



Australian Government

Department of Agriculture, Fisheries and Forestry

Australian Plague Locust Commission

Activity Report 2005-2006



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Introduction

The Australian Plague Locust Commission was established in 1974 and began operations in late 1976. The Commission is financed by the States of New South Wales, Victoria, South Australia and Queensland, with a matching contribution from the Australian Government. The Commission consists of six Commissioners: one from each contributing State, one each from the Department of Agriculture, Fisheries and Forestry and the Department of the Environment and Heritage, and a Director assisted by permanent staff. The Director and staff are members of the Department of Agriculture, Fisheries and Forestry Australia (DAFF). Observers may be invited to attend Commissioners' meetings subject to agreement by Commissioners. The Commission is responsible to the Minister for Agriculture, Fisheries and Forestry and State Premiers.

APLC Charter

In August 2002, a Memorandum of Understanding (MOU) was signed between the Department of Agriculture, Fisheries and Forestry (DAFF) on behalf of the Australian Government and participating member States effectively replacing the original (1974) Exchange of Letters under which the APLC was established. The MOU also incorporated a Charter that replaced the original terms of reference under which the APLC had operated since its establishment.

The purpose of the APLC, as defined in the Charter, is “to control locust populations in those situations where they have the potential to inflict significant damage to agricultural industries in more than one member state.” In fulfilling its charter, the APLC is required to:

Implement a preventive control strategy to minimise economic loss to agricultural industries caused by the Australian plague locust, spur-throated locust and migratory locust, with priority given to Australian plague locust.

Minimise risk of locust control to the natural environment, human health and markets for Australian produce.

Develop improved locust management practices through a targeted research program.

Provide a monitoring and forecasting system for operations conducted by APLC and member states.

Promote and facilitate adoption of best practice in locust control by member states.

Participate in cooperative national and international programs for development of APLC expertise.

Continually review APLC operations to ensure they keep pace with the expectations of industry, community and government.

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Review of the 2005-2006 season

In the spring of 2005-06, the APLC was again involved in significant locust control activities in the southern Riverina area of New South Wales. APLC staff were also involved in providing technical support to Victorian authorities following the development of several outbreaks in Victoria. In late December 2006, there was some good evidence of long distance locust migration from the NSW Riverina and possibly parts of northern Victoria to the north and north-west with locust population possibly reaching parts of the Channel Country of south-west Queensland. Whilst the APLC has been aware of previous migrations from northern and central NSW into Queensland, it was not believed that locust populations from southern NSW would move back into the Channel Country.

By mid January, a potentially serious locust situation developed in the Channel Country with adult locusts widely distributed at concentration to swarm density. Whilst much of the Channel Country was dry, there were sporadic strip storms during January 2006. APLC ground surveys detected egg laying in a few areas and there was a risk that strip storms across the region may have resulted in significant locust breeding. An extensive aerial survey was therefore undertaken in early February. The aerial survey failed to detect any hopper bands and found that conditions were generally dry or very dry indicating that the localised storms had not been sufficient to generate a good vegetation response.

A number of important reviews were undertaken during 2005-06. An independent performance review of the Commission was undertaken by Dr Kevin Sheridan (AO). This review made a number of recommendations the majority of which were endorsed by APLC Commissioners. In addition, an independent review of APLC work level classifications was completed. The Australian Bureau of Agricultural and Resource Economics (ABARE) was commissioned to undertake an economic analysis of APLC locust control activities. The study conservatively estimated an average benefit:cost ratio of approximately 6.5:1 over the past five years (2000-2005).

Mr Steve McCutcheon, Executive Manager of the Product Integrity, Animal and Plant Health Division of the Department of Agriculture, Fisheries and Forestry, assumed the role of Chairman of the Commission in 2005 following the re-assignment of Dr Gardner Murray to other senior executive responsibilities within the department. Mr Dennis Hopkins, South Australian Commissioner, retired in May 2006.

Good progress was made in a number of research areas including locust migration, environmental impact and pesticide application. A new research strategy was also developed to provide a framework for future research. There was also ongoing research collaboration with a number of universities through the APLC's involvement as an industry partner on several Australia Research Council Linkage projects.

Laury McCulloch
Director

Locust situation

Australian plague locust

Overview

Locust populations across eastern Australia generally remained at low levels in 2005-06 with the ongoing widespread drought restricting opportunities for reproduction and associated population increase. There were two exceptions. Firstly, locust activity in the Riverina area of southern NSW in the spring required the APLC to undertake moderate scale control operations. The second exception was in parts of Victoria where significant locust activity occurred in the spring and summer requiring control intervention by Victorian authorities.

The lack of significant summer rainfall in the Channel Country of south-west Queensland appeared to negate the potential threat of an outbreak following migration into the area in late 2006. By the autumn locust population levels were low throughout most of eastern Australia

New South Wales

In the autumn of 2005 only a few confirmed reports of laying had been received from the Riverina and the APLC found it difficult to predict the likely level of possible infestations in the spring. The APLC believed there was a likelihood that there would be a need for landholders to undertake ground control of small bands and that the APLC may need to undertake small-scale aerial control.

Hatching of over-wintering eggs commenced in the Deniliquin area in late September and by mid October high density early instar nymphs were observed near Barratta. Two main areas of hopper band activity were identified to the north of Deniliquin around Wanganella and another area to the south near Mathoura. Remnant swarms from control in the previous autumn had aggregated and laid in these areas in March and April 2005 and a few low density swarms had also moved into adjacent areas of northern Victoria.

By late October, numerous small bands infested the Deniliquin area extending east to Jerilderie, Tocumwal, Cobram, Rand and Lockhart (Fig. 1). Hopper band targets were seen intermittently from the air depending on the prevailing weather conditions. The variability in weather conditions and visibility of bands complicated control efforts as did the need to survey and undertake control operations in two distinct separate areas. Aerial control of hopper bands started on 2 November and ended on 16 November with a total of 125 targets controlled comprising an area of approximately 222 km² (Table 1).

The subsequent swarm campaign required the deployment of two helicopters due to the operational need to survey and undertake control operations simultaneously both to the north and south of Deniliquin. A second control base was established at Jerilderie for swarms forming further north and east. The swarm campaign was also protracted mainly due to targets forming progressively from lower density populations throughout most of December. A total of 144 swarms were aerially sprayed comprising an area of 331km² (Table 1). During the control campaign there was good liaison with the NSW Department of Environment and Conservation (DEC) in relation to locust control in areas containing habitat of the endangered plains wanderer. Staff from the Murray and Riverina Rural Lands Protection Board also provided invaluable support to the APLC during control operations.

There appear to have been several significant night migrations from the Riverina northwards towards the Nyngan-Bourke area from late November and migratory movements to the north continued until late December. Swarms were found at Nyngan, Bourke, Brewarrina and Enngonia during December. The December migrations appear to have involved a significant population as high numbers of insects, many exhibiting the radar characteristics of locusts, were recorded by the Bourke insect monitoring radar (IMR). Shortly after the late December migration swarms were found in the Channel Country of south-west Queensland in dry conditions.

A second period of migrations, primarily to the west occurred during January and February. Swarms were found in the Tibooburra area after mid January, but locust numbers declined in this area in February (Fig. 2). Small scale egg laying occurred near Broken Hill in late January after the appearance of a few low density swarms associated with storm rains on 20 January. A few small bands and sub bands developed during February-early March (Fig. 3). The APLC closely monitored the situation but the localised nature and scale of the hopper bands did not warrant any aerial control measures. These bands provided an opportunity for researchers from the University of Sydney to study band movement and feeding behaviour.

