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INSECTS AND MITES ASSOCIATED WITH STORED
PRODUCTS IN QUEENSLAND
4. ACARINA AND PSEUDOSCORPIONES

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SUMMARY

Thirty-three species of Acarina of the families Tyroglyphidae, Anoetidae, Epidermoptidae, Scutacaridae, Pyemotidae, Tydeidae, Cheyletidae, Macrochelidae, Phytoseiidae, Aceosejidae, Ameroseiidae, Laelapidae, Uropodidae and Erythraeidae, and two species of Pseudoscorpiones of the family Cheliferidae, are recorded from stored products in Queensland.

Tyrophagus putrescentiae (Schrank) is most prevalent, and with its predator complex is the only species found regularly in large aggregations. Applied control measures are rarely necessary and cases of annoyance to humans are not common.

INTRODUCTION

The earliest records of stored product Acarina in Queensland were made by H. Tryon (1903-1917), Government Entomologist of the Department of Agriculture and Stock. Many of the reportings, however, concerned interceptions in commodities coming into Queensland. W. J. Rainbow of the Australian Museum, Sydney, compiled the first summary of Australian acarines (1906) but it was not until the contributions of Womersley (1941*a*, 1941*b*, 1954, 1956), Robertson (1946, 1959) and particularly Hughes (1948, 1961) that a reasonable inventory of the Australian fauna appeared. Associations with stored products in Queensland specifically are not well documented and there is little material from early collections available for examination. Much of the later material cannot be determined because of deterioration of mounting media.

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This report is the fourth of a series (see Champ and Smithers 1965; Champ 1966a, 1966b) covering a survey of the arthropod fauna of stored products in Queensland and carried out during 1960-1964. The data gathered have been supplemented from relevant literature, unpublished Queensland Department of Primary Industries reports, and acarine materials held in the Department of Primary Industries Collection.

Various bird-infesting and rodent-infesting mites are found commonly contaminating commodities in storage in Queensland, e.g. *Ornithonyssus bursa* (Berlese) and *O. bacoti* (Hirst), but these are regarded as incidental and beyond the scope of the present project.

No reference to local occurrence of Pseudoscorpiones was located.

The classifications followed in this paper are those of Hughes (1961) and Kew (1911) for Acarina and Pseudoscorpiones respectively, and where possible, species are referred to those accepted by these authors.

Data are presented under headings of "Distribution" and "Recorded Hosts and Habitats". *Distributions* are given as follows: a statement of world distribution; published records from elsewhere in Australia if these precede the first Queensland record; and Queensland records giving general references first, then specific localities and the year of the first records from these localities together with references or with actual acarine material, the authorities who have determined the material and in parentheses the collection in which the material is held, and finally the months of the year in which occurrence has been recorded. Where no reference or authority is given, material has been determined by the author. The abbreviation DPI has been used to denote the Department of Primary Industries Collection. *Recorded hosts and habitats* are given as follows: statements, if any, from references to the Queensland scene; and specific records giving host or habitat, locality, year of record, authority who determined the material and collection where held. Again, where no reference or authority is given, the author holds responsibility.

SPECIES RECORDED

Acarina

Acarophenax tribolii Newstead and Duval 1918

Acarus siro Linnaeus 1758

Blattilaelaps nauphoetae Womersley 1956

Caloglyphus berlesei (Michael 1903)

Caloglyphus krameri (Berlese 1881)

Carpoglyphus lactis (Linnaeus 1758)

Cheletomorpha lepidoptorum (Shaw 1794)

Cheyletus eruditus Schrank 1781

Cheyletus malaccensis Oudemans 1903

Dermatophagoides sp.

