VG95006
Monitoring, management & reduction of tomato leafminer in Bowen

Dale V. Abbott & Sally Abbott
Bowen Crop Monitoring Services

Know-how for Horticulture™

VG95006

This report is published by the Horticultural Research and Development Corporation to pass on information concerning horticultural research and development undertaken for the tomato industry.

The research contained in this report was funded by the Horticultural Research and Development Corporation with the financial support of the Queensland Fruit & Vegetable Growers (QFVG).

Cover price: $20.00
HRDC ISBN 1 86423 843 7

Published and distributed by:
Horticultural Research & Development Corporation
Level 6
7 Merriwa Street
Gordon NSW 2072
Telephone: (02) 9418 2200
Fax: (02) 9418 1352
E-Mail: hrdc@hrdc.gov.au

HORTICULTURAL RESEARCH & DEVELOPMENT CORPORATION

Partnership in horticulture

MONITORING, MANAGEMENT & REDUCTION OF TOMATO LEAFMINER IN BOWEN VG95006

Dale V. Abbott & Sally Abbott
Bowen, North Queensland
June 1998

BOWEN CROP MONITORING SERVICES PTY LTD

A Project Funded by

The Queensland Fruit & Vegetable Growers

The Horticultural Research & Development Corporation

VG95006

Principal Investigator

Dale V. Abbott
Principal Consultant
Bowen Crop Monitoring Services Pty Ltd
P.O. Box 4
BOWEN QLD 4805

Ph: 07 4785 1066
Fax: 07 4785 1107

The purpose of this report is to inform growers and industry that integrated pest management centred on cultural management practices can effectively work as a control method for leafminer.

Bowen Crop Monitoring Services Pty Ltd wish to express their thanks for the support and financial commitment given by

The Queensland Fruit and Vegetable Growers

The Horticultural Research and Development Corporation

Contents

Acknowledgments

Dale and Sally Abbott would like to thank the Bowen District Growers Association and the IPM Committee members for the support and opportunity to conduct this research.

During the course of this project the staff of the ABC Rural Report, based in Townsville, have been extremely cooperative and supportive. We wish to particularly thank Sarah Hawke and Kathy Kennedy.

The staff of the *Bowen Independent* have also provided excellent assistance.

Industry Summary

Tomato leafminer has been a constant threat to export and domestic tomato production in Bowen, North Queensland. Tomato leafminer is rated as a Category B quarantine pest for export tomatoes. The two main focal points of this project have been:

- **a clear, economical, environmentally friendly monitoring system for leafminer**
- **the adoption of IPM farm hygiene practices by all growers to reduce and manage leafminer**

Critical to the success of this project has been the regular transfer of research results and information to all sectors of the Bowen community. Throughout the life of the project, results and recommendations have been communicated on a weekly basis to industry and the general public through radio and newspaper reports. This has been supported by personal contact with growers by the researchers on a daily basis.

The outcomes of this project are:

- **Reduction of the leafminer population to a consistently low manageable level during the main production period, March to November. This was achieved for the 1995, 1996 and 1997 seasons.**
- **Evidence that district wide adherence to the seasonal break in production, December 25th to February 15th, is vital for leafminer management. Non-compliance to this cultural practice results in major crop losses due to leafminer.**
- **69% of growers have adopted all farm hygiene practices to control leafminer as formulated in the Voluntary Code of Practice.**
- **95% of the growers surveyed in Bowen believe that the initiatives taken in this project have reduced the leafminer problem.**
- **The most effective integrated pest management method to control leafminer in Bowen is cultural management. Cultural management of leafminer is a positive step towards achieving the aims of the number one priority in the Tomato RDE Priorities '98, "Development, adoption and coordination of IPM" and contributes to the Queensland Tomato Industry Strategic Plan to " Facilitate development of alternate products, technology and practices for pest control" (QFVG,1998).**

Future work targets:

- **100% adoption by all growers to the Voluntary Code of Practice, specifically to a district wide concurrent seasonal break.**
- **Best practice to manage leafminer incorporated into farm/company quality assurance programs.**
- **Best chemical strategy as a component of the IPM system for leafminer management.**
- **Production of a poster which will be the cornerstone for a *permanent* IPM system for the management of leafminer.**

Technical Summary

Phthorimaea operculella (Zeller), potato tuber moth, is commonly known as tomato leafminer in Queensland. It is a major pest of tomatoes in Bowen, the premier Australian winter producing region of fresh market tomatoes. Tomato leafminer only attacks plants of the Solanaceae family. This includes tomato, eggplant, capsicum and chillies. The solanaceous weed hosts are Blackberry nightshade (_Solanum nigrum)_, Apple of Peru (_Nicandra physalodes)_ and Thornapple (_Datura spp._) These crops are grown in the Bowen farming region with these weeds common to cultivation areas.