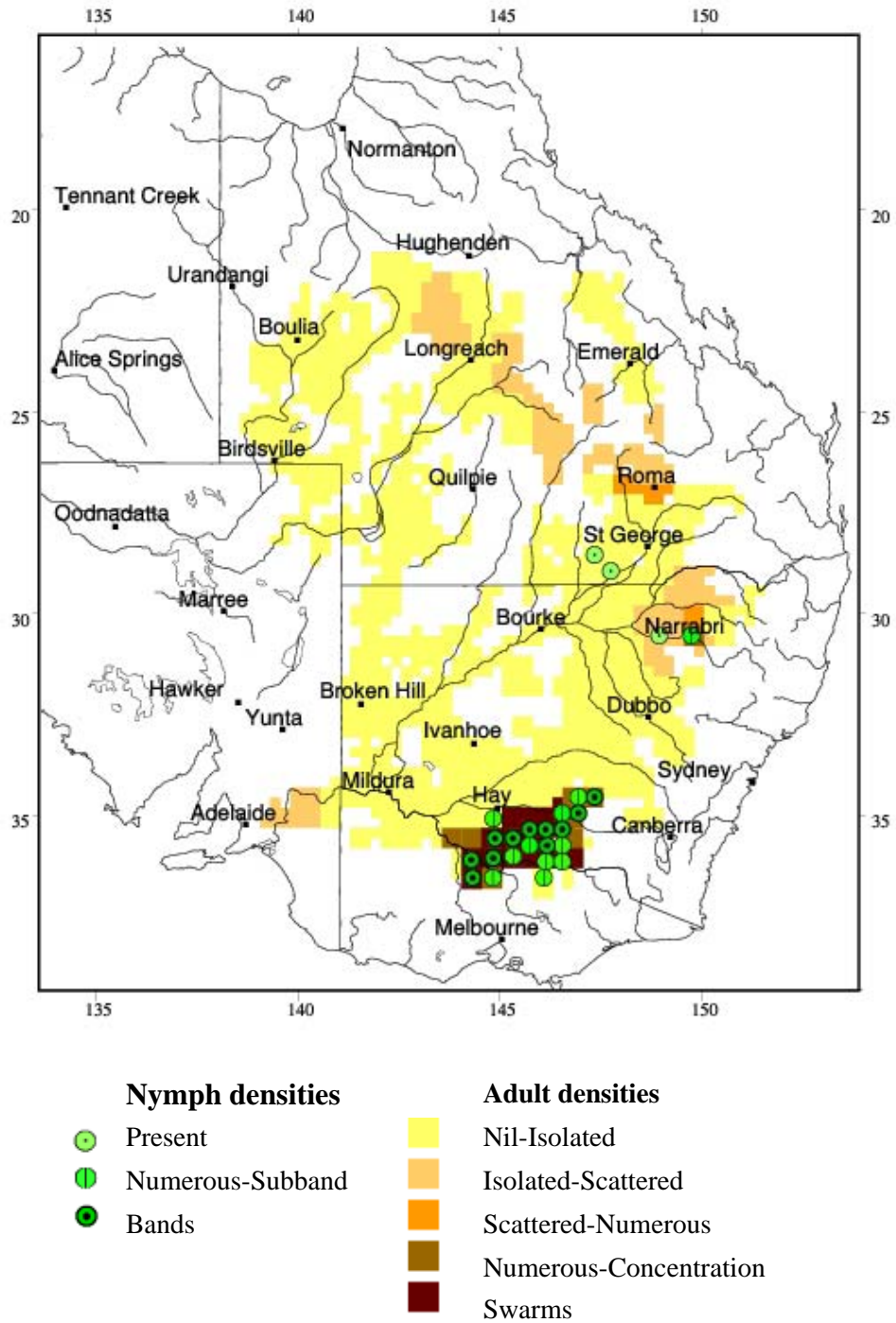
Adults at medium densities were found in parts of the NSW Central West and Northwest Plains during February and numerous density nymphs found near Tottenham and Moree-Collarenebri indicated some breeding occurred in these areas. Locust numbers declined during March - April and no significant autumn egg laying was evident.

Queensland

Locust numbers remained at very low levels throughout Queensland in the spring (Fig. 1). However, in January 2006 a potentially serious situation developed in the Channel Country of south-west Queensland and adjacent areas of South Australia and western NSW (Fig. 2). Following initial reports of locusts in January 2006, APLC ground surveys found a generally widespread locust population at relatively high density (numerous concentrations and a number of low density swarms) throughout south-west Queensland. Samples of locusts indicated that some had started to develop eggs in areas where strip storms had occurred. The APLC assessed the overall population as similar in scale to the population that developed in the Channel Country in January-February 2004. Given the widespread extent of the population, extensive aerial and ground surveys were undertaken in early February to detect hopper bands. No hopper bands were detected from the air and only a few small bands were found by ground survey near 'Nappa Merrie' in early February, and near Monkira in early March (Fig. 3). Vegetation conditions were dry to very dry in most areas as storm rains in January had been isolated and did not result in a significant vegetation response. Follow up ground surveys in February indicated that the adult population had declined substantially from that present in January.

Further monitoring by ground surveys during late February and early March was disrupted by rainfall. Concentration density adults persisted near Bimerah, south of Longreach, in February and storm rains in mid February allowed localised breeding to occur. Small bands were found at Bogewong in early March and medium density nymphs were also found in the Longreach – Winton area (Fig. 3). However, these populations were small in scale and localised and did not warrant control by the APLC.

Australian Plague Locust Distribution



Densities estimated for areas of locust habitat, based on survey and reports

Figure 1: Australian plague locust distribution: November 2005

Australian Plague Locust Distribution

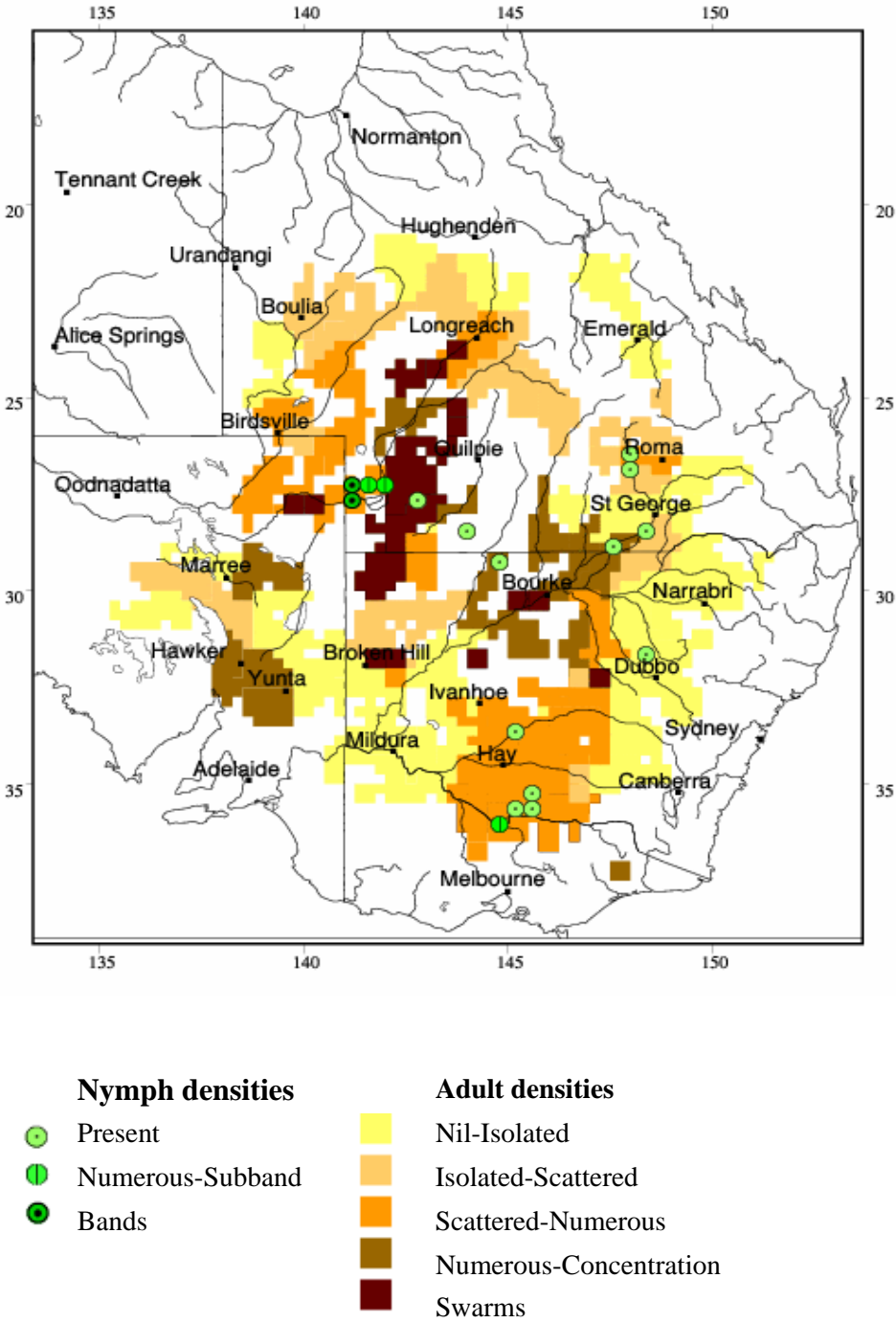
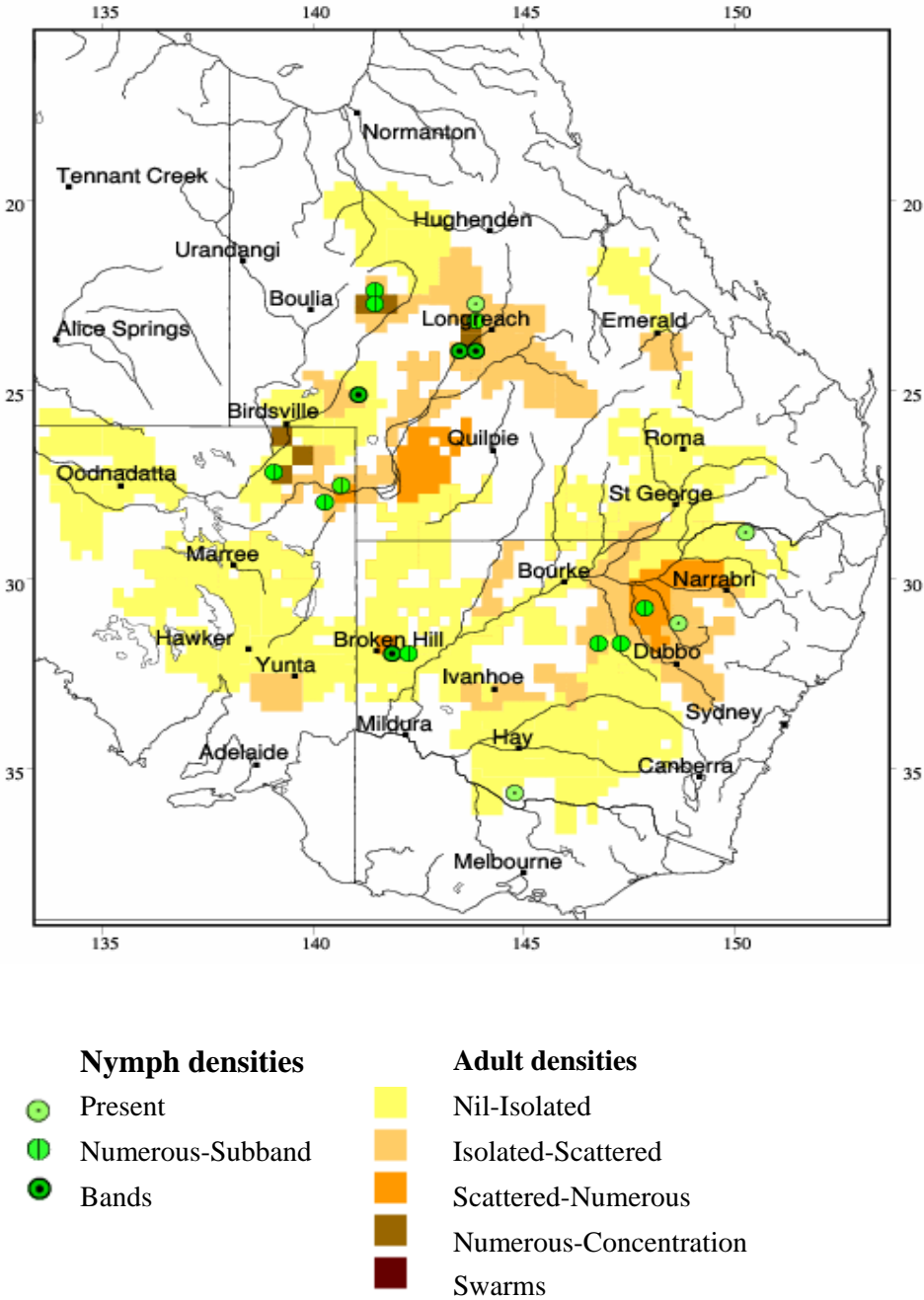