Erythraeus sp.
Fuscuropoda marginata (C. L. Koch 1839)
Glycyphagus destructor (Schrank 1781)
Haemolaelaps casalis (Berlese 1887)
Histiostoma feroniarum (Dufour 1839)
Kleemania plumosus (Oudemans 1902)
Lardoglyphus konoii (Sasa and Asanuma 1951)
Leiodynychus krameri (G. and R. Canestrini 1882)
Macrocheles muscaedomesticae (Scopoli 1772)
Melichares (Blattisocius) tarsalis (Berlese 1918)
Proctolaelaps (Proctolaelaps) hypudaei (Oudemans 1902)
Proctolaelaps (Proctolaelaps) hystrix (Vitzhum 1923)
Pyemotes ventricosus (Newport 1850)
Rhizoglyphus echinopus (Fumouze and Robin 1868)
Suidasia nesbitti Hughes 1948
Thyreophagus entomophagus (Laboulbene 1852)
Tydeus interruptus Sig Thor 1932
Typhlodromus (Amblyseius) cucumeris Oudemans 1930
Tyroglyphus sp.
Tyrophagus casei (Oudemans 1910)
Tyrophagus dimidiatus (Hermann 1904)
Tyrophagus longior (Gervais 1844)
Tyrophagus putrescentiae (Schrank 1781)

Pseudoscorpiones

Cheiridium museorum (Leach 1817)
Withius subruber (Simon 1879)

Tyroglyphidae

Tyroglyphus sp.

Records.—Sugar, dried prunes, Brisbane, 1914-1915 (Tryon 1915).

Acarus siro

Distribution.—Cosmopolitan (Hughes 1961). Australia, introduced, not common, as *Aleurobius farinae* De Geer (Rainbow 1906); South Australia 1934, Victoria 1934, as *Tyroglyphus farinae* Linné (Womersley 1941a). SOUTH QUEENSLAND: Brisbane 1902-1903 (Tryon 1903), 1946-1947 (Smith 1947); no specified locality, as *Tyroglyphus farinae* De Geer (Nichols and Weddell 1949); Kingaroy 1963 (DPI), Dec.

Recorded habitats.—Cheese in cool stores (Nichols and Weddell *op. cit.*). Nut-in-shell peanuts in silos, Kingaroy 1963 (DPI).

Note.—*A. siro* is not common.

Tyrophagus putrescentiae

Distribution.—Cosmopolitan (Hughes 1961). Australia, introduced, as *Tyroglyphus siro* Linn. (Rainbow 1906, Womersley 1941a); Western Australia 1931, Victoria 1932, South Australia 1933 (Womersley *op. cit.*); New South Wales 1939 (Robertson 1959). SOUTH QUEENSLAND: *Brisbane*, ? as *T. siro* Linn. (Tryon 1903), 1946-1947 (Smith 1947), 1942, no date det. A. M. Hughes, Commonwealth Institute of Entomology, Jan. to Dec.; *Toowoomba* 1947, Feb. (Robertson *op. cit.*); 1963 det. CIE, Feb., July; *Murgon* 1946-1947 (Smith *op. cit.*); *Jimna* 1955 (DPI), May; *Bongeen, Dalby*, 1960 (DPI), Sept.; *Kingaroy* 1961, Jan. to Dec. (Champ 1965); *Woombye*, 1962 det. CIE, Jan.: CENTRAL QUEENSLAND: *Rockhampton*, 1962 det. CIE, Jan.

Recorded habitats.—Cheese (Tryon *op. cit.*, Smith *op. cit.*, Nichols and Weddell 1949, Robertson *op. cit.*—these citations probably refer to related occurrences, see Comments). Nut-in-shell peanuts in bag stacks and silos (Champ *op. cit.*). Records include: cheese, Toowoomba 1947; old potato tubers infested with mealy bugs, Brisbane det. AMH; hoop pine from nursery, Jimna 1955; wholemeal porridge, Brisbane 1963 (DPI); "Salami" sausage, Brisbane 1948 (DPI); broom-millet, Brisbane, 1949, 1954 (DPI); ham, Rockhampton 1962 det. CIE (DPI); in packing case around sauce bottles, Brisbane 1943 (DPI); swarming on refrigerator in house, Woombye 1962 det. CIE; on mushrooms, Toowoomba 1963 det. CIE; laboratory insect cultures, Brisbane 1960-1965; stored cereals particularly in damp spillage and residues, Brisbane 1960-1965, Bongeen Dalby, 1960 (DPI).

