorsal spur of empodium II is obvious.

COLLECTIONS EXAMINED—*Abutilon tubulosum* (A. Cunn. ex Hook) Walp., Oberon, 8.i.1980 (J. Gutierrez); *Acalypha* sp., Fijian fire bush, Seven Hills, 5.vii.1970 (J. Donkin); *Alocasia* sp., elephant's ear plant, Roseville, 16.xi.1967 and xii.1972 (C. Chadwick); *Amygdalus persica* L., peach, Darkes Forest, 7.i.1980 (E. Gladman); Dural 21.ii.1967; Kelso, 30.i.1980 (E. Reedy); Leeton, 23.ii.1977 (E. Schicha); North Ryde, 24.ii.1965; Orange, 19.iii.1965; Stoney Point, 15.ii.1965; Uralla, 8.ii.1980 (W.G. Thwaite); Wamoon, 27.ii.1957 (P.C. Hely); West Pennant Hills, 9.ii.1965; Yanco, 15.ii.1965; *Apium graveolens* L., celery, Handwood, 16.iii.1965; *Azalea nudiflora* L., St. Ives, 4.ii.1977 (S. Clark); *Cassytha* sp., devil's-twine, Dural, 17.iv.1980 (Gaul); *Citrus* sp., Gosford, 16.ix.1966; Oxford Falls, 17.x.1966; Sydney, 17.x.1966; *Cucumis sativa* L., cucumber, Gosford, 17.xii.1962 (F.A. Gibson); *Dahlia* sp., Mortdale, 9.ii.1968; Murwillumbah, 28.ii.1967; *Delphinium* sp., Wyong, 6.i.1967; *Dianthus armeria* L., deptford pink, Horsley Park, 7.x.1980 (G. Bergamin); *Fragaria vesca* L., strawberry, Castle Hill, 8.x.1968 (H.G.G.); Dural, 11.xii.1978 (S. Goodwin); Menai, 18.vii.1967; Narara, 18.viii.1967; Rydalmere, 29.xi.1967; *Glycine soja* (L.) S. and Z., soybeans, Sydney, iii.1976 (H. Rose); *Gossypium hirsutum* L., cotton, Narrabri, 18.ii.1965 (C. Brickhill); Nevertire, 13.iii.1975; Wee Waa, vi.1977 (S.G. Burbidge); *Juglans regia* L., walnut, Stoney Point, 15.ii.1965; *Lobelia* sp., Denistone, 5.xii.1967; *Lycopersicon esculentum* Mill., tomato, Tumbi Umbi, 18.i.1980 (R. Stimson); *Magnolia stellata* Maxim., Rydalmere, 12.xii.1967; *Malva parviflora* L., marshmallow, Telopea, 9.xi.1967; West Ryde 9.x.1964; *Mangifera indica* L., mango, Martinsville, 8.i.1965; *Medicago sativa* L., lucerne, Warrawee, 30.iv.1979 (W.M. Milne); *Musa* sp., banana, Allambie Heights, 29.xii.1966; *Passiflora* sp., passion fruit, Sydney, 12.i.1944; *Phaseolus* spp., beans, Albury, 26.i.1965; Darkes Forest, 7.i.1980 (E. Gladman); Gosford, 24.x.1966; Leeton, 27.ii.1957 (P.C. Hely); Merrylands, 27.i.1967; Rydalmere, 4.iii.1977 (J. Humphreys); *Physalis minima* L., wild gooseberry, Batlow, 25.i.1965; *Polyanthes* sp., Parkes, 9.xii.1966; *Populus nigra* L., poplar, Woolwich, 17.i.1980 (J. Gutierrez); *Plumeria* sp., frangipani, Dundas, 5.v.1977 (G.R. Brown); *Prunus domestica* L., plum, Albury, 24.ii.1965; Batlow, 26.i.1965; Galston, 7.ii.1980 (R. Waddell and C. Tearle); Sydney, 6.i.1965; *Pyrus communis* L., pear, Wagga, 15.ii.1967; Wamoon, 24.ii.1965; Yanco, 15.ii.1965; *Pyrus malus* L., apple, Armidale, 3.ii.1965; Glenorie, 24.i.1980 (W. Fabian); Griffith, 3.i.1980 (P.J. Keenan); Kentucky, 22.i.1965; Lucknow, 22.i.1965; Nashdale, 2.i.1965; Orange, 15.i.1957 (N. Lloyd); Rydalmere, 29.xi.1967; Spurway, 2.ii.1965; Tenterfield, 6.iv.1957 (B. Robinson); Trentham Cliffs, 31.i.1980 (H. Creecy); Wagga, 17.ii.1967; Young 10.ii.1965; *Rosa* sp., roses, Corbie Hill, 15.ii.1965; Dural, 23.xi.1966; Prospect, 8.xii.1964; *Rumex* sp., dock, Yanco, 23.xi.1965 (M. Casimir); *Stachys arvensis* L., stagger weed, Telopea, 29.viii.1966; *Solanum melongena* L., egg plant, Dareton, 16.v.1967; *Stenotaphrum secundatum* (Walt.) Kuntze, buffalo grass, Ashfield, 4.i.1965; *Tagetes erecta* L., marigold, Woolwich, 13.i.1980 (J. Gutierrez); *Trifolium repens* L., white clover, Kensington, 23.x.1978 (D. McFarlane); *Tropaeolum majus* L., nasturtium, Hunter's Hill, 16.ix.1966; *Viburnum* sp., snowball, North Ryde, 24.ii.1965; *Vicia* sp., vetches, Sydney, 1972; *Viola* sp., violet, Mullumbimby, 21.vii.1967; Orange, 15.i.1957 (N. Lloyd); Seven Hills, 14.vii.1967; *Vitis* sp., grape, Hanwood, 6.iii.1967; *Zea mays* L., maize, Bathurst, 17.iii.1964; Parramatta, 28.xii.1966.

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