Figure 2: Australian plague locust distribution: January 2006

Australian Plague Locust Distribution



Densities estimated for areas of locust habitat, based on survey and reports

Figure 3: Australian plague locust distribution: March 2006

Victoria

A significant locust population developed in Victoria in the spring. The main locust population was present in an area outside the APLC area of operations. Hopper bands developed in the Mitiamo area of central Victoria and an infestation also developed in the Omeo-Swifts Creek area (Fig. 1) possibly as a result of undetected migration into the Omeo Valley in autumn 2004. Control of hopper bands was undertaken by landholders, local and Victorian state authorities. However, by early December a number of swarms formed in both these areas and further control operations were undertaken.

In central Victoria there was a gradual movement of the swarms to the south and laying was reported in the Bendigo area in late January. Despite control measures in the Swifts Creek-Omeo area, substantial laying by swarms occurred in December through to early January and a large number of hopper bands formed in January 2006 (Fig. 2). A major control campaign was mounted by Victorian authorities against the hopper band infestation in the Swifts Creek-Omeo area in January. The campaign was very effective and no swarms formed in the area. The APLC provided significant quantities of the bio-pesticide Green Guard and conventional pesticides to Victoria, on a replacement basis, for swarm and band control and also provided technical advice during the control campaigns.

South Australia

Throughout most of the 2005-06 locust season only very low numbers of plague locust were found by APLC surveys in the northeast of South Australia. During January 2006, however, concentration to swarm density adults were found near Innamincka, Woomera and Moolawatana (Fig. 2). These locusts appear to have been migrating swarms from the east, which layed in a few locations where rains occurred in late January as evidenced by the subsequent occurrence of medium density nymphs at Innamincka and 'Clifton Hills' in mid March. In late March 2006 reports were received of an adult locust population from the Nullarbor area of south west South Australia. This area had received significant rainfall in the period January to March 2006. Surveys by South Australian authorities in March and April confirmed the presence of the adult locusts and indicated that laying had occurred. The eggs laid were forecast by the APLC as likely to over-winter and to hatch in the spring.

Western Australia

In March 2006 the Department of Food and Agriculture Western Australia (DAFWA) reported significant widespread locust populations were present in northern and central parts of the Western Australian wheat-belt and that it was suspected that egg laying had occurred. Follow up surveys by DAFWA in April 2006 indicated that egg-laying was extensive and that a serious locust outbreak was expected to develop in the spring when eggs hatched.

Spur-throated locust

No significant populations of the Spur-throated locust were reported during 2005-06.

Migratory locust

No significant populations of the Migratory locust were reported during 2005-06.

Operations

The Operational Plan for 2005-2006 was endorsed by Commissioners in August 2005. The plan defined expected outcomes to be achieved by the APLC during the year together with outputs and risks.

Forecasting, Information and Survey

Eight Locust Bulletins were issued during the period September 2005 to April 2006. In addition, when control operations were undertaken in the NSW Riverina the APLC provided stakeholders with details of its control operations through several issues of its Locust Management Advice during October-December 2006.

In February 2006 extensive fixed wing aerial surveys were undertaken in the Channel Country of Queensland and adjacent parts of South Australia and New South Wales. Aerial surveys were also undertaken in the Broken Hill area of New South Wales. These surveys were a precautionary measure to ascertain whether significant hopper band populations were present. No hopper bands were detected by the aerial surveys in the Channel Country although several small bands were detected by ground survey to the east of Broken Hill.

The 2005-06 season was characterised by frequent adult migratory movements beginning after the fledging of the spring generation and continuing until March. The interpretation of events was supported by data obtained from the Insect Monitoring Radars (IMR), which recorded a high frequency of nights with larger (i.e. locust sized) insects in the 300-900m altitude range (18 nights during December). The radar data indicated a predominant movement to the north and northwest during December strongly suggesting that long-distance migrations were responsible for the occurrence of swarms in southwest Queensland in January. The development of several persistent low pressure trough systems during late December and early January produced convergent winds over western Queensland and NSW that potentially could have concentrated migrant adult locusts from a wide area of NSW and Queensland. There is also evidence for a further period of migrations, predominantly to the west, in late January and February coincident with the apparent decline in locust numbers in western Queensland. Multiple data sources including radar data, APLC survey report information, light trap and wind trajectory information provide convincing, if inferential, evidence for explaining and understanding the role of migrations in locust population fluxes, which occur during outbreak years.

The APLC's HP Palm Pilots used for recording survey data were replaced with newer model Hx4700 PDA's during the 2005/06 season. The new PDA's incorporate survey software developed by Exa-min technologies with GPS and moving map capabilities. Maps containing historical locust information, sensitive areas (organic properties, plains wanderer mapped habitat, and National park boundaries), and property boundaries were developed by the APLC's GIS manager and incorporated in the PDA's. PDA's used by APLC staff in aircraft during the seasons control campaigns greatly enhance the quality control and environmental safety capabilities.