Notes.—*T. putrescentiae* is the most common mite in stored products in Queensland and is frequently present in large numbers and usually associated with *Cheyletus malaccensis*. Males and females have been recorded but no hypopial forms.

Tyrophagus longior

Distribution.—Cosmopolitan (Hughes 1961). SOUTH QUEENSLAND: *Brisbane* 1909-1910 (Tryon 1910); no specified locality (Nichols and Weddell 1949); *Brisbane* 1947, Feb. (Robertson 1959).

Recorded habitats.—Currants (Tryon *op. cit.*). Cheese (Robertson *op. cit.*); cheese in factory holding rooms (Nichols and Weddell *op. cit.*).

Note.—*T. longior* is not common.

Tyrophagus casei

Distribution.—Cosmopolitan (Hughes 1961). QUEENSLAND: no specified locality (Nichols and Weddell 1949).

Recorded habitat.—Cheese in factory holding rooms (Nichols and Weddell *op. cit.*).

Note.—*T. casei* is not common.

Tyrophagus dimidiatus

Distribution.—North America, Europe (Hughes 1961). SOUTH QUEENSLAND: *Toowoomba* 1960 det. Commonwealth Institute of Entomology, Dec.

Recorded habitat.—Tunnelling in upper surface of pileus of mushrooms, *Toowoomba* 1960 det. CIE.

Caloglyphus berlesei

Distribution.—Probably cosmopolitan (Hughes 1961). South Australia 1909, Western Australia 1931, Australian Capital Territory 1934 (Womersley 1941a). SOUTH QUEENSLAND: *Toowoomba* 1957 det. A. M. Hughes, Aug.; *Bongeen, Dalby*, 1960 (DPI), Sept.

Recorded habitats.—Poultry litter, *Toowoomba* 1957 det. AMH; damp and mouldy grain residues, *Bongeen, Dalby*, 1960 (DPI).

Notes.—*C. berlesei* is common on the Darling Downs in damp situations. Hypopi appear frequently in dry grain residues.

Caloglyphus krameri

Distribution.—Europe, Africa, Australia (Hughes 1961). SOUTH QUEENSLAND: *Biloela* 1956 det. A. M. Hughes, May; *Bongeen* 1960 (DPI), Sept.; *Kingaroy* 1961 (DPI), July (Champ 1965): NORTH QUEENSLAND: *Upper Barron* 1961 det. Commonwealth Institute of Entomology, June.

Recorded habitats.—Nut-in-shell peanuts in silos (Champ *op. cit.*). Sorghum heads, *Biloela* 1956 det. AMH; damp and mouldy grain residues, *Bongeen* 1960 (DPI); damaging cactus plants, *Upper Barron* 1961 det. CIE.

Notes.—*C. krameri* is taken occasionally in damp situations and hypopi are found in associated dry grain residues. Heteromorphic males have been recorded.

Rhizoglyphus sp.

Records.—Bulbs from Holland, Brisbane, 1907-1908 (Tryon 1908), 1916-1917 (Tryon 1917); avocado seeds from Fiji, Brisbane, 1916-1917 (Tryon 1917).

Rhizoglyphus echinopus

Distribution.—Cosmopolitan (Hughes 1961). Australia (Michael 1903); Tasmania (Lea 1908); New South Wales 1934 (Womersley 1941a). SOUTH QUEENSLAND: *Maroochie* (= Maroochy) (1897-1898 as *Rhizoglyphus Robini* (Tryon 1898); *Brisbane* 1902-1903 (Tryon 1903), *Warwick* 1953 det. A. M. Hughes; *Kingaroy* 1957 (Champ 1965), July: NORTH QUEENSLAND: *Atherton*, 1963 (DPI), May.

