New Records of *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) from South Australia and Western Australia

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ABSTRACT Records of *Helicoverpa armigera* from pheromone and light traps are presented for areas of South Australia and Western Australia where this agricultural pest has not previously been recognised. Although considerably less abundant than *H. punctigera*, *H. armigera* was recorded at all trap locations in the two states, many of which were in arid inland areas devoid of agricultural crops. A better definition of the distribution of this species may assist in understanding the dynamics of pesticide resistance in populations within the cropping areas.

Helicoverpa armigera (Hübner) and *H. punctigera* (Wallengren) are major pests of cropping in many parts of Australia. *H. armigera* has a cosmopolitan distribution throughout Africa, Asia and Australia (Fitt 1989), while *H. punctigera* is endemic to Australia. Both species are highly polyphagous and mobile, although unlike *H. punctigera*, *H. armigera* has a propensity to develop resistance to chemical pesticides (Daly 1993; Forrester *et al.* 1993).

Common (1953) defined the distribution of *H. armigera* in eastern Australia as "largely confined to coastal and subcoastal Queensland and New South Wales". A few specimens from western Queensland were considered vagrants, while doubts were cast on the validity of three undated, but old, specimens collected from near Adelaide, South Australia (SA). Zalucki *et al.* (1986) updated the known distribution adding records from various authors during the 1960s which showed *H. armigera* still most abundant in coastal Queensland and New South Wales (NSW), but with scattered specimens from inland cropping areas of western and southern inland NSW and from the Kimberley region of far north-western Western Australia. Both Common (1953) and Zalucki *et al.* (1986) urged the need for more extensive sampling of adults and larvae to better define the distribution of *H. armigera*, particularly in non-cropping areas. Elsewhere we present trapping and host plant data for *H. armigera* and *H. punctigera* in much of inland eastern Australia (Gregg *et al.* 1993, 1994; Zalucki *et al.* 1994). In this paper we highlight some recent records of *H. armigera* from South Australia and from parts of Western Australia where it has not previously been reported.

As a part of studies of the ecology of *Helicoverpa* spp. in non-cropping areas of inland Australia (Fitt *et al.* 1990; Gregg *et al.* 1990), we established an extensive network of monitoring traps throughout much of eastern Australia (Fig. 1). A network of pheromone traps was originally established in 1987. Further traps were added in winter 1990 and 1991, most in collaboration with the CSIRO Double Helix Science Club, a schools-based science education club. Each site was equipped with a pair of dry funnel pheromone traps (Gregg and Wilson 1991), one for *H. armigera* and one for *H. punctigera*, which were cleared at weekly intervals by local collaborators. In South Australia, pheromone traps were initially established at four sites (Clare, Gladstone, Port Lincoln, Woomera) with three sites added in 1991 (Tarcoola, Oodnadatta, Arkaroola). In Western Australia there were two sites, one in suburban Perth (Marangaroo) and one in the inland (Giles). Traps were baited with the appropriate Hercon plastic laminate sex pheromone lures (Gregg and Wilson 1991) and dichlorvos impregnated killing strips, which were replaced monthly. Traps were cleared at weekly intervals and catches were sent by mail to UNE at Armidale, where identifications were confirmed.

During 1991 light traps were also established at three of the sites in SA (Tarcoola, Arkaroola, Oodnadatta) and one in WA (Giles). These were Pennsylvania type light traps (Gregg and Wilson 1991) operating on 240 V power and equipped with 40 W BLB fluorescent tubes. The traps were activated by time switches and cleared regularly, often daily, by local collaborators. All catches were sent to UNE, where they were sorted and identified. All specimens which had wing markings resembling *H. armigera* were dissected for confirmation of identity using characteristics of the genitalia (Common 1953).