Cultural management of leafminer has been the focus of this project. The work undertaken has been a continuation of the research outcomes from the initial project, _The Introduction of Integrated Pest Management Programs for Fruit and Vegetables in the Bowen District_ (VG201). The major component of the research has been leafminer moth monitoring, information transfer of pest populations and trends, recommended farm and crop hygiene practices and the constant re-enforcement of the Voluntary Code of Practice. Fruit and vegetable crop production in the Dry Tropics is heavily reliant on chemical control methods for pest management. There are limited chemical options for the control of leafminer, with currently registered insecticides unable to provide an acceptable level of control. This project has shown that cultural practices work. Therefore the benefits of cultural management practices must be recognised and adopted by all growers as the best method available to manage this pest.

The pheromone lure trapping system has worked very well and provides an excellent early detection method of leafminer activity and a guide to changing population levels. The system is efficient and reliable.

The major demand of this project has been the transfer of information and monitoring results on a weekly basis. The regular re-enforcement of farm hygiene practices throughout the growing season using radio and newspaper outlets and personal contact has been a key element for the adoption of this IPM strategy. An IPM strategy based on cultural management is not a product that can be bought and used. It is the construction of an attitude, the acceptance of a set of actions, and then implementation of those actions. Cultural management of leafminer is not a "quick fix" but a cooperative farming tactic that must be consciously planned for every season. As chemical companies are responsible for their pest control products, Bowen growers must be responsible for their pest control product, the Code of Practice.

Future research and education efforts are aimed at the appraisal of existing registered insecticides for leafminer and ownership of the Code of the Practice by all growers. All methods of technology transfer employed were effective because they were reliable, accessible and regular. The daily involvement of the researchers with on-farm pest management enhanced these methods.

Introduction

Tomato leafminer (*Phthorimaea operculella*) is a constant threat to export and domestic tomato production in the Dry Tropics, North Queensland. District losses of $10 million and individual grower yield losses of 50-70% were experienced in the 1992 and 1993 seasons. The impetus for this project, VG95006, was a demand by Bowen District Growers to further reduce and manage leafminer populations. The initial project, *The Introduction of Integrated Pest Management Programs for Fruit and Vegetables in the Bowen District* (VG201), was initiated in response to a substantial increase in pest populations in Bowen, particularly tomato leafminer in tomato crops.

The objective of VG95006 was to reduce leafminer damage in tomato crops by focusing on the two main methods established in the previous project.

These were:

(i) Monitoring - continuation of the district leafminer monitoring system which consisted of weekly monitoring of 48 pheromone traps

(ii) Information transfer and grower education - growers were informed of leafminer population levels 52 weeks of the year by :

- **Weekly newspaper reports**
- **Weekly radio reports**
- **Monthly reports were presented at the Bowen IPM Committee meetings.**

Six years on, after two 3 year projects concentrating on district monitoring and IPM strategies, namely, crop and farm hygiene and the adoption of a seasonal break in production, crop losses have been significantly reduced. Crucial to this project has been the effective information transfer and constant re-enforcement of leafminer management tactics.

Tomato leafminer is rated as a Category B quarantine pest for export tomatoes to New Zealand. It is imperative that this pest be kept under constant management. This project has concentrated on providing an economical and efficient monitoring system for this pest and on promoting and encouraging the adoption of IPM farm hygiene practices by all growers to manage this pest. Short term chemical "silver bullets" are not the answer. There is no magic wand for the control of leafminer.

The implication for industry is that host specific pests, such as leafminer, can be controlled by IPM strategies on a district basis. This project has shown that an IPM strategy, centred on cultural management, can work, as long as there is 100% grower acceptance.

Materials and Methods

This project is an extension of the VG201 project. Based on the success of the district monitoring system devised in VG201, the following procedure was undertaken.

1. Monitoring

(i) 48 pheromone vertical water traps were established on a 2 kilometre grid pattern throughout the farming district. Each of these traps is a monitoring station designed to attract the male leafminer moth.

(ii) These stations were checked weekly with the total number of male leafminer moths recorded .

(iii) These counts were collated and compared to the previous year's population activity.

2. Information Transfer and Grower Education

Growers were informed of leafminer population levels 52 weeks of the year by the following communication methods.

(i) Weekly newspaper reports informing growers and the general community of current leafminer activity, previous season activity, high activity areas and current recommendations. A sample report can be seen in Appendix 1.

(ii) Live weekly ABC radio reports broadcasting all of the above pest information, with specific advice on control measures, such as in-crop management, sanitation and general farm hygiene were given. This regular program, titled "*The Bowen/Burdekin Integrated Pest Management Report*" reaches audiences from Mackay to Cairns. This report also focused on other prevailing pest problems and industry events in the region. Appendix 2 contains sample radio scripts.