Recorded habitats.—Arrowroot, Maroochie (Tryon 1898). Dahlia and gladioli bulbs, Brisbane (Tryon 1903). Bulbs from Holland (Tryon 1909). Gladioli bulbs from America (Tryon 1913). Caladium bulbs (Tryon 1914). Turnip seed from Denmark (Tryon 1915). Damp nut-in-shell peanuts (Champ *op. cit.*). Records include: iris bulbs, Brisbane 1961 det. CIE; wheat plants, Warwick 1953 det. AMH; soybean root nodules, Atherton 1963 (DPI).

Notes.—*R. echinopus* is common. Hypopi have been recorded.

Thyreophagus entomophagus

Distribution.—Cosmopolitan. Australia, introduced, as *Tyroglyphus entomophagus* Laboub. (Rainbow 1906); New South Wales 1934 (Womersley 1941a). NORTH QUEENSLAND: (Caldwell 1947): *Townsville* 1942 (DPI), Dec; SOUTH QUEENSLAND: *Brisbane* 1965 (DPI).

Recorded habitats.—Milled cereal products, of minor importance (Caldwell *op. cit.*). Flour, *Townsville* 1942 (DPI); laboratory insect cultures of *Tribolium castaneum* Herbst. and *Sitophilus oryzae* (L.), *Brisbane* 1965 (DPI).

Note.—*T. entomophagus* is common.

Lardoglyphus konoii

Distribution.—Eurasia (Hughes 1961). SOUTH QUEENSLAND: *Brisbane* 1954 (DPI), May.

Recorded habitat.—Animal casings, one record.

Suidasia nesbitti

Distribution.—Almost cosmopolitan. SOUTH QUEENSLAND: *Brisbane* 1946 (DPI), Mar.; NORTH QUEENSLAND: *Cairns* district 1962 det. Commonwealth Institute of Entomology.

Recorded habitat.—Poultry mash, *Brisbane* 1946 (DPI), *Cairns* 1962 det. CIE.

Glycyphagus destructor

Distribution.—Cosmopolitan (Hughes 1961). Victoria 1932, South Australia 1934 as *G. cadaverum* Schrank (Womersley 1941a). SOUTH QUEENSLAND: *Brisbane* (as *Lepidoglyphus destructor* (Schrank), *Domrow* 1954), 1949 (DPI); *Yarranlea* 1960 (DPI), Sept.; *Allora* 1960 (DPI), Dec.

Recorded habitats.—On *Rattus rattus* (Domrow *op. cit.*). Broom millet spillage, *Brisbane* 1949 (DPI), June; sorghum residues in harvester, *Yarranlea* 1960 (DPI); barley residues, *Allora* 1960 (DPI).

Notes.—*G. destructor* is recorded occasionally and is usually associated with *Cheyletus malaccensis* or *Cheletomorpha lepidopterum*. Hypopi are common.

Carpoglyphus lactis

Distribution.—Cosmopolitan (Hughes 1961). Western Australia 1931, South Australia 1932, Victoria, New South Wales 1934 (Womersley 1941a). SOUTH QUEENSLAND: *Brisbane* 1964, May.

Recorded habitat.—Dried figs, Brisbane 1964.

Note.—*C. lactis* is common in dried figs.

Anoetidae*Histiostoma feroniarum*

Distribution.—Cosmopolitan (Hughes 1961). New South Wales 1932, South South Australia 1934 (Womersley 1941a). SOUTH QUEENSLAND: *Lawes* 1965, Nov.

Recorded habitat.—Infesting potatoes left in field after harvest, Lawes 1965.

Note.—Hypopi were found attached to potato-infesting insects.

Epidermoptidae*Dermatophagoides* sp.