Pesticide development and trials

The presence of locusts in the Riverina in the spring allowed two initial trials to be conducted on the potential use of fipronil as a barrier spray involving spraying into the wind. Initial results indicated promising results in terms of nymphal mortality although further trials will be required to validate the technique. These trials are seen as potentially important in providing a possible alternative to drift spraying and in reducing possible adverse impacts on non target species. Limited research on the field persistence of the bio-pesticide Green Guard were also undertaken.

Control Operations and Pesticide Use

A summary of APLC locust control operations in 2005-06 is presented in Table 1. In terms of the scale of control operations, the 2005-06 season was relatively low. The areas treated using Green Guard, fipronil and fenitrothion are shown in Table 2.

Table 1: Control Operations 2005-06

Control Base	Type	Period	Number of targets	Area Treated (km ²)
Deniliquin, NSW	Band	2-16/11/2005	125	222.4
Deniliquin, NSW	Swarm	30/11-19/12/2005	135	289.5
Jerilderie, NSW	Swarm	9-11/12/2005	9	41.9
Total 2005-06			269	553.8

Table 2: Area treated (km²) by pesticide type: 2005-06

Fenitrothion	Fipronil	Green Guard
417	72	63
(75 %)	(13%)	(12%)

Estimated control costs and benefits 2005-06

In 2005-06 the average cost of APLC control measures, inclusive of pesticide and aircraft costs but excluding APLC staff costs, was estimated at approximately \$12 per hectare. The costs for band and swarm control were estimated at \$11 per hectare and \$13 per hectare respectively. The estimated costs incurred in 2005-06 are significantly higher than 2004-05. In comparison to 2004-05, there are several reasons for the increase in cost per hectare in 2005-06. These include the increased cost of control agents, reduced economies of scale particularly in terms of increased target search effort by fixed wing and helicopters, the higher proportion of swarm control in 2005-06 and the fact that only a small proportion of control was undertaken with fipronil which is the most cost effective agent.

Applying the economic model developed by the Australian Bureau of Agricultural Economics (ABARE), it is estimated that APLC control operations in 2005-06 avoided approximately \$6.5 million in potential crop damage.

Pesticide supply and stocks

A summary of pesticide stock, including pesticide purchased, used and the carry-over stock, is shown in Table 3 (fenitrothion and fipronil) and Table 4 (Green Guard). The APLC provided significant quantities of control agents to Victorian authorities on a loan/replacement basis. Whilst this arrangement imposes administrative cost on the APLC it has a number of benefits, including a reduced risk of obsolete pesticide stocks accumulating.

Table 3: Pesticide Stock: Summary 2005-06

	Fenitrothion (tonnes)	Adonis 3 (litres)
On Hand 1 July 2005	42.50	9,800
Purchased 2005-2006	12.60	6,000
Used 2005-2006	11.15	800
Purchased by VICDPI	3.00	nil
Stock 30 June 2006	40.95	15,000

Table 4: Bio-pesticide Stock ⁽¹⁾ 2005-06

On Hand 1 July 2005	132
Purchased 2005-2006	78
Used 2005-2006	33
Purchased by VICDPI	71
Adjustment/Write off for repackaging	2
Stock 30 June 2006	104

⁽¹⁾ For practical reasons stocks of Green Guard are expressed as the number of 14L containers

Environmental Management System

Progress was made by the APLC in meeting the objectives of its Environmental Management System (EMS). A progress report is provided at Annex 1.

Competency Based Training and Assessment

The APLC's competency based training program continued to develop and progress field staff through the required field operational elements. Both John Nolan (OIC Narromine) and Robin Graham (OIC Broken Hill) completed their Certificate IV in Workplace Training, complementing their qualifications in work place assessment obtained in 2004/05. The APLC's assistant operations manager (Heath McRae) started a Certificate IV in Occupational Health and Safety which should be completed by May 2007.

International linkages

In November 2005, at the invitation of the United Nations Food and Agriculture Organization (FAO), the Director (Mr McCulloch) participated in the briefing of a tripartite evaluation mission on the 2003 Desert Locust upsurge in Rome, Italy. The Director also participated in a peer review meeting of the report of the mission in May 2006 again at the invitation of FAO. The full travel costs of the Director's participation in both meetings were met by FAO.

The Director and the Pesticide Officer (Mr Spurgin) attended the 9th International Conference of the Orthopterists' Society in Canada in August 2005.

A proposed visit to the APLC in February 2006 by Dr Ralf Peveling, an internationally recognised eco-toxicologist with extensive expertise in the environmental impact of locust

control, was deferred until September 2006 due to the potentially serious locust situation that developed in the Channel Country of south-west Queensland in February 2006.

Occupational Health & Safety

The APLC's interim fatigue management guidelines were implemented during 2005-06. Overall the guidelines operated successfully although adherence to the guidelines requires more detailed and comprehensive planning in the deployment of APLC staff to undertake control operations.

Two vehicle accidents involving APLC staff were recorded during the year. Both accidents involved single vehicles and occurred at relatively slow speeds on wet roads. No significant injuries resulted.

A potential OH&S issue posed by the purchase of large (250kg) containers of fenitrothion in 2004-05 was avoided by an arrangement with the supplier whereby all the large containers were replaced by 100kg containers.

Administration

APLC Commissioners' met on three occasions in 2005-06. Meetings were held in Canberra on August 2005, December 2005 and May 2006. The December 2005 meeting was convened to discuss the outcomes of the independent review, an economic study undertaken by the Australian Bureau of Agricultural and Resource Economics (ABARE) and the APLC research strategy. Mr Dennis Hopkins retired as the South Australian Commissioner following the May 2006 meeting. APLC Commissioners and management expressed their thanks to Mr Hopkins for his contribution to locust control in South Australia and to the APLC over many years. Mr Hopkins will be replaced as Commissioner by Mr David Cartwright.

An independent external review of the APLC was undertaken by Dr Kevin Sheridan with secretariat support provided by Ms Julia Rymer, from the Product Integrity, Animal and Plant Health Division of the Department of Agriculture, Fisheries and Forestry. The review made sixteen recommendations, most of which were subsequently endorsed by Commissioners. The recommendations together with comments on progress with implementation are provided at Annex 2. Commissioners also endorsed the revised APLC research strategy as a framework for future research priorities.

A study on the economics of locust control, commissioned by the APLC and undertaken by ABARE, estimated an annual average benefit cost ratio for APLC operations of 6.5:1. The study estimated that APLC operations during the major 2005 plague avoided potential losses to agriculture estimated at \$55 million. The APLC also subsequently commissioned ABARE to undertake a supplementary economic study which would focus on the cost benefits accruing due to early intervention by the APLC to reduce locust populations in remote areas thereby avoiding or reducing the potential for migration into cropping areas. The results of the supplementary study will be available in late 2006.

Staffing

The Commission's staffing position at 30 June 2006 is shown in Table 5. Staff were absent from base for a total of 1130 days. Tom Jenkins (OIC Longreach) resigned from the APLC in 2006 to take up a position with in Canberra. Stacy Moor was employed for a period of approximately 4 months on leave without pay from the Victorian Department of Primary Industries. Mr Deveson was transferred to the position of Forecasting and Information Officer in August 2005. Dr Haikou Wang joined the APLC on a contract

basis in late January 2006 as the Geographic Information Systems (GIS) Officer. Dr Wang has substantial experience in GIS and insect radar research.

An independent consultant undertook a review of APLC work level classifications during the year. The review made a number of recommendations for the reclassification of several APLC positions including the position of Director, Forecasting and Information, Control and Environmental Officer. The review also recommended that the position of Deputy Director be re-established incorporating the duties of the existing Operations Manager position together with additional responsibilities. Most of the recommendations were accepted by the department and action was commenced in June 2006 to implement the recommendations.

Table 5: Staffing position at 30 June 2006 and days away from Base 2005-2006

Officer	Position	Period Employed	Days away from base
E. Deveson	Forecasting and Information Officer	Throughout	16
R. Graham	OIC Broken Hill	Throughout	93
T. Jenkins	OIC Longreach	To 22 March 2006	91
L. McCulloch	Director	Throughout	38
H. McRae	OH&S/Training Officer	Throughout	46
J. Nolan	OIC Narromine	Throughout	106
A. Rodgers	Field Officer	Throughout	76
C. Anderson	Field Officer	10/1/06 to 31/5/2006	46
W. Spratt	Operations Manager	Throughout	22
P. Spurgin	Control Officer	Throughout	46
P. Story	Environmental Officer	Throughout	107
A. Coleman	Field Officer	From 1/8/2005	99
R. Webb	Field Officer	From 1/8/2005	99
S. Moor	Field Officer	10/10/05 to 9/4/2006	71
I. Wright	Administration Officer	Throughout	4
M. Steinbauer	Entomologist	Throughout	66
C. Jenkinson	Field Officer	To 26/5/2006	96
H. Wang	GIS Manager	From 30/1/2006	8

Finance

Total revenue in 2005-06 amounted to \$3.932 million (Annex 3). Expenses totalled \$3.927 million (Annex 4) resulting in a small net operational surplus of \$5,143. However, after asset revaluations were taken into account there was an accumulated loss of \$24,000 in the Accumulated Results (Reserve Fund) (Annex 5).