(iii) Monthly reports were presented at all Bowen IPM Committee meetings. This committee was established as an initiative of the first project and has been maintained as a sub-committee of the Bowen District Growers Association. The IPM Committee is chaired by an elected grower member of the BDGA , the secretary is the Executive Officer of the BDGA and the Principal Investigator is a member of the committee. Monthly newsletters were circulated by the Executive Officer detailing research progress and outcomes.

3. Grower Field Trials

Trials were instigated as new techniques and alternative control measures became available. As information came to hand whether it was anecdotal experience or scientific research from growers, consultants, Government departments or chemical companies, new ideas or initiatives were investigated. These tactics were incorporated into on-farm non-replicated trials conducted under commercial conditions.

4. Grower Survey

A survey addressing information transfer and farm hygiene practices relating to tomato leafminer was distributed to the 24 tomato growers and the 8 capsicum growers in the Bowen farming district, see Appendix 3. The survey consisted of ten detailed questions with a completion time of 15 minutes. The survey was mailed to growers with a reply paid envelope enclosed with a fax reply option. The time interval for the survey return was 2 weeks. This was followed up with a reminder fax one week prior to the due date of return. These results were collated and analysed and constituted the major milestone of this project, *Milestone No.2, 31/03/98, Rigid Farm Hygiene Practices Achieved.*

A summary of these results was presented by the Principal Investigator at the BDGA IPM Committee meeting in April 1998. These results were also sent to all Bowen growers via the BDGA monthly newsletter.

Results

1. Monitoring

The recording of male tomato leafminer moth trap counts (Appendix 6) commenced in July 1995. Leafminer moth counts were recorded every week from 48 trap sites, with the average weekly trap count calculated. Subsequently the average trap count per week for each month was then available for comparison. Population changes and trends were communicated to the farming community on a weekly basis. This mode of reference was considered to be clear and effective.

The average monthly number of male leafminer moths recorded in pheromone traps in Bowen from 1992 to 1998 are shown in Figure 1 and Table 1. Each year peak leafminer activity occurs between October and January. Leafminer levels peak at the end of the growing season. Weekly trap counts for July 1995 to June 1998 are tabulated in Appendix 6.

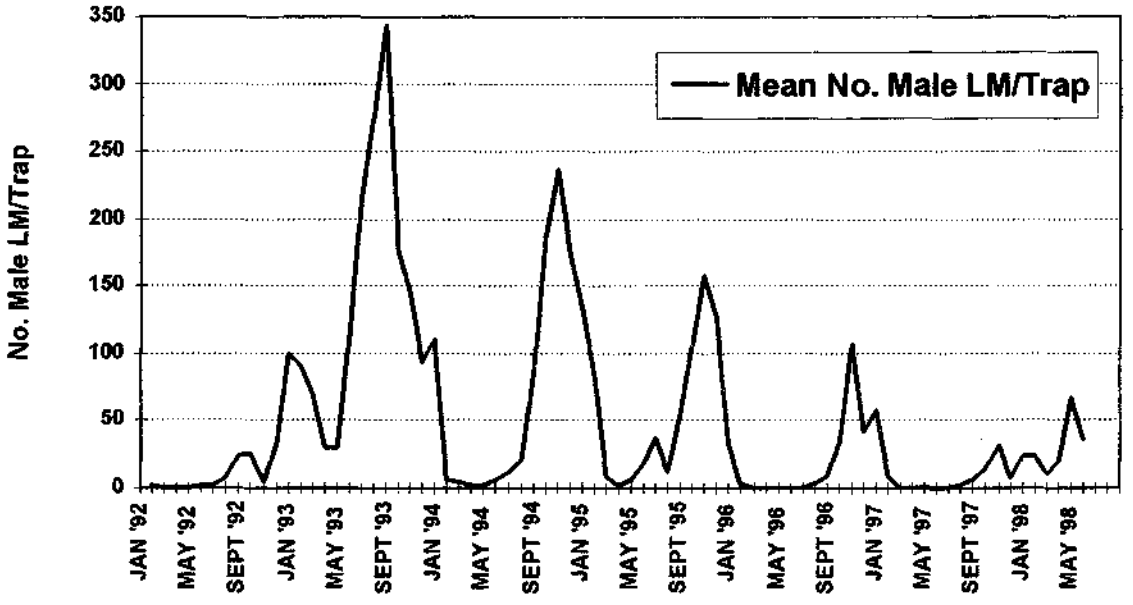


Figure 1. Plot of average monthly pheromone trap catches of male tomato leafminer moths for January 1992 to June 1998

Table 1.