Record.—Ex casein glue, Brisbane, Aug. 1959, det. Commonwealth Institute of Entomology.

Scutacaridae*Acarophenax tribolii*

Distribution.—Probably cosmopolitan (Hughes 1961). SOUTH QUEENSLAND: *Fourmartin* 1961 (DPI), Jan.; *Kingaroy* 1962 (DPI), Mar. (Champ 1965).

Recorded habitat.—Associated with *Tribolium castaneum* Herbst. infestations in peanuts (*Champ op. cit.*) and rotting maize cobs, Fourmartin 1961 (DPI).

Note.—*A. tribolii* is apparently common.

Pyemotidae*Pyemotes ventricosus*

Distribution.—Cosmopolitan (Hughes 1961). South Australia (Swan 1934). SOUTH QUEENSLAND: *Brisbane* 1935-1936 (Veitch 1936), Jan. to Dec.; *Kingaroy* 1962 (Champ 1965); NORTH QUEENSLAND: *Townsville* 1944 (DPI), May.

Recorded habitats.—Infesting apiary, brood killed (Veitch *op. cit.*). Associated with insect infestations in nut-in-shell peanuts (Champ *op. cit.*). Laboratory insect cultures, attacking and causing death of immature stages of *Sitophilus oryzae* (Linnaeus), *Sitophilus zeamais* (Motschulsky), *Sitophilus granarius* (Linnaeus), *Rhizopertha dominica* Fabricius and *Ephestia elutella* (Hübner), Brisbane 1960-1965 (DPI); oaten straw, Townsville 1944 (DPI); ex grain bag in baker's shop, Brisbane 1961 (DPI).

Notes.—*P. ventricosus* is common. It is a serious pest of laboratory insect cultures and is usually present in heavily insect infested grain or other stored products. Cases of skin irritation have been recorded from persons in contact with infested material. The observation of apiary infestation by H. Hacker, reported by Veitch (*op. cit.*), appears to be an isolated outbreak as *P. ventricosus* has not been recorded since in extensive examinations of beehives throughout Queensland (C. Roff, personal communication).

Tydeidae

Tydeus interruptus

Distribution.—Europe (Hughes 1961). SOUTH QUEENSLAND: Kingaroy 1963 (DPI), Nov.

Recorded habitat.—Grain spillage, Kingaroy 1963 (DPI).

Cheyletidae

Cheletomorpha lepidoptorum

Distribution.—Cosmopolitan (Hughes 1961). Western Australia 1932, South Australia 1933, as *C. venustissima* (Koch) (Womersley 1941*b*). SOUTH QUEENSLAND: Brisbane 1949 (DPI), Jan. June; Allora 1960 (DPI), Dec.; Kingaroy 1962 (DPI), Apr. (Champ 1965).

Recorded habitats.—Nut-in-shell peanuts in open bag stacks, infested with *Tyrophagus putrescentiae* (Champ *op. cit.*). Records include: broom millet debris infested with *Glycyphagus destructor* and *Cheyletus malaccensis*, Brisbane 1949 (DPI); wheat spillage infested with complex containing *G. destructor*, Allora 1960 (DPI); barley debris with no apparent Tyroglyphidae, Brisbane 1961 (DPI).

Note.—*C. lepidoptorum* is recorded occasionally.

Cheyletus eruditus

Distribution.—Cosmopolitan (Hughes 1961). New South Wales 1909 (Womersley 1941*b*). SOUTH QUEENSLAND: Brisbane 1932 (Womersley *op. cit.*); Kingaroy 1962 (DPI).

Recorded habitats.—On cheese (Womersley *op. cit.*). Nut-in-shell peanuts infested with *Tyrophagus putrescentiae* (Champ *op. cit.*). Usually associated with Tyroglyphidae.

Note.—*C. eruditus* is not common.