Key Performance Indicators

The 2005 external review of the APLC suggested a number of Key Performance Indicators (KPIs) against which the future performance of the APLC could be measured. These KPIs have been adopted, with some modifications to provide additional semi quantitative measures, for reporting on an annual basis. Details of the KPIs and performance measures together with an assessment of the APLC's performance in 2005-06 are summarised in Table 6.

Table 6 : Performance against KPIs

Key Performance Indicator (KPI)	KPI Measures	Assessment/comments (2005-06)
Effectiveness of monitoring, prediction and control of locust populations	Significant populations detected at early-mid instar stage Accuracy of forecasts of population scale, timing and location Majority of control against nymphal stage	<i>All significant plague locust populations in the APLC area of operations detected at an early stage. Approximately 60 percent of control in 2005-06 was against swarms due to lack of cohesive band. No significant adverse aerial spraying incidents recorded or notified.</i>
Availability and effectiveness of control agents	Availability of existing agents Replacement agents identified and application rates/techniques verified	<i>No major issue with availability of existing control agents. No promising alternative agents identified and no approaches from industry for APLC to trial new agents.</i>
Environmental impact of control	No reported significant adverse impacts No adverse aerial spraying incidents	<i>One report of adverse impact of control on bees in the Riverina. in 2006-07 under investigation.</i>
Trade risks minimised	No adverse trade (residue) impacts	<i>No adverse trade (residue) impact or issues reported</i>
Cooperation with environmental, OH&S and other relevant agencies in developing and implementing plans for control programs	Plans developed and agreed and reviewed on regular basis.	<i>APLC member States to develop operational plan/brief for APLC operations in respective states</i>
Ensuring OH&S of APLC staff, including aerial safety	No significant OH&S incidents	<i>Two vehicle accidents recorded but no injuries sustained. No aerial safety incidents reported. Most APLC staff attended a flying in the wire & obstruction course in May 2006</i>
Improved management practices developed through a targeted research program	Research findings incorporated into APLC control strategy and operations	<i>Research ongoing Use of fipronil barriers and possible changes to Metarhizium application method/rate need further research</i>
APLC staff participation in national and international programs/scientific conferences	APLC staff invited to participate in such programs and conferences	<i>APLC staff provided technical advice to Victoria during control. Director invited by FAO to participate in 2 meetings. 2 APLC staff attended international Orthopterists conference.</i>
Development of effective strategic, operational and communication plans	Plans developed, endorsed and implemented	<i>Strategic plan to be finalised by December 2006. Operational Plan for 2006-07 developed/endorsed. Communication Plan to be finalised in 2006-07.</i>
Training of member state staff	Plans published APLC training course developed and core of trained member state staff available	<i>APLC locust training course for State staff developed for delivery early in 2006-07. Policy paper on support by state staff under development.</i>

Research

Research Review Committee

The Research Review Committee met with APLC research staff in August 2005 to examine and finalise a new APLC Research Strategy. The Committee endorsed the updated APLC Research Strategy for 2006-10. The strategy was compiled by Martin Steinbauer.

Due to other priorities in 2005-06, including the development of a revised research strategy and the independent review, the meeting of the Research Committee was postponed until 2006-07.

Summaries of research in progress

The following research summaries provide an overview of current research activities being undertaken by the Australian Plague Locust Commission. The research summaries are not considered to constitute publication as the investigations are often incomplete and any results presented tentative.

Impact of fipronil on termites. (M. Steinbauer)

Environmental-impact research on termites continued in 2005-06. To avoid time-consuming sorting of pitfall-trap samples and costly specimen-identification wood billets were chosen to assess termite activity at the field sites. In six experimental enclosures near Tambo, Queensland, termite activity exhibited no consistent trend with the previous history of fipronil application (**Figure 1**). Given that the sites had been treated with fipronil some 9 months earlier, it is possible that termite populations had recovered by the time the billets were deployed. Examination of termites from soil samples and returned billets, revealed a greater diversity of termite species at “Manning” which has red soil; all other locations have black soil. Soil type will be factored into the design of a repeat trial planned for 2006-07. In addition, fipronil should be applied to the experimental enclosures just prior to deployment of wood billets.

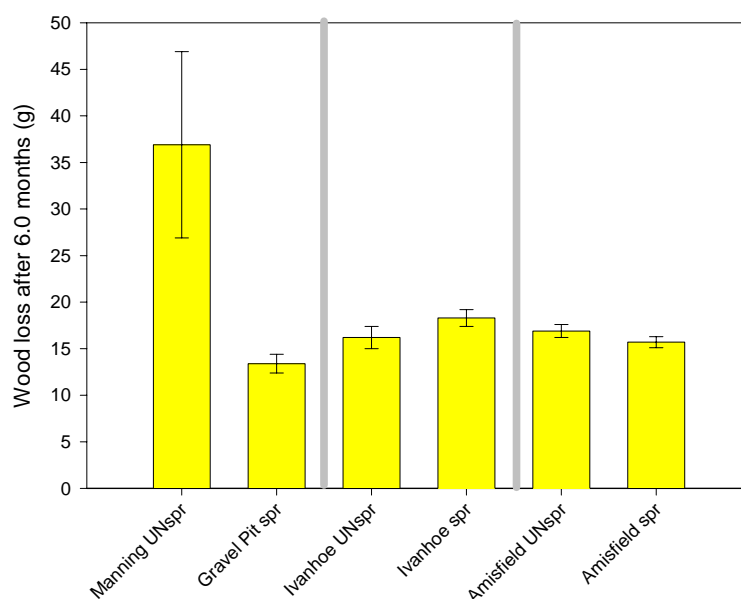


Figure 1. Termite activity (indicated by wood loss) at paired sites - 3 treated with fipronil 9 months earlier and 3 untreated sites

Comparing light trap catches of locusts with possible locust migrations detected by radar (M. Steinbauer)

The APLC has long maintained a network of light traps at eight locations around Australia. Light trap data is considered to be of considerable importance by simple virtue of the duration of its collection and the invariable nature of the manner of its collection. However, the origin of locusts caught in light traps, and therefore the significance of the data, has been questioned. To determine whether locusts caught in light traps are migrants or are locusts from areas neighbouring the trap, designed four portable lights (the

dimensions of which exactly replicate those of the light traps that comprise the APLC's network of eight traps) were designed and operated in the vicinity of the Insect Monitoring Radar (IMR) at Bourke. If migrating locusts were detected by the IMR, the light traps would likely attract and catch a portion of them and the two sets of data should exhibit a correlation with one another. However, if catches were not correlated with IMR data, this could indicate that locusts were attracted from the surrounding habitat. The traps were operated on three occasions, twice for ten nights and on the third occasion for six nights. Catches of Australian plague locust were small on all the nights when trapping occurred. Unfortunately, the first period of trapping had ceased some three nights before the night of 24 December 2005 when the radar detected a large overflight of locusts. Catches of a species of cricket in March 2006 were very large and validated the experimental hypothesis (see **Figure 2**). Light trapping near one or other of the IMRs in future seasons of greater locust activity should provide better opportunities to continue this research as well as to help refine IMR-specific algorithms used to differentiate Australian plague locust (APL in caption below) from other species of locust of similar weight and body-size and/or other insects.

