SCARABAEIDAE (COLEOPTERA) ASSOCIATED WITH PEANUTS IN SOUTHERN QUEENSLAND

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Abstract

The common scarabs associated with peanuts in southern Queensland are *Heteronyx piceus* Blanchard, *H. rugosipennis* Macleay, *Sericesthis ino* (Blackburn) and *S. suturalis* (Macleay) in the South Burnett, and *Pseudoheteronyx basicollis* Lea, *H.* sp. nr *rugosipennis* and *S. suturalis* at Clifton on the Darling Downs. A key to larvae of these species is presented. In the South Burnett, *H. piceus* is the major pest species, comprising 90% of larval populations under peanuts.

Introduction

In southern Queensland, peanut production is concentrated in the South Burnett region around Kingaroy (20,000 ha), with smaller areas grown near Gayndah in the Central Burnett (3,500 ha) and at Clifton on the Darling Downs (1,500 ha). Scarab larvae were first recorded as peanut pests by Smith (1946) who reported larvae of *Rhopaea magnicornis* Blackburn damaging peanut crops after a pasture fallow period. Damage by such 2-year life-cycle species has declined as pasture has been removed from crop rotations.

Scarabs were next reported attacking the crop in 1962 (R. G. Winks, pers. comm.). He found a *Heteronyx* sp. damaging crops in the South Burnett; it was univoltine and the biology appeared to be closely tied to the development of the peanut crop. Scarab larvae are now common under peanuts in the South Burnett and cause substantial yield losses (Rogers and Brier in press). *Pseudoheteronyx basicollis* Lea, the black sunflower scarab, was noted on peanuts at Clifton in 1973 (P. G. Allsopp, pers. comm.).

The control of scarabs on peanuts is possible through the application of granular pesticides at planting (Rogers and Brier in press). This management strategy requires the assessment of third-instar populations at the end of the previous season. This assessment requires clarification of the major pest species as well as methods for identifying the pest species as third instars.

This paper clarifies the identity of the species associated with peanuts in the South Burnett and Clifton areas of southern Queensland, based on extensive surveys by D.J.R. and H.B.B. It documents the palidial patterns of the larvae of each species and presents data on the relative abundance of scarab larvae in South Burnett peanut crops between 1980/81 and 1988/89. An illustrated key to larvae (by K.J.H.) is also presented.

Methods

Specimens for identification were collected from the soil under peanut plants; larvae were collected in March-May, and adults in November-December. South Burnett specimens were collected between 1976 and 1989, while Clifton material was collected during 1988 and 1989. Larvae were characterised using palidial patterns and reared in the laboratory to adults for identification. Specimens of adults and additional larvae of all identified species are lodged in the Queensland Department of Primary Industries insect collection, Brisbane.

A series of 16 insecticide trials between 1980/81 and 1988/89 provides more information on the relative importance of the various scarab species on peanuts in the South Burnett. These trials were conducted on heavily infested farms in the Corndale and Tingoora districts, 6 km and 23 km north of Kingaroy, respectively. The experiments were sampled in April-May of each year by dry sieving soil with a motorised soil sieve. Only data from the untreated plots is presented here as the chemical treatments could bias the species composition of larval collections.