Average number of male leafminer moths per trap per week for 1992-1998

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
1992		<1	<1	0	<1	2	2	7	23	26	5	33*
1993	100	91	71	30	29	115	216	276	344	178	146	93**
1994	110	6	4	1	1	5	11	21	84	190	237	174***
1995	132	83	8	2	6	18	37	12	55	108	158	126+
1996	33	3	<1	<1	<1	<1	<1	2	9	34	108	42++
1997	59	10	<1	<1	<1	<1	<1	2	7	13	31	7+++
1998	24	24	10	19	67	38						

*	No seasonal break in production - 12 months production	(0 days)
**	Seasonal break 1993/1994 - December 30th to February 1st	(32 days)
***	Seasonal break 1994/1995 - January 1st to February 1st	(32 days)
+	Seasonal break 1995/1996 - December 25th to February 5th	(42 days)
++	Seasonal break 1996/1997 - December 25th to February 15th	(52 days)
+++	Seasonal break 1997/1998 - December 25th to January 15th	(21 days)

2. Grower Field Trials

Bowen Crop Monitoring Services Pty Ltd, the Research Provider, investigated several alternative control measures for leafminer population reduction. These were:

(i) Double Cropping Option

A soil fumigant, metiram (Metham®) was injected through the trickle tubing after final harvest of a tomato crop. The aim was to control developing tomato seedlings, in order to be able to produce a rockmelon crop grown on the same plastic mulch. Metiram at 600L/Ha successfully killed the established tomato plants with no regrowth of these plants. However, 3 weeks after application, emergence of tomato seedlings was evident through the plastic mulch and especially in the inter-rows. These volunteer seedlings acted as a secondary food source for subsequent generations of leafminer emerging from the previous crop. The result of this trial was that metiram did not provide adequate control of germinating tomato seeds to prevent the development of leafminer on emerging seedlings.

(ii) Tomato leafminer virus

In conjunction with Chris Monsour, Cooperative Research Centre for Tropical Pest Management(UQ) a virus specific to tomato leafminer had been located and was successful in killing leafminer larvae from Bowen under laboratory conditions. Further work was aimed at mass producing the virus for field trials in Bowen in 1996. Cost considerations prevented this development.

(iii) Alternative insecticides

(a) A coded compound, AC303,630, was compared to the standard treatments, Nitofol® and Helothion® for leafminer control. One application of AC303,630 at 400 ml/ha gave superior control of leafminer compared to Nitofol® and Helothion®. Unfortunately the company concerned did not consider further research work a priority.

(b) The registered miticide, Vertimec® (abamectin), was trialed in the 1997 season on a commercial block of tomatoes at the rate of 450 ml/ha. This was in combination with a biological insecticide, Dipel Forte®. No difference in control to the standard organo-phosphate treatment was achieved.

3. Technology Transfer and Grower Education

A grower survey addressing information transfer and the adoption of farm hygiene practices was distributed to the 24 tomato growers and the 8 capsicum growers in the Bowen farming district. The survey is shown in Appendix 3.
63% of tomato growers and 50% of capsicum growers responded to the survey, giving an overall response rate of 60%.

(i) Information Transfer

One hundred per cent of responding growers were aware of the District Leafminer IPM initiatives. In terms of information transfer, the most common source by which growers obtained information about leafminer activity was the weekly newspaper report published in the Bowen Independent. Figure 2 shows that 89% of respondents used this medium. Dale Abbott's weekly Radio Report was listened to by 63% of respondents for information about leafminer population levels. However, all respondents sometimes listen to the Radio Report for information *other* than leafminer population levels.

Other sources of leafminer information included personal contact (47%) with either crop consultants, other growers, resellers and IPM committee meetings (21%). IPM committee meetings were introduced as part of the initial Leafminer Project (VG201) in 1993 to discuss research progress and communicate and implement project initiatives. Those growers not attending IPM committee meetings indicated the following reasons:

- **lack of time**
- **they pay consultants to pass on relevant information**
- **they access leafminer information from other sources**
- **IPM committee meetings are ineffective**