Pheromone and light trapping has greatly extended the known distributions of both species of *Helicoverpa* well into inland parts of Queensland and NSW (Fitt *et al.* 1990; Gregg *et al.* 1993, 1995). In these areas, *H. punctigera* is the predominant species, accounting for 98% of all trap captures and a similar proportion among collections of larvae from a range of host plants (Zalucki *et al.* 1994). Results for our traps in

South Australia and Western Australia confirm that *H. armigera* is also widespread, though much less abundant than *H. punctigera* in these areas (Table 1). It was recorded from all eight sites in

Table 1. Records of *H. armigera* and *H. punctigera* from pheromone traps and light traps at sites in South Australia and Western Australia during 1991-1993.

Site	Trapping Period	Total *H. armigera*	Total *H. punctigera*
Pheromone traps			
Gladstone, SA	April 1991-October 1992	60	10,068
Arkaroola, SA	November 1991-April 1993	2	372
Oodnadatta, SA	October 1991-June 1993	1	462
Tarcoola, SA	October 1991-May 1993	6	530
Innaminka, SA	September 1990-October 1993	15	956
Port Lincoln, SA	July 1990-December 1992	7	1,253
Clare, SA	July 1990-October 1993	2	3,366
Woomera, SA	June 1990-June 1991	1	44
Marangaroo, WA	June 1990-November 1993	8	22
Giles, WA	October 1991-October 1993	21	656
Light traps			
Arkaroola, SA	November 1991-April 1993	18	3,174
Oodnadatta, SA	October 1991-June 1993	139	9,404
Tarcoola, SA	October 1991-May 1993	4	4,277
Giles, WA	October 1991-May 1993	7	5,169