Cheyletus malaccensis

Distribution.—Eurasia (Hughes 1961). SOUTH QUEENSLAND: *Brisbane* 1949 (DPI), Jan., Feb., June, Oct.; *Bongeen, Macalister, Dalby*, 1960 (DPI), Sept.; *Oakey* 1960 (DPI), Oct.; *Allora* 1960 (DPI), Dec.; *Kingaroy* 1961 (DPI), Jan. to Dec. (Champ 1965).

Recorded habitats.—Nut-in-shell peanuts in bag stacks and silos, peanut debris, infested with *Tyrophagus putrescentiae* (Champ *op. cit.*). Grain spillage, associated with infestation complexes containing *T. putrescentiae*, *Caloglyphus* spp., and *Glycyphagus destructor*, throughout south Queensland.

Notes.—*C. malaccensis* is very common and is present in most infestations of Tyroglyphidae. All males recorded have been heteromorphic.

Macrochelidae*Macrocheles muscaedomesticae*

Distribution.—Cosmopolitan (Hughes 1961). SOUTH QUEENSLAND: *Bongeen* 1960 (DPI), Sept.; *Kingaroy* 1961 (DPI), July (Champ 1965); *Cooroy* district 1963 (DPI), Oct.

Recorded habitats.—Associated with breeding *Scatopse fuscipes* Mg. (Diptera: Scatopsidae) in rotting wheat residues, *Bongeen* 1960 (DPI), and maize trash, *Cooroy* district 1963 (DPI), and *Diploneura (Dohrniohphora) cornuta* Bigot (Diptera: Phoridae) in mouldy nut-in-shell peanuts (Champ *op. cit.*).

Note.—*M. muscaedomesticae* is found commonly in damp residues where Diptera are breeding.

Phytoseiidae*Typhlodromus (Amblyseius) cucumeris*

Distribution.—Victoria 1953 (Womersley 1954). SOUTH QUEENSLAND: *Dalby* 1960 (DPI), Sept.

Recorded habitat.—Ex complex of Insecta and Acarina in mouldy wheat, *Dalby* 1960 (DPI).

Aceosejidae*Proctolaelaps (Proctolaelaps) hypudaei*

Distribution.—Cosmopolitan (Hughes 1961). NORTH QUEENSLAND: *Cairns* 1961, Feb.; *Nambour* 1964, Feb.: det. Commonwealth Institute of Entomology.

Recorded habitat.—On orchid plant growing in Japanese fibre, *Cairns* 1961; on dried cyclamen leaves, *Nambour* 1964: det. CIE.

Proctolaelaps (Proctolaelaps) hystrix

Distribution.—Germany (Vitzthum 1923). SOUTH QUEENSLAND: Bongeen 1960 (DPI), Sept.

Recorded habitat.—Decaying wheat residues in silos heavily infested with insects and acarines, Bongeen 1960 (DPI).

Melichares (Blattisocius) tarsalis

Distribution.—Cosmopolitan (Hughes 1961). South Australia 1935, Australian Capital Territory 1944 as *Blattisocius tineivorus* (Oudemans) (Womersley 1954). SOUTH QUEENSLAND: Brisbane 1961 (DPI); Kingaroy 1940 (DPI), Jan. to Dec. (Champ 1965).

Recorded habitats.—Infestation complexes containing *Cadra cautella* (Walker), *Oryzaephilus mercator* Fauv., *Tribolium castaneum* Herbst. and *Carpophilus dimidiatus* in nut-in-shell peanuts in bag stacks and silos (Champ *op. cit.*). Records include: ex laying mash, Brisbane 1961 (DPI); laboratory insect cultures, Brisbane, 1962-1965 (DPI).

Note.—*M. tarsalis* is very common in outbreaks of stored product insects.

Ameroseiidae*Klemania plumosus*

Distribution.—Europe, Australia (Hughes 1961). SOUTH QUEENSLAND: Kingaroy 1962 (DPI), Mar. (Champ 1965).