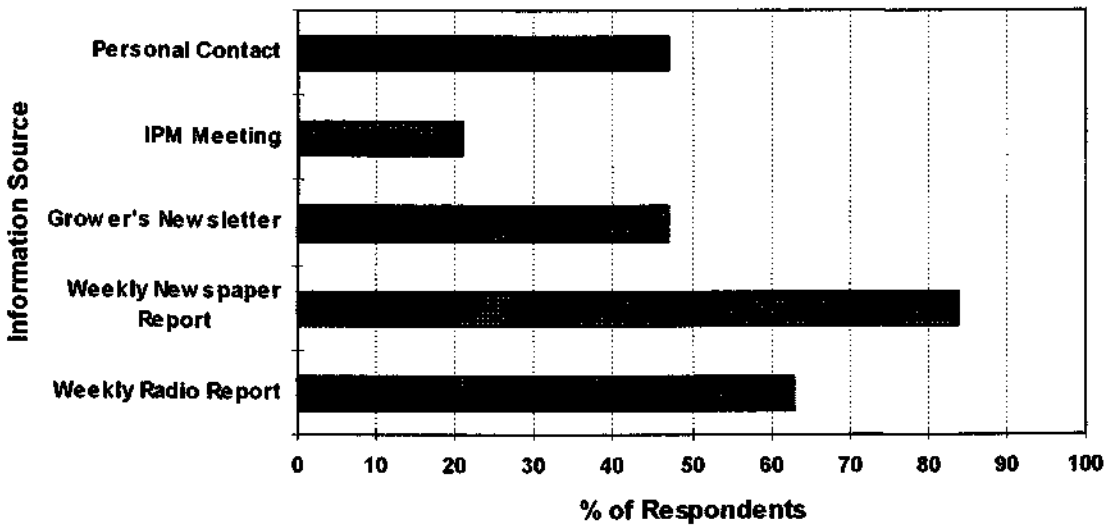


Figure 2. Sources through which growers obtain information about current leafminer population levels.

(ii) Farming Practices

A number of farm cultural practices have become standard practice as a result of the Leafminer IPM project. These include:

- **inclusion of the recommended seasonal break (Dec 25 to Feb 15)**
- **slashing crop immediately after final pick**
- **lifting plastic and deep ploughing immediately after final pick**
- **destruction of volunteer seedlings**
- **destruction of alternate weed hosts**

Figure 3 shows the cultural practices employed by growers to reduce the threat from leafminer. Sixty nine percent (69%) of growers stated they employ all practices listed. All growers surveyed incorporate a seasonal break. Sixty percent (60%) strictly adhere to the 6 week seasonal break from December 25th to February 15th, with 30% extending their seasonal break in excess of 6 weeks. One respondent stated that their seasonal break varied from year to year. It is important to note, that the seasonal break employed by a grower may extend for 6 weeks or more, but it may not coincide with the recommended seasonal break within the Code of Practice. For example, November 30th to January 25th, is a break of 6 weeks, yet it is not a break in production on a district basis. That is only a 4 week break from December 25th. Figure 3 also illustrates that all growers use insecticides as a farming practice to reduce leafminer.

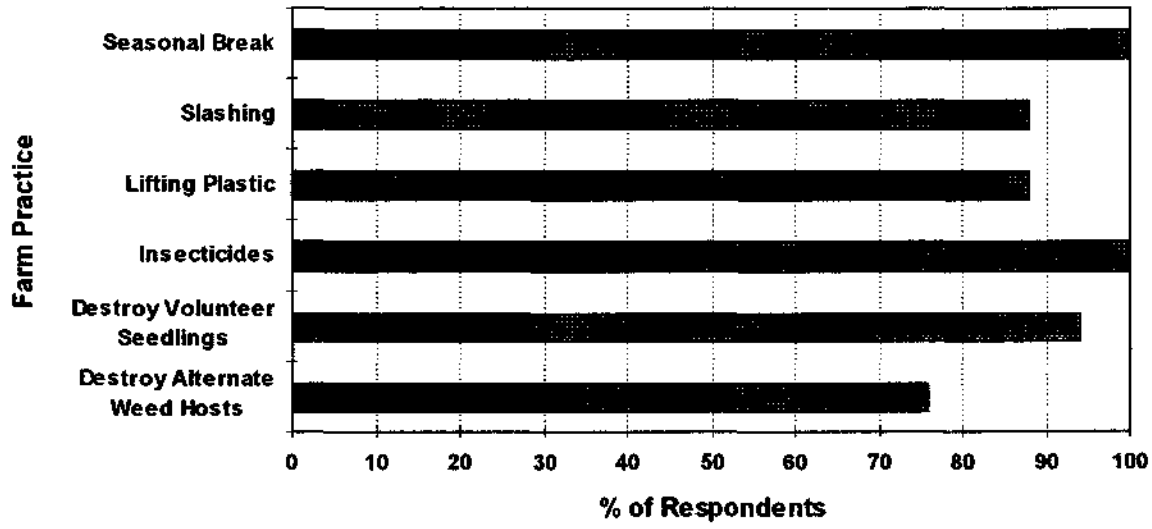


Figure 3. Farming practices employed by growers to reduce the threat of leafminer.