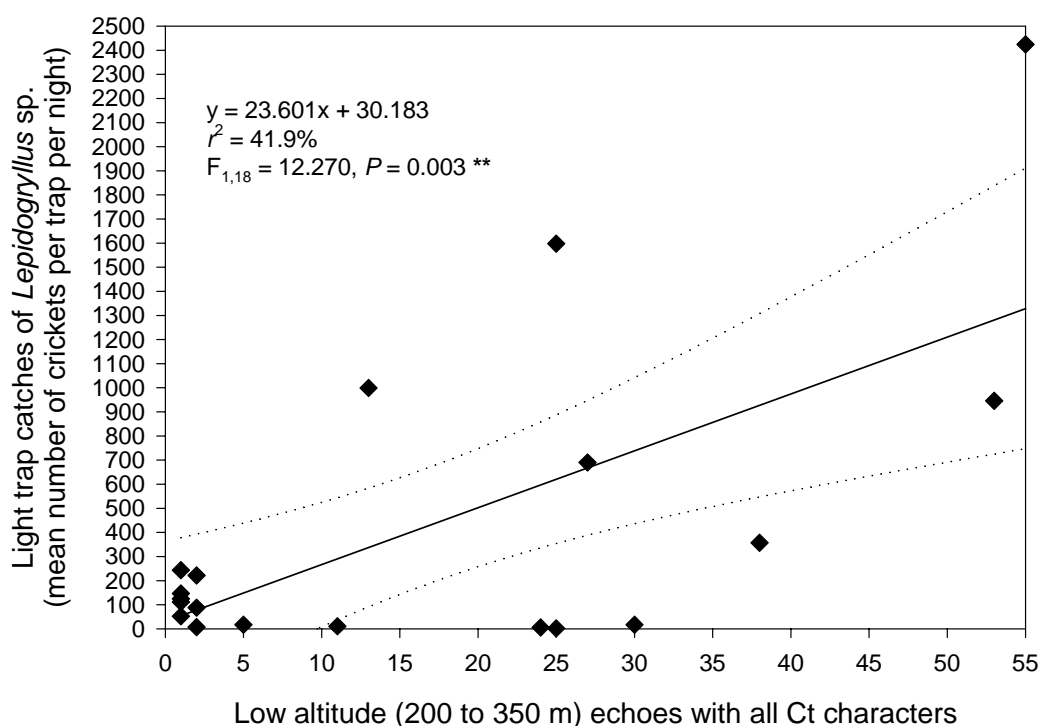


Figure 2. Light trap catches of crickets versus IMR counts of APL-sized insects at low altitude from the IMR at Bourke

Use of fipronil to control infestations of Australian plague locust nymphs (P. Spurgin and L. McCulloch)

Full coverage, blanket treatments with fenitrothion are a standard application method used by the Australian Plague Locust Commission to control nymphal populations of the Australian plague locust, *Chortoicetes terminifera*. Fipronil is also used with wider intervals between aerial spray runs (200 to 500 m rather than the 100 m normally used for crosswind blanket treatments with fenitrothion) to rapidly treat large areas with significant infestations of nymphs in marching bands. Use of this wide interval application technique with fipronil at doses of 0.3 to 0.5 g a.i./ha (depending on the spraying interval used) have become a key factor in the success of recent large scale control campaigns. Apart from

substantial cost savings there is potential for reduced impacts on non-target species when compared to full coverage, blanket treatments with fenitrothion.

Two trials to refine this method of application have resulted in the use of wide interval spray runs (using a 200 and 300 m interval between spray runs) made parallel to the prevailing wind direction. This technique produced a spray pattern with distinct alternating strips of treated and untreated vegetation that effectively controlled mobile bands of Australian plague locust 3 to 7 days after spraying. The dose of fipronil in the 70 to 100 m wide treated strips ranged from 1 to 1.5 g a.i./ha. No fipronil was detected in the intervening areas between these strips (suggesting that these areas could act as refuges for non-target species that may assist in the long term recolonisation of treated areas following control campaigns. Trial results indicate that this application technique, termed **Discrete Strip Spraying (DSS)**, may possibly provide a useful additional technique for effective control of the nymphal stage of various locust species using fipronil or other pesticides (Insect Growth Regulators) that have extended residual activity. Research is continuing to determine an optimum spraying interval.

Use of *Metarhizium* to control infestations of Australian plague locust nymphs and adults (*P. Spurgin*)

Metarhizium (Green Guard ULV) has been used effectively to control infestations of Australian Plague locust nymphs during summer campaigns in Queensland where the daily temperature range (hot days, warm nights) is ideal for the rapid growth of the fungus within the body of the locust (> 90% mortality in 7-10 days using a dose of 25 g spores/ha at a rate of 0.5 L/ha). The efficacy of *Metarhizium* in less than ideal in conditions such as those experienced during spring or early summer in the Riverina district of New South Wales (warm days, cool nights) was evaluated during control operations against bands of late instar nymphs in the Deniliquin area in November 2005. Approximately 6,400 ha (45 targets) in designated threatened species habitat of the endangered Plains Wanderer were treated with the standard rate of 25 g in 0.5 L/ha. Four of these targets with different vegetation conditions (short/tall and sparse/dense pasture grasses) were monitored using field cages. Mortality was very slow with infected nymphs surviving for up to 30 days following treatment (with many fledging into adults that were able to fly). Nymphs also continued to feed during this period. Mortality in the short/sparse grass blocks (> 80%) was higher than in the tall/dense areas (55 – 85%) suggesting that droplet coverage in denser vegetation as well as temperature were significant factors to be considered for future control in these areas. When the opportunity arises, field trials to test an improvement in droplet coverage with a rate of 38 g spores in 0.75 L/ha are planned.

Green Guard was also tested at an operational scale (3,500 ha treated) against swarms of adult Australian plague locust during December 2005. A substantial locust population had become established in a valley in Swifts Creek area of eastern Victoria. The APLC assisted the Victorian Department of Primary Industries with an aerial control operation where a helicopter was used to apply Green Guard (at 25 g/ha) to laying swarms. Green Guard was chosen as the best control agent in this situation due to the large number of watercourses present throughout the area. The high summer temperatures assisted in killing the locusts relatively quickly (reports from farmers and VICDPI of 10-14 days, limited field caging suggested 12 days) but the late start to the operation allowed many of the locusts to lay eggs before succumbing to the effects of the *Metarhizium* infection.

Persistence of *Metarhizium* on pasture vegetation (*P. Spurgin*)

There was a gap in the published and registration data on how long *Metarhizium anisopliae* spores in the Green Guard ULV formulation survived under field conditions on sprayed vegetation and remained able to infect locusts. To examine this, grass was collected daily from several sites within a large block (250 ha) treated with 25 g/ha. The

sampling continued for 7 days after application. Samples were frozen until analysis was undertaken using a technique developed by Becker Underwood Pty. Ltd. Spores were washed off each grass sample and incubated under laboratory conditions to determine the number of viable spores present. This measure is expressed as the number of colony forming units present per gram (cfu/g) of grass sample.

The study determined that immediately following spraying, droplet coverage on grass was high, ca. 3.0×10^4 to 1.0×10^5 cfu/g grass. This declined gradually for an approximate half life of 2 days (4.9×10^4 cfu/g). Laboratory LD50 data for *C. terminifera* indicated a dose of 417 spores/insect (Milner & Prior 1994 & 1997). Based on this data the survival rate of spores on vegetation suggests that a sufficient number of spores would remain 5-6 days after spraying to kill the majority of locusts present. However, this is not seen in the field suggesting that coverage (number of droplets per gram of vegetation) must be increased to increase efficacy.

Locust control in habitat areas of the plains-wanderer, *Pedionomus torquatus* Gould, in the New South Wales Riverina (P. Story, T. Deveson and L. McCulloch)

The potential effects of pesticides used to control locusts in the Riverina area of New South Wales, in areas also occupied by the endangered plains-wanderer, *Pedionomus torquatus* Gould, has been of concern since the early 1980s. A collaborative project between the Australian Plague Locust Commission (APLC), the New South Wales Department of Environment and Climate Change (NSW DECC) and Elanus Pty. Ltd. developed a spatial index representative of the overlap between mapped habitat of this endangered species and areas sprayed with pesticides to control the Australian plague locust, *Chortoicetes terminifera* (Walker) between 1977 and 2005. Peaks in the overlap index, expressed as a percentage of the identified habitat in the Riverina study area, corresponded with years of peak locust control activity. The maximum overlap occurred in 1993-1994, where approximately 16% of primary and 12% of secondary plains-wanderer habitat was sprayed with pesticide. Subsequently, locust control protocols during 2004-2005 were altered to minimise the amount of the traditional chemical pesticide, fenitrothion, applied to plains-wanderer habitat, and increasing use of the biological control agent, *Metarhizium anisopliae* var. *acridum* (Green Guard®). The phenyl pyrazole insecticide, fipronil, was also used selectively to control adult swarms in plains-wanderer habitat in preference to fenitrothion. A more specific research project into the potential ecophysiological effects of fipronil on the plains-wanderer is now underway. The study has been submitted for publication.