Results and discussion

In 1976 a survey (by H.B.B.) of scarab larvae under peanuts and adjacent grass

[2]*Deceased.*

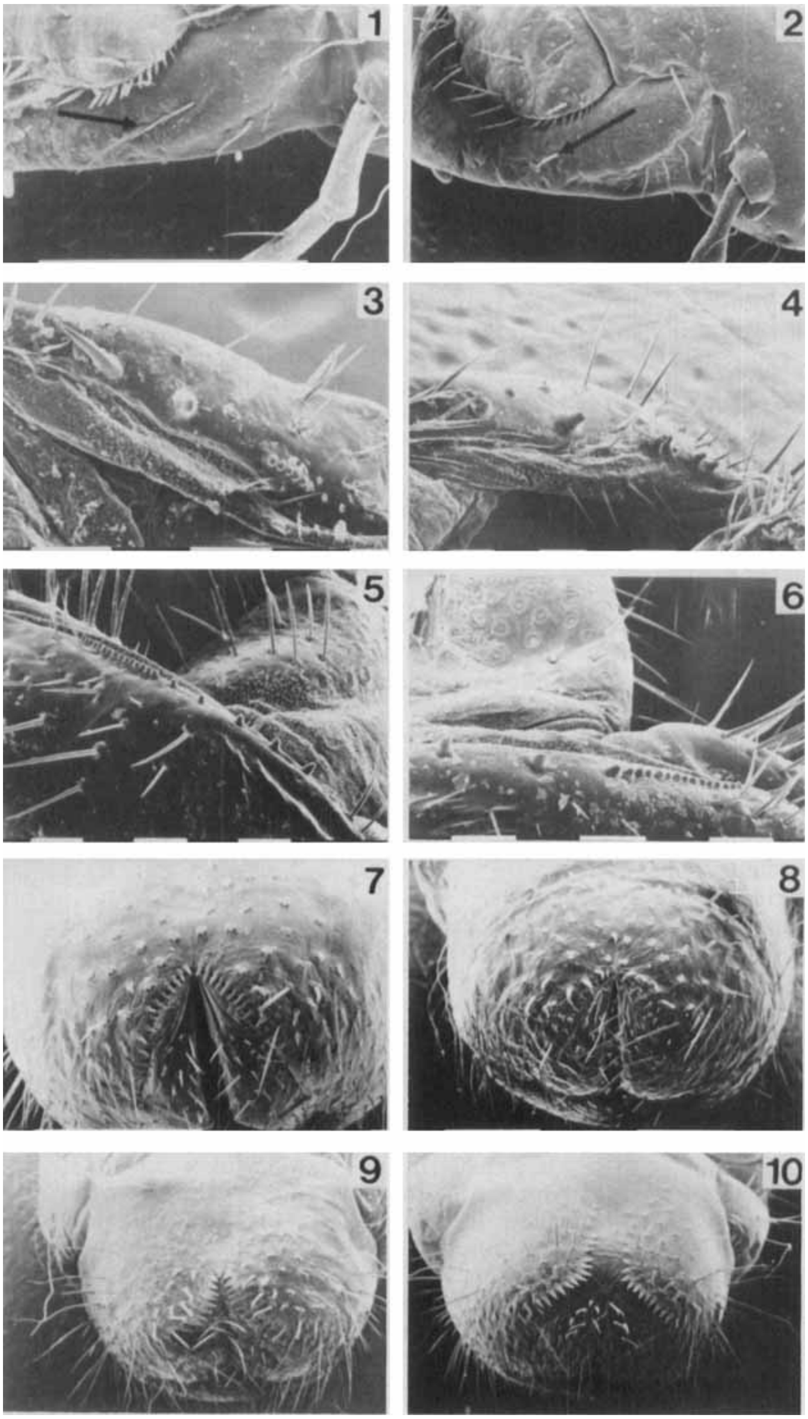
pasture in the South Burnett showed that at least 12 scarab species were present under pasture, with no one species predominating. At least 7 species were found under peanuts and 84% of individuals were of a single species. This species, a melolonthid, also comprised 14% of individuals found under pasture. The survey showed that the scarab larvae associated with peanuts in the South Burnett have 3 distinct palidial patterns. The most common pattern was a palidium in the shape of a double-stemmed Y (Fig. 10). Both other types had a V-shaped palidium. The more common of these 2 had large stout pali (Fig. 9). The third species had a V-shaped palidium and small indistinct pali (Figs 7, 8). These 3 palidial arrangements were found also in the larval samples from under peanuts at Clifton.

Identification of reared adults showed that while the same 3 palidial patterns were recorded at Clifton and in the South Burnett, different species were present in the 2 collection areas. In the South Burnett, the most abundant species was *H. piceus* Blanchard (palidium — double stemmed Y), while the less common species were *H. rugosipennis* Macleay (palidium — V shaped with stout pali), *Sericesthis ino* (Blackburn) and *S. suturalis* (Macleay) (palidia — V shaped with small pali). The *Sericesthis* spp. were much less common that the *Heteronyx* spp. The limited sampling at Clifton indicates that *P. basicollis*, the black sunflower scarab (palidium as for *H. piceus*), was the most abundant species in that area. *H.* sp. nr. *rugosipennis* (palidium as for *H. rugosipennis*) and *S. suturalis* were equally common at Clifton. Scarab populations there did not appear to be as high as in the South Burnett.

Table 1. The scarab fauna under peanuts in the South Burnett, 1980/81-1988/89.