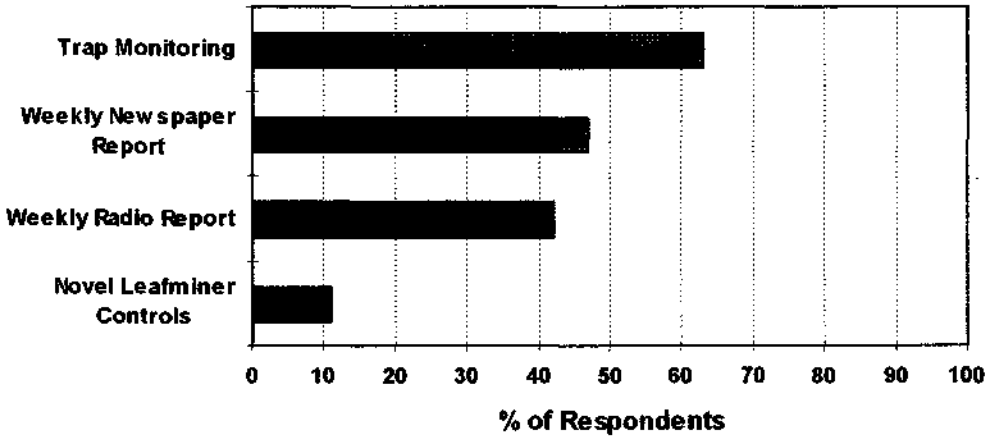


Figure 4. Aspects of the leafminer IPM project which respondents indicated they would like to see continued beyond June 1998.

Discussion

The objective of this project was to reduce the leafminer population to a manageable level in Bowen. This has been achieved by the adoption of an increased seasonal break in production from 4 weeks to a minimum of 6 weeks and adherence to rigid farm and crop hygiene practices by Bowen growers. These cultural management practices were constantly reinforced on the weekly radio report, in the weekly leafminer report published in the newspaper, at monthly IPM Committee meetings, in monthly grower newsletters and by personal contact with growers.

The monitoring system highlights those production areas which are the source of leafminer infestations each year. Figure 1 shows that the peak leafminer population has been reduced every year from 1993. At the end of the 1997 season (Nov./Dec.) the peak population level was 10% of that recorded at the height of the leafminer problem in 1993. Six years of data clearly demonstrates the value of the seasonal break. The population falls dramatically during the "no host " period. Consequently leafminer remain at a low manageable level during the main production period, March to November.

To illustrate the importance of the seasonal break for leafminer control in the Bowen district reference should be made to Table 1. The seasonal break at the end of 1994 and 1995 was 32 days and at the end of the 1996 season it was 42 days. The leafminer averages for the 1995 and 1996 seasons clearly shows the benefit of extending the seasonal break beyond 5 weeks. The extended seasonal break at the end of the 1996 season, 52 days, resulted in the lowest numbers of leafminer trapped for 5 years. However early plantings in January 1998 (a minority of growers ignored the recommended seasonal break of December 25th to February 15th) has resulted in increased leafminer numbers and corresponding damage to tomato crops. The consequence of this non-compliance to the seasonal break is the highest leafminer trap counts for 5 years and significant crop loss due to leafminer. It is concluded by extending the seasonal break on a district level, the leafminer problem is reduced. A seasonal break of less than 42 days results in a significant leafminer problem during the following production season.

Survey results indicated that 63% of growers wanted the monitoring program to continue. They believe it is the only method by which pressure can be exerted on those growers who fail to accept the Voluntary Code of Practice. The Code of Practice(see Appendix 4) includes a seasonal break in tomato production, December 25 to February 15, the removal of crop and plastic mulch, ploughing immediately after final pick, and the destruction of volunteer tomato seedlings and alternate weed hosts. This is a self-regulatory system as there is no legislation that can be enforced. This Code of Practice has been adopted as standard practice by 69% of growers in Bowen.

The project has been successful because the transfer of the research results has involved all sectors of the Bowen farming community. Results have been communicated through the life of the project on a weekly basis to industry, through radio and newspaper reports and personal contact with growers by the researchers on a daily basis. Ninety five percent (95%) of the 32 growers surveyed in Bowen, believe that the initiatives introduced through the life of this project have reduced the leafminer problem in Bowen.

This project has shown that an IPM strategy centred on cultural management will work, as long as there is 100% grower compliance. The major concern is to maintain compliance to the Code of Practice by growers every year. It only takes one grower to plant tomatoes before February 15 to "carry-over" the leafminer population from the previous season to create a

major pest problem in Bowen. The provision of an early season food source, specifically tomatoes, guarantees a leafminer problem throughout the major production period. The adoption of a 6 week break in tomato production on a district basis by all growers is the number one criteria for effective leafminer management. This 6 week break must be district wide and not a series of staggered seasonal breaks which vary from farm to farm.

The cultural management of an insect pest is not a neatly packaged saleable item available from the local farm reseller. It is a an integrated pest management concept and a personal decision. Bowen growers have a choice to manage an insect pest without the use of chemicals. This is a difficult concept to adopt especially when the outcome is dependant on total grower co-operation. This is integrated pest management in action. It may sound a little dramatic, but waiting for a chemical whether synthetic or biological, or a genetically engineered tomato variety, to control leafminer, is like waiting for a cure to cancer. Preventative medicine is available now. Why not use it?