Analysis of the 2003-2005 locust plague in eastern Australia (T. Deveson and L. McCulloch)

Progress on the study was limited to the collation of locust data due to other APLC priorities. Next steps include the collation of a range of weather data, rainfall, wind and synoptic charts for selected periods) to be followed by data interpretation and analysis.

Review of migration patterns in Australian plague locust (T. Deveson)

This research project was finalised in 2005-06 with the publication of two research papers (Refer publications section below)

External research collaboration

Ongoing collaborative research between the Australian Plague Locust Commission (APLC), the University of Wollongong (UoW), Texas Tech University (TTU) and the Australian National Research Centre for Environmental Toxicology (EnTox) continued throughout the 2005-2006 period. This research is partly funded through the Australian Research Council's (ARC) Linkage Program and focuses on the development of novel

passive sampling techniques for pesticides, development and collation of bioassays to assess current and potential pesticides and the sublethal effects of fenitrothion and fipronil on Australian native vertebrate fauna

Australian Research Council SPIRT Project C0010657. Organophosphate pesticides and locust control: sublethal effects on vertebrates. Partner Organisations: University of Wollongong, Texas Tech University

With the completion of the avian risk model component of this study in the previous 12 months (see APLC Annual Activity Statement 2004-2005), activity within this project has centred on quantifying the sublethal effects of fenitrothion and fipronil on Australian native marsupials, *Sminthopsis crassicaudata* (Gould) and *S. macroura* (Gould). Specifically, the APLC's involvement in this project is focussing on evaluating the effects of fenitrothion on aerobic metabolism during cold exposure and exercise performance (run duration and oxygen consumption) in these two species before and after the ingestion of pesticide. Significant declines have been measured in running endurance for up to five days after dosing, but peak metabolic rate (PMR) and cost of transport were unaffected. PMR and cumulative oxygen consumption during a thermogenic challenge (one hour exposure to conditions equivalent to $-20\text{ }^{\circ}\text{C}$) did not change following fenitrothion ingestion, with PMR averaging 10 times BMR. Although this research has not yet concluded, it appears that fenitrothion-induced exercise fatigue is not due to limitations in oxygen or substrate delivery to muscle or in their uptake *per se*, but more likely relates to decreased ability to sustain high-frequency neuromuscular function.

S. crassicaudata and *S. macroura* are highly insectivorous, have the ability to gorge feed and have distributions and habitat preferences that overlap closely with the APLC's area of operations. They are therefore considered suitable experimental models for investigating the sublethal effects of pesticides on the Dasyuridae and *in situ* effects will be further investigated over the next 12-24 months.

Australian Research Council Linkage Project LP0455803. Evaluating the effects of fipronil a moderately persistent new generation pesticide on Australian native vertebrates. Partner Organisations: University of Wollongong, Texas Tech University.

This research project increases the level of scrutiny applied to fipronil in relation to its potential effects on non-target native vertebrate fauna. Because fipronil remains persistent in the environment for a longer period than the organophosphorous compound, fenitrothion, this research seeks to examine the potential for its bioaccumulation, particularly in female vertebrates, with maternal transfer to milk or egg yolk having potential to affect the development of young.

An initial study during 2004-2005 examined the effect of fipronil (including fenitrothion as a comparison) injected into eggs (over a range of doses) on embryo mortality, embryo metabolism during incubation and chick size, condition and thyroid hormone levels post-hatching. The co-occurrence of locust control activities and avian reproduction in arid and semi-arid environments within the APLC's area of operations, justifies an investigation into the potential maternal exposure and storage of pesticides and their effects on embryonic development.

During this study, eggs treated with fenitrothion showed no significant differences in hatchability, body mass or skeletal measurements. Although levels of plasma acetyl and butyryl cholinesterase showed a weak linear pattern increasing with dose rate, these differences were not statistically different from the control group. Oxygen consumption was higher for the control group

Embryos treated with fipronil also showed no differences in body mass or skeletal measurements but exhibited lower hatchability at higher doses (although this was not statistically significant). Similarly, while thyroxine levels generally increased with dose, no statistically significant difference was demonstrated. In a separate pilot study, the extent of maternal transfer of fipronil in the zebra finch (*Taeniopygia guttata*) was evaluated and a weak dose dependency shown for fipronil deposited in yolk, however the degree to which this may affect embryonic development was not evaluated.

In a subsequent study, the University of Wollongong has tested the toxicities of technical grade fipronil, the Adonis 3UL formulation and its components in zebra finch, a native bird at exposure risk in locust control regions, estimating oral dose LD50 by the up and down method. Under laboratory conditions, unexpectedly high toxicities were attributed to diacetone alcohol (DAA), a solvent making up 12.5% (mass based) in this particular Adonis formulation. In contrast, finches were asymptomatic when exposed to 0.3% technical grade fipronil. Depending upon the behaviour and persistence of DAA under field conditions, this formulation of Adonis may pose a more serious concern than fipronil, the active pesticide, for the health of small birds and possibly other vertebrates. This project is continuing and input is being sought from both the APLC and the manufacturers of fipronil.

Australian Research Council Linkage Project LP0453498. Developing a new approach to aquatic pollutant assessment combining time integrated sampling with toxicity testing. Partner Organisation: National Research Centre for Environmental Toxicology and

Australian Research Council Linkage Project LP0560619. Development of a novel air pollution monitoring strategy: combining passive sampling with toxicity testing. Partner Organisation: National Research Centre for Environmental Toxicology

Present approaches for monitoring the risks of aquatic and air borne pollutants are limited to grab sample analysis for specific compounds using target values and/or ecotoxicological assessment of population biomarkers. These two projects aim to develop an improved approach to aquatic and air pollutant risk assessment by combining time integrated extraction of chemicals using passive samplers in combination with toxicity testing using a range of toxicity tests.

The following bioassays have been developed within this project and are now available for use as a Tier 1 assessment of current and potential locust control pesticides.

Assay	Target chemical group	Example chemicals
Imaging PAM phytotoxicity	Herbicides	Diuron, atrazine, simazine etc
Acetylcholine esterase activity	Organophosphorous pesticides	Fenitrothion, chlopyrifos etc
E-Screen (cellular estrogenicity)	Endocrine disruptors	Synthetic estrogens, some industrial chemicals
Estrogen Receptor Assay	Endocrine disruptors	Synthetic estrogens, some industrial chemicals
Chemically activated luciferase assay (ER-CALUX)	Endocrine disruptors	Synthetic estrogens, some industrial chemicals
Microtox (acute bacterial toxicity)	Various	Phenol, various
Chemically activated	Ah-receptor binding	Dioxins and dioxin-like

luciferase assay (Ah-CALUX)	toxicants	chemicals
umuC genotoxicity	Biologically reactive chemical (DNA damage, potential carcinogens)	Benzo-a-pyrene, chlorination by-products

Both low (LDPE) and high density polyethylene (HDPE) sheets have been evaluated as passive samplers (PSDs) for use in aquatic sampling and the HDPE has been calibrated for fenitrothion and fipronil due to its higher partition coefficient. LDPE and HDPE samplers in addition to polyurethane discs are currently being evaluated as air samplers for both fenitrothion and fipronil. Field deployments of air samplers during 2005-2006 have shown promise, however the relationship between the amounts of pesticide detected in the air samplers and the environmental concentration is yet to be fully quantified. It is envisaged that these two projects will deliver cost-effective tools for the sensitive assessment of pesticide effects allowing rapid Tier 1 style assessments for current and future locust control agents.

Publications

Deveson, E.D. and Walker, P.W. (2005) Not a one-way trip: historical distribution data for Australian plague locusts support frequent seasonal exchange migrations. *Journal of Orthopteran Research* 14(1), 91-105.

Deveson, E.D., Drake, V.A., Hunter, D.M., Walker, P.W. and Wang, H.K. (2005) Evidence from traditional and new technologies for northward migrations of Australian plague locusts (*Chortoicetes terminifera*) (Walker) (Orthoptera: Acrididae) to western Queensland. *Austral Ecology*, 30, 928-943.

Deveson, E.D.(2005) An evaluation of MODIS imagery. APLC Technical Report No.1/2005

Deveson, E.D.(2005) Field evaluation of NDVI relative greenness imagery – Broken Hill 2002-03. APLC Technical Report No.2/2005

Fildes, K., Astheimer, L. B., **Story, P. G.**, Buttemer, W. A. and Hooper, M. J. (2006). Cholinesterase response in native birds exposed to fenitrothion during locust control operations in eastern Australia. *Environmental Toxicology and Chemistry* 25(11):2964-2970.