Year	Location	Scarab density	Total species	% of population *H. piceus*	*H. rugosipennis*	*Sericesthis* spp.	Other spp.
1980/81	Tingoora	3.5/plant	4	96.4	1.8	0	1.8
	Tingoora	7.1/plant	4	93.4	2.2	0	4.4
1981/82	Corndale	6.1/m	2	96.7	3.3	0	0
	Corndale	4.8/m	1	100	0	0	0
1982/83	Corndale	3.8/m	5	54.7	21.3	0	24.0
1983/84	Corndale	16.9/m	3	93.6	3.7	0	2.7
1984/85	Corndale	24.2/m	3	92.9	5.7	0	1.4
1985/86	Corndale	4.8/m	3	87.0	12.1	0	0.9
	Tingoora	6.7/m	3	96.3	3.1	0	0.6
	Tingoora	14.5/m	3	97.1	2.3	0	0.6
1986/87	Corndale	9.5/m	6	68.3	8.4	0	23.3
	Tingoora	9.8/m	4	91.4	2.6	5.6	0.4
1987/88	Corndale	19.5/m	3	94.5	3.4	0	2.1
	Tingoora	19.0/m	4	95.5	3.7	0.4	0.4
1988/89	Corndale	16.4/m	3	85.6	1.1	0	13.3
	Tingoora	3.5/m	3	86.2	4.6	9.2	0

The data from untreated plots of the insecticide trials (Table 1) show that scarab populations averaged more than 11 larvae/m between 1980/81 and 1988/89. *H. piceus* was the most common scarab species associated with peanuts, comprising almost 90% of the scarab populations over the 9 years of trials. This species has been recorded as a minor pest of peanuts in north Queensland (Gough and Brown 1988). *H. rugosipennis* larvae were the next most common species in the South Burnett. This species was present in all trials, except one, and on average accounts for 5% of scarab populations. *Sericesthis* spp. were collected in only 3 trials and cannot be regarded as significant pest species. A total of 9 other species were recorded in the trials, but together they usually comprised less than 5% of the scarab fauna. In the 3 trials where these other species contributed more than 10% of the total population, most specimens were from 2 species of unidentified Dynastinae. These species had 2-year life-cycles and appeared to be feeding on stubble from the preceding maize crop. Both species key to Dynastinae in Britton (1974) and McQuillan (1985) and can be distinguished by the following characters: species A — raster with tegillar setae semi-decumbent and straight, last antennal segment with 2 dorsal sensory spots; species B — raster with tegillar setae erect (*ca* 90°) with setal apicies curved posteriorly, last antennal segment with 4 (3-5) dorsal sensory spots.



FIGS **1-10**—Larvae of *Sericesthis*, *Heteronyx* and *Pseudoheteronyx* species: **(1-2)** left mandible, dorsolateral view (mediodorsal setae arrowed): **(1)** *S. ino*; **(2)** *H.* sp. nr. *rugosipennis*; **(3-6)** maxillary stridulatory teeth: **(3)** *S. ino*, dorsal view; **(4)** *S. suturalis*, dorsolateral view; **(5)** *H.* sp. nr. *rugosipennis*, lateral view; **(6)** *P. basicollis*, dorsolateral view; **(7-10)** raster: **(7)** *S. ino*; **(8)** *S. suturalis*; **(9)** *H.* sp. nr. *rugosipennis*; **(10)** *P. basicollis*. Scale lines (white bars) = 1.0 mm for Figs 1, 2, 7-10; 0.1 mm for Figs 3-6.

The following key to larvae includes scarab species reared from under peanuts in the South Burnett and at Clifton. Terminology follows that of McQuillan (1985).

Key to the common scarab larvae (instar III) under peanuts in south Queensland (Minor characters or additional description are given square brackets)