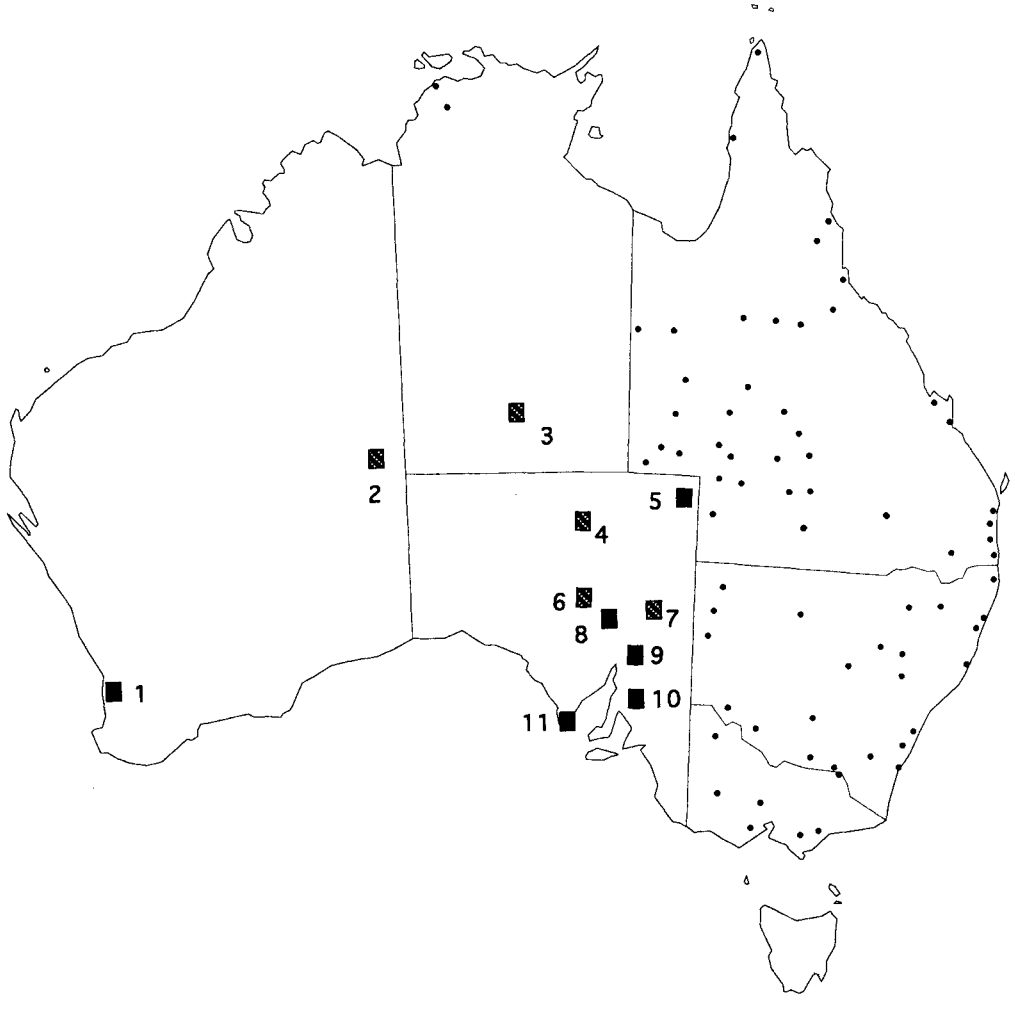

Fig. 1. Pheromone and light trap locations: 1—Marangaroo, 2—Giles, 3—Alice Springs, 4—Oodnadatta, 5—Innaminka, 6—Tarcoola, 7—Arkaroola, 8—Woomera, 9—Gladstone, 10—Clare, 11—Port Lincoln. Other trap sites in the network through eastern Australia are also shown (•).

SA, making up 0.06% to 2.2% of the catch, and at both sites in Western Australia. In addition to these records, 39 specimens of *H. armigera* (plus 3,420 *H. punctigera*) were recorded from a light trap at Alice Springs between December 1990 and June 1993. Several of the sites where *H. armigera* was recorded are in arid areas where no cultivated host plants are available, but where erratic autumn rainfall leads to prolific growth of a range of ephemeral plants, some of which are hosts for both species (Gregg *et al.* in press; Zalucki *et al.* in press).

Our records clearly indicate that *H. armigera* is not restricted to cropping areas as earlier believed (Common 1953). Although the population ecology and migratory patterns of *H. punctigera* in inland Australia are now better understood (Gregg *et al.* 1993, 1994), the significance of the inland populations of *H. armigera* and their interchange with the much more abundant populations in cropping areas (Fitt 1989) is not clear. Previous records of *H. armigera* from South Australia are few. Apart from those recorded by Common (1953), unpublished records in the Insect Collection of the SA Dept. of Agriculture have subsequently shown a single specimen of *H. armigera* reared from cabbages collected at Virginia, near Adelaide on 23 March 1978. Several other *Helicoverpa* specimens collected in *H. armigera* pheromone traps in SA have proved, upon dissection, to be *H. punctigera* (P. Bailey, pers. comm).

In Western Australia there are no historical records of *H. armigera* from the southern part of the state and more recent studies involving an extensive network of light traps has also failed to demonstrate the presence of this species (K. Walden, pers. comm.). While it appears unlikely that *H. armigera* is common in the area, it is feasible that small numbers could be overlooked in light trap catches containing large numbers of *H. punctigera* and other insects.

One difficulty with our Perth records is that they come from a suburban site where the possibility of an introduction of larvae on produce cannot be dismissed. Nevertheless, we suggest that more extensive trapping using pheromone traps in conjunction with the established light trap network (operated by WA Agriculture) may help to clarify the presence and distribution of *H. armigera* in that state. The presence of small numbers of *H. armigera* in cropping areas of southwestern WA could be significant given the propensity of this species to develop resistance to pesticides, most recently to the synthetic pyrethroids (Gunning *et al.* 1984). The heavy reliance of the lupin industry in that state on synthetic pyrethroids for control of spring infestations of predominantly *H. punctigera* could impose significant selection pressure on a small background population of *H. armigera*. The same potential for inadvertent selection for resistance in small populations of *H. armigera* on winter/spring legumes also exists in Victoria and South Australia, where crops of field peas and lupins may be sprayed with pyrethroids. Although rarely detected, *H. armigera* is also present on these crops. Pyrethroid use on these spring crops could exacerbate selection for resistance in summer crops, both by applying selection pressure on an additional unrecognised generation of *H. armigera* and by potentially increasing the relative abundance of *H. armigera* in these populations.

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