Recorded habitat.—Nut-in-shell peanuts in bag stacks (Champ *op. cit.*).

Laelapidae*Haemolaelaps casalis*

Distribution.—Probably cosmopolitan (Hughes 1961). Australian Capital Territory as *Haemolaelaps megaventralis* Strandtmann (Womersley 1956). SOUTH QUEENSLAND: Brisbane 1960 (DPI), Jan.; Bongeen, Dalby, 1960 (DPI), Sept.; Kingaroy 1963 (DPI), Apr.

Recorded habitats.—Associated with infestation complexes containing Tyroglyphidae in grain residues, Bongeen 1960 (DPI), Brisbane 1961 (DPI), Kingaroy 1963 (DPI).

Note.—*H. casalis* is common as above.

Blattilaelaps nauphoetae

Distribution.—SOUTH QUEENSLAND: Brisbane 1948 (Womersley 1956).

Recorded habitat.—Ex *Nauphoeta cinerea* (Olivier) (Orthoptera:Blattidae) (Womersley *op. cit.*).

Uropodidae*Fuscuropoda marginata*

Distribution.—Europe (Hughes 1961). SOUTH QUEENSLAND: *Bongeen* 1960 (DPI), Sept.

Recorded habitat.—Associated with an infestation complex including Tyroglyphidae in damp and mouldy wheat residues, *Bongeen* 1960 (DPI).

Leiodynchus krameri

Distribution.—Cosmopolitan (Hughes 1961). SOUTH QUEENSLAND: *Brisbane* 1960 (DPI), Apr.; *Kingaroy* 1961 (DPI), July (Champ 1965).

Recorded habitats.—Peanut debris (Champ *op. cit.*). Maize residues, *Brisbane* 1960 (DPI).

Note.—*L. krameri* appears common.

Erythraeidae*Erythraeus* sp.

Record.—Ex infested wheat residues, *Norwin*, Jan. 1961, det. Commonwealth Institute of Entomology.

Cheliferidae*Withius subruber*

Distribution.—Europe, Asia (Kew 1911). SOUTH QUEENSLAND: *Brisbane* 1960 (DPI), Apr., *Bongeen* 1960 (DPI), Sept., *Oakey* 1960 (DPI), Oct. (det. M. Beier, Commonwealth Institute of Entomology, 1962); *Kingaroy* 1961 (DPI), Jan. to Dec. (Champ 1965); *Yarraman*, 1965, Dec.; CENTRAL QUEENSLAND: *Gladstone* 1947 (DPI), June.

Recorded habitats.—Nut-in-shell peanuts in bag stacks infested with *Tyrophagus putrescentiae* (Champ *op. cit.*). Tyroglyphidae infestations in barley, maize, wheat residues in bag stores and silos, *Brisbane*, *Gladstone*, *Bongeen*, *Oakey*, 1960 (DPI), *Yarraman* 1965, Dec.

Note.—*W. subruber* is the common pseudoscorpion associated with insect and acarine infestations of stored products locally.

Cheiridium museorum

Distribution.—British Isles (Kew 1911). QUEENSLAND: *Brisbane* 1946 (DPI), Oct.

Recorded habitat.—"On stored wheat," *Brisbane* 1946 (DPI).

COMMENTS

The acarine fauna of stored products in Queensland corresponds, with a few exceptions, with species which have a recorded cosmopolitan or near cosmopolitan distribution.

The following species are not recorded from Queensland but are cosmopolitan or are reported established in other parts of Australia.