1. Eyespot absent on frons above antennal socket; maxillary stridulatory area with proximal peg backwardly pointed and sharkfin-shaped (Figs 3, 4); mandibles with 3 or 4 mediodorsal setae (Fig. 1); [palidium broadly V-shaped with small pali, longest pali at most 0.076 mm long] 2
   Eyespot present on frons above antennal socket; maxillary stridulatory area with proximal peg conical (Figs 5, 6); mandibles with 1 mediodorsal seta (Fig. 2); [palidium Y-shaped or if V-shaped, then with large pali, longest pali at least 0.127 mm long] 3
2. Maxillary stridulatory area (Fig. 3) with 2 widely spaced pegs, proximal one sharkfin shaped, with a row of 5-9 contiguous tubercles [a small break in row may be present], spacing between pegs and start of row *ca* equidistant; distance between pali mostly less than length of pali (Fig. 7), longest palus [0.064-0.076 mm long] *ca* one-third the length of longest hamate seta in row on teges adjacent to pali [palidium with 8-13 pali in each slightly curved row, 1-2 setae offset from row distally i.e. away from angle of V, angle *ca* 90° or less; head capsule width 2.45-2.7 mm (n = 8)] . . . . **Sericesthis ino** (Blackburn)
   Maxillary stridulatory area (Fig. 4) with 2 widely spaced large pegs, proximal one sharkfin-shaped, at about same distance distally with 3 (sometimes 2 or first peg may be doubled as in Fig. 4) small pegs *ca* equidistant but closer together than distance between large pegs; distance between pali mostly less than length of pali (Fig. 8), longest palus [0.051-0.076 mm long] *ca* one-fifth to one-sixth the length of longest hamate seta in row on teges adjacent to pali; [palidium with 8-12 pali in each row, 2-4 setae offset from row distally, angle *ca* 90° or more; head capsule width 3.6-4.1 mm (n = 4)] . . . . **S. suturalis** (Macleay)
3. Palidium V-shaped (Fig. 9) 4
   Palidium Y-shaped (Fig. 10) 5
4. Longest palus [0.165-0.20 mm] *ca* half length of longest hamate seta on teges in row adjacent to pali, palidial angle *ca* 90° or more; [palidium with 8-11 large pali per row; head capsule width 3.7-3.9 mm (n = 8); maxillary stridulatory area with a row of 5-7 pegs *ca* equidistant plus a row of 8-16 contiguous tubercles, start of row closer to last distal peg than distance between pegs] . . . . **Heteronyx rugosipennis** Macleay
   Longest palus [0.127-0.153 mm] *ca* one-third of longest hamate seta on teges in row adjacent to pali, palidial angle *ca* 70° (Fig. 9); [palidium with 8-11 large pali per row, head capsule width 3.6-3.8 mm (n = 4); maxillary stridulatory area (Fig. 5) with row of 5-7 pegs *ca* equidistant and distally with row of 15-17 contiguous tubercles, start of row closer to last peg than distance between pegs] . . . . **H.** sp. nr. **rugosipennis** Macleay
5. Maxillary stridulatory area with 5-7 pegs becoming closer distally with distal 2-3 pegs close and with row of 13-18 contiguous tubercles adjacent to most distal tooth; campus with 17-28 pigmented spots lateral to each tegulum posteriorly; [palidium with 11-16 large pali per row, longest pali 0.102-0.127 mm; head capsule width 2.85-3.4 mm (n = 9)] . . . . **H. piceus** Blanchard
   Maxillary stridulatory area (Fig. 6) with 3 pegs *ca* equidistant and with row of 11-15 contiguous tubercles very close (sometimes adjacent) to most distal tooth; campus with 3-8 pigmented spots lateral to each tegulum posteriorly; [palidium (Fig. 10) with 12-17 pali per

row, longest pali 0.127-0.153 mm; head capsule width 3.4-3.5 mm (n = 7)] . . . . **Pseudoheteronyx basicollis** Lea

Within the tribe Scitalini, McQuillan (1985) noted a posterior backwardly pointed peg in the maxillary stridulatory area of *Scitala sericans* Erichson, *Sericesthis nigra* (Lea) and *S. nigrolineata* (Boisduval), but not for *Telura* sp. or *T. vitticollis* Erichson. This corresponds to the proximal sharkfin-shaped peg noted above for *Sericesthis ino* and *S. suturalis*. Thus, this backwardly pointed sharkfin-shaped peg on the maxillary stridulatory area appears to be a generic character for some Scitalini (e.g. *Sericesthis* and *Scitala*).

Although McQuillan (1985) did not mention the mediodorsal setae on the mandibles, noted in couplet 1 above, it seems to be a useful character at the species level. From the figures of head capsules of Melolonthinae in McQuillan (1985), it appears that *Heteronyx tasmanicus* Blackburn (Heteronycini), *Telura* sp., *Scitala sericans* and *Sericesthis nigra* (Scitalini) have 1 mediodorsal seta on each mandible, while *Sericesthis nigrolineata* has 3 or 4 mediodorsal setae per mandible.

From the information presented here we conclude that the major scarab pest species associated with peanuts in the South Burnett area of Queensland is *H. piceus*. Identification of *H. piceus* larvae is now possible using the palidial and other characters presented in the key. This information could be used as an essential part of a management strategy for scarab pests of peanuts in southern Queensland.

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