Technology Transfer

The end users of the outcomes of this project, Bowen growers, were constantly informed of the results throughout the life of this project. The farming community and industry were informed of leafminer population levels and the recommended management strategies on a regular basis by the following six methods:

- weekly newspaper reports
- weekly radio reports
- presentation of research reports at monthly IPM meetings by the Principal Investigator
- monthly newsletters to growers which included the information presented at IPM meetings
- direct contact with growers by the researchers on a daily basis and on demand
- editorial features in the *North Queensland Horticultural Journal, Good Fruit and Vegetables* and in the Queensland Fruit and Vegetable Growers Research Reports

Radio and newspaper media outlets were invaluable and critical to the success of this project. The researchers are private crop consultants who are on-farm every day and in personal contact with growers. Tomato leafminer has been a part of the pest monitoring undertaken by the researchers in their daily pest management capacity for Bowen tomato growers before and during the life of this project.

A calender of activities, detailing media releases, publications and meeting dates is provided in Appendix 5.

Recommendations

Tomato leafminer is a host specific pest which can be easily controlled by disrupting its life cycle by denying access to its favoured food source. Presently, the most effective integrated pest management method to control leafminer in Bowen is cultural management. Future work is targeted at 100% adoption by all growers to the Voluntary Code of Practice, specifically to a district wide concurrent seasonal break in tomato production and alternate crop hosts, namely egg fruit and capsicums. Regular attention to and implementation of crop and farm hygiene practices needs to be developed as best practice."Best Practice to Manage Leafminer" could be incorporated into farm/company policy documents and quality assurance programs.

Bowen growers must make the following decisions and commitments if they want to control crop losses from leafminer :

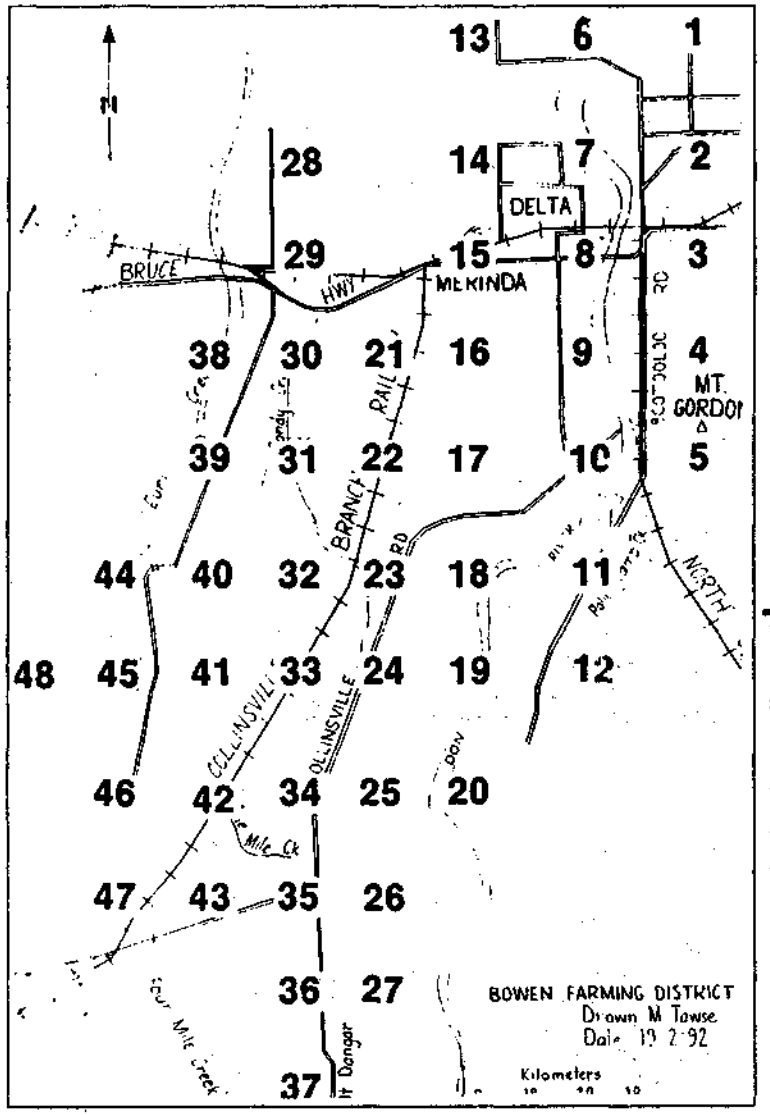
- **Do I believe that the cultural management of leafminer works?**
- **Will I plant tomatoes(egg plant or capsicums)before February 15th each year? Company policy?**
- **Will I plant sequentially or plant young blocks next to old blocks? Company policy?**
- **Will I routinely employ all post-harvest clean-up procedures? Company policy?**
- **Will I finish harvesting and clean-up by December 25? Company policy?**
- **Will I regularly survey cropping areas during the growing season and seasonal break for regrowth tomatoes and alternate weed hosts? Company policy?**
- **Will I appoint a staff member to oversee this management? Job specification?**
- **Is the Voluntary Code of Practice a part of our Company Policy?**

Ownership of the Code of Practice needs to be encouraged and enhanced. The foundations have been made with the data and evidence documented. Bowen growers and the researchers maintain that the trap monitoring system is a valuable vehicle for the transfer of leafminer *and* other prevailing pest information and provides an early detection system for leafminer.