TYROGLYPHIDAE: *Caloglyphus mycophagus* (Megnin 1874), South Australia 1939 (Womersley 1941a); *Lardoglyphus zacheri* Oudemans 1927, Australia (Hughes 1961); *Glycyphagus domesticus* (De Geer 1778), New South Wales (Rainbow 1906), Western Australia 1931, South Australia 1933, Victoria 1938 (Womersley 1941a); *Ctenoglyphus plumiger* (Koch 1935), South Australia 1934 (Womersley 1941a). **ANOETIDAE:** *Histiostoma sapromyzae* (Dufour 1839), Australia (Hughes 1961). **CHEYLETIDAE:** *Cheyletia flabellifera* (Michael 1878), South Australia 1939 (Womersley 1941a); *Acaropsis docta* Berlese 1886, Western Australia (Womersley 1941b). **PHYTOSEIIDAE:** *Typhlodromus (Amblyseius) obtusus* (C. L. Koch 1839), South Australia 1934 (Womersley 1954). **ACEOSEJIDAE:** *Proctolaelaps (Proctolaelaps) pomorum* (Oudemans 1929), Australia (Hughes 1961). **LAELAPTIDAE:** *Eulaelaps stabularis* (C. L. Koch 1839), cosmopolitan (Hughes 1961); *Androlaelaps concisus* Womersley 1956, Western Australia 1953 (Womersley 1956).

The following species have been intercepted at the port of Brisbane but are not known to be established.

ACEOSEJIDAE: *Melichares (Blattisocius) keegani* (Fox 1947), Brisbane 1962.

LAELAPTIDAE: *Haemogamasus (Euhaemogamasus) pontiger* (Berlese 1903), Brisbane 1961, Victoria 1952 as *H. oudemansi* Hirst (Womersley 1956).

The occurrence of extended periods of low humidities, and of low rainfall and hence drying out of otherwise suitable media, operates against extensive build-ups of the primary feeding Tyroglyphidae, particularly in the more primitive habitats such as straw, hay and debris. The frequent recording of hypopial forms in such localities as well as in grain and food storages indicates the integral role of this stage in the survival of this group under local conditions. Applied control of species of Tyroglyphidae is rarely warranted—one notable exception has been the complex of *Acarus siro* (in cool stores), *Tryophagus casei* and *Tyrophagus longior* (holding rooms), which were recorded in 1947 as pests of cheese stores (Nichols and Weddell 1949). This occurrence, however, was exceptional in that transport difficulties were experienced in the State during this year and cheeses were held in factories for longer than normal periods (Smith 1947). *A. siro* is not otherwise common; this is possibly linked with higher year-round temperatures than in other parts of its range.

Tyrophagus putrescentiae is the most common species associated with stored products in Queensland and probably the most destructive. High populations have been recorded in many stored products and particularly in peanuts stored in silos (Champ 1965). The predator *Cheyletus malaccensis* is usually associated with *T. putrescentiae* and has been observed to reduce host populations drastically. Under apparently drier conditions *Cheletomorpha lepidopterum* joins the complex and may become the major predator. Hypopi of *T. putrescentiae* have not been recorded and in drier habitats hypopus-forming *Glycyphagus destructor* becomes more common.

Caloglyphus berlesei and *C. krameri* are common in damp grain residues and usually are associated with hypopi. *Rhizoglyphus echinopus* is recorded frequently from bulbs and other underground plant storage structures. As elsewhere, *Lardoglyphus konoi*, *Suidasia nesbitti* and *Carpoglyphus lactis* appear to be confined respectively to dried animal tissue, wheat bran and pollard mixtures, and dried fruit, particularly dried figs.

The acarines found in laboratory insect cultures are *Pyemotes ventricosus*, *Thyraepagus entomophagus*, *T. putrescentiae* and the predator *Melichares tarsalis*. *P. ventricosus* is the most serious pest and severe infestations have been recorded, particularly in pupal *Sitophilus oryzae* (L.) within grain, and *Ephestia elutella* (Hübner). This acarine has been responsible for the more severe cases of annoyance to humans from stored product acarines; the importance of this group, however, is overshadowed by the activities of *Liponyssus bursa* and *L. bacoti* resulting from nesting of pigeons (*Columba livia*) and sparrows (*Passer domesticus*) in storage premises, and removal of hosts in rat-baiting campaigns respectively.

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