Annex 1: Environmental Management System: Objectives and conformance

Programme	Sub-project	Progress (2005-06)
1. Excellence in all operational areas	Staff trained to full field competence	<i>Officers in charge (OIC's) completed Cert IV in Training and Assessment APLC Competency Training Program fully implemented for all new staff.</i>
	DGPS used in all spray aircraft	<i>APLC aircraft contract requires spray aircraft be fitted with dGPS and experienced pilots.</i>
	Improved control efficiency (area treated for band control > swarm control)	<i>2004-05 saw 16% more area treated for swarms than bands. This can be attributed to control in 2004-05 being only in southern NSW with smaller blocks, taller vegetation and difficulty locating bands.</i>
2. All waste managed appropriately	Waste management contract	<i>Contract for safe disposal of all waste and pesticide drums by a certified waste disposal contractor delayed until early 2006-07.</i>
3. Minimise the intensity, extent and duration of disturbance to native flora and fauna	Incidents effectively managed	<i>One minor pesticide spill. Spill notified to NSW EPA, containment action take. Disposal action delayed until early 2006-07.</i>
	Reduce the proportional use of fenitrothion in control ops by 25%	<i>Fipronil and Green Guard accounted for 25% of control by area in 2005-06</i>
	Increased successful use of fipronil and larger track spacing	<i>Standard track spacing for fipronil on bands set at 300m and 200m for swarms. Barrier spraying trials conducted to evaluate efficacy with potential for reduce environmental impact</i>
4. Contribute to our understanding of natural and managed ecosystems	Develop risk assessment process for APLC pesticides, based on outcomes of environmental research.	<i>- Thesis on "Exposure of birds in Eastern Australia to locust control pesticides". Completed - Thesis "Effect of locust control pesticides on avian development". In process - Publication "Fenitrothion effects on fat-tailed dunnart" - Fipronil trial at Tambo commenced</i>
	Develop field protocols based on research	<i>Fipronil only used operationally as wide track low area dose, not blanket treatment, against nymphs. Protocol for barrier spraying of fipronil requires further field trials</i>
5. Avoid disturbance to protected sites/areas	Development of the GIS and OpsManager® sensitive area database	<i>Finalised 2004. Upgraded to include Plains-wanderer habitat 2004/05. Data on included in GIS in 2005-06.</i>
	Include in Handheld PDA's	<i>Handheld PDA's introduced 2005/06 and moving map with property and sensitive area boundaries used during control.</i>
	Procedures and buffers developed to avoid disturbance	<i>Buffers for fenitrothion and fipronil remain the same. Metarhizium buffer for water bodies reduced to 100m upwind for ULV.</i>
6. Ensure stakeholders are aware of all environmental obligations and they assist APLC achieve these.	Develop environmental aspect into APLC stakeholder training course.	<i>Training programs undertaken with NSW, SA and Victorian representatives 2004/2005. APLC trainers participated in Queensland locust training course in 2005-06. APLC training course for States developed for delivery early 2006-07.</i>
	Landholder consultation prior to and after pesticide application	<i>OpsManager® pesticide application notification forms all successfully sent. One notification returned and resent to correct address. Landholder consultation form to be revised in respect of organic status or Green Guard once advice received from supplier</i>

Annex 2: Implementation of external review recommendations

Recommendation

1. The Commissioners and Director should define and enunciate the roles and responsibilities of the APLC, its Commissioners and Director and ensure that these are clear and well understood. This should be undertaken as a matter of priority.
 2. It is recommended that each State based Commissioner ensure that operational plans developed in conjunction with relevant state agencies are available for each area of the State.
 3. It is recommended that the Commissioner representing New South Wales determine NSW's policy should the NSW RLPB's no longer have the capacity to contribute the NSW funding commitment
 4. The APLC has been and continues to be very effective in carrying out its responsibilities and is highly regarded by all its stakeholders. It is most strongly recommended that the APLC continue and should be commended for its performance over the past five years.
 5. A new Strategic Plan be developed for the 2006-10 Period by the Commissioners and staff of the APLC
 6. It is recommended that the APLC establish a Communications Plan as soon as practicable
- The APLC and the states give consideration to the establishment of Community (Stakeholder) Reference Groups based on the South Australian model
- There needs to be a core of staff trained in locust control in each state. The APLC should conduct a training program for state based staff
- The issue of fatigue management is a major OH&S issue. It is recommended that the current review of the APLC Fatigue Management Policy be finalised prior to the Spring 2005 locust season
- The Commissioners must ensure compliance with all aerial safety regulations, ensure staff are accredited when required and ensure that appropriate staff undergo associated training. The Commissioners must examine the Australian Transport Safety Bureau report, the NSW commissioned report and other relevant material to ensure the aviation Safety of its staff.
- Policy for the provision of assistance for locust control, or the provision of control agents by loan or grant to a state, must be determined and enunciated by the Commissioners prior to commencement of the next locust control season.
- It is recommended that research into the population dynamics of the Australian plague locust be continued in order

Implementation progress

- No specific action identified*
- States requested to provide operational plans for APLC control in respective member States*
- Completed. No further action.*
- No action required*
- Draft Strategic plan drafted. To be further developed and Finalised by December 2006*
Plan drafted and new brochure. Investigate publicity at open days
No action: APLC to participate in relevant State Committees
- The APLC is developing a Locust training course for delivery in September 2006 and at subsequent two year intervals*
- Interim fatigue management guidelines have been developed in consultation with staff and introduced in October 2005*
- Aerial safety review consultancy progressed with report expected in early 2006-07.*
- Completed. Policy paper agreed*
- The review of APLC research identified population dynamics*

to improve the effectiveness of the APLC forecasting program

as a priority. An ARC linkage grant proposal with Sydney University has been approved Incorporated into research strategy

As there is some debate concerning the continued availability of the current chemical control agents, it is recommended that research must be continued as a high priority to seek additional bio-control and conventional pesticides for use in locust control programs.

Also it is essential that the APLC develop mechanisms to guarantee the supply of Green Guard

It is the responsibility of each Commissioner and the APLC collectively to ensure that the planning for locust control is coordinated with all agencies, landholders and communities Impacted by the control program

To be achieved and updated via State operational plans (Rec 2)

The Research Review Committee of the APLC must ensure that all research projects are adequately planned and that all project results are collated and available for use by others

RRC to report following next meeting

It is essential that the staff of the APLC maintains their national and international involvement within the limitations of their own control programs

Ongoing no specific action

Annex 3: Revenue 2005-2006

Australian Government Contribution	1,740,500
Member States Contributions ⁽¹⁾	1,740,500
Australian Government (Additional Funding: Overheads)	372,331
Member States¹ (Additional Charge: Overheads)	13,294
Additional Member States' Contribution: 2005-06	28,000
Additional Commonwealth Contribution: 2005-06	28,000
Miscellaneous Revenue	9,889
Total Revenue	3,932,514

⁽¹⁾ Member State contributions: NSW (32.5%), Victoria (10%), South Australia (5%) and Queensland (2.5%)

Annex 4: Itemised Account of Expenditure 2005-2006

Employee Remuneration	1,007,150
Superannuation	186,136
Leave Expense	112,162
Other Employee On Costs	28,570
Staff Training And Development	14,380
Total Employee Expenses	1,348,398
Insecticide Expensed	164,508
Bio-Insecticide Expensed	66,288
Helicopter Charter	227,437
Fixed Wing Aircraft Charter	77,257
Aerial Spray Aircraft Charter	170,008
Aviation Fuel	-
Control Ops: Equipment & Freight	89,059
Sub-Total: Control Operations	794,557
Light Trap Operations	9,142
Other Technical & Field Expenses	25,531
Vehicles	349,122
Travel	202,704
IT, Communications & Office Equipment	193,104
Contractors	51,950
Human Resources Services	32,945
Internal Business Overhead Allocation	90,524
Other Administrative	14,104
Official Hospitality	781
General Office Supplies	19,173
Purchase Publications & Data	9,125
Production Of Publications	4,412
Property & Accommodation	205,161
Memberships & Conferences	9,065
Consultancy Services	79,387
Public Relations & Marketing	1,732
Legal	10,251
Total Supplier Expenses	2,102,770
Depreciation & Amortisation	88,613
Corporate Expenses (Funded)	372,331
Corporate Expenses (UnFunded)	13,295
Interest Expense	1,964
Total Other Expenses	476,203
Total Expenses	3,927,371

Annex 5: Accumulated Results

Accumulated Result: 1 July 2005	Nil
Net Operating Result 2005-2006	5,143
Asset Valuation Adjustment	-28,921
Accumulated Result : 30 June 2006	-23,778