Chemical control of leafminer must be addressed. Registered insecticides do not control high leafminer populations yet all growers surveyed utilise insecticides to reduce the impact of leafminer. The best chemical strategy to control leafminer in Bowen as a component of the overall IPM strategy has to be clearly demonstrated to growers in the field.

To promote and the adoption of the Code of Practice the researchers plan the production of a poster titled "Best Practice to Manage Leafminer". It is envisaged that this poster will be displayed in farm offices, packing sheds, machinery sheds, reseller outlets, QDPI, Shire Council offices, educational institutions and industry organisations. The researchers believe that this poster will be the cornerstone for a *permanent* IPM system for the management of leafminer in the Bowen farming district. The management tactics displayed in this poster will be applicable to other farming regions where leafminer is a threat to crop production.

Tomato Leafminer Population Levels for the week of July 4, 1998



Site	Number Male Moths per Week		Site	Number Male Moths per Week	
1	31*	(0)	25	360*	(2)
2	3	(0)	26	0	(1)
3	9	(0)	27	31*	(0)
4	60*	(0)	28	22*	(0)
5	35*	(0)	29	54*	(0)
6	14*	(0)	30	144*	(0)
7	21*	(0)	31	67	(4)
8	42*	(0)	32	97	(0)
9	81*	(0)	33	n/a	
10	190*	(0)	34	64*	(3)
11	22*	(1)	35	26	(n/a)
12	18	(1)	36	13	(0)
13	13*	(1)	37	7*	(2)
14	42*	(0)	38	117	(1)
15	225*	(9)	39	87	(0)
16	23	(1)	40	22*	(n/a)
17	10*	(1)	41	43*	(2)
18	44*	(0)	42	8	(0)
19	216*	(13)	43	0	(0)
20	36*	(0)	44	65	(n/a)
21	6*	(0)	45	33*	(0)
22	9	(1)	46	74*	(0)
23	n/a	(0)	47	6	(1)
24	26*	(0)	48	131*	(2)

* denotes an increase in numbers from previous week

!! denotes trap adjacent to regrowth or volunteer tomatoes.

# denotes trap adjacent recently cultivated ground.

COMMENTS: 44 traps (96%) are recording leafminer male moth activity, with 11 trap sites recording above threshold (>70/week). In 1997, at this same week, the average L.M. count/trap/week was <1. This year it is 55. Leafminer activity increased slightly across most of the district. Crops should be monitored closely for leafminer infestations and appropriate spray programs used. Be sure to remove harvested crop residues as quickly as possible once picking has finished in ground tomato crops. There are too many blocks of volunteer tomatoes - THESE MUST BE PLOUGHED IN! This will be the last leafminer activity report as the leafminer project has finished as of June 30. Leafminer trap monitoring and reporting may continue in the future if further funding can be obtained. THANK YOU.

SPONSORED BY
BOWEN INTEGRATED PEST MANAGEMENT PROGRAMME

For further information, DALE or SALLY ABBOTT
BOWEN CROP MONITORING SERVICES P/L.
Phone 4785 1066 - Fax 4785 1107

Appendix 1 Weekly newspaper map and report for the week of July 4, 1998 as printed in the *Bowen Independent*.

Appendix 2

Sample Scripts of Weekly ABC Rural Radio Reports

November 22nd,1996

"Good morning Sarah, how are you?"

Leafminer continues to remain high, with all traps active. Two traps this week recording over 800 per week. Majority of growers have now completed their tomato season and are preparing ground for next year. We are in the 3rd critical period of our leafminer seasonal program. How we manage leafminer numbers in the next 2 months will determine the leafminer population in February 1997.

Four years of leafminer counts prove conclusively if we do not have a host crop, as in tomatoes, in the ground from December 25th to mid February we substantially reduce the leafminer population, as what has happened this season. I urge all growers who are considering planting prior to the 15th of February to reconsider their planting dates.

Insecticide usage in 1996 was considerably lower due to one specific reason. Low leafminer numbers through the majority of our growing season. This was achieved specifically by the extended seasonal break and good farm management. This can be repeated every year if we do not plant tomatoes till mid February.

Heliothis activity is constant and high in late season crops. All crops have suffered from the recent high temperatures with blossom-end rot, sunburn and pollination problems decreasing yield dramatically, especially late season capsicums.

Silverleaf whitefly have now been found throughout the Bowen area. Interesting point with its life cycle that it does not live in grasses. So concentrate on keeping your farms free of broadleaf weeds over the summer break. This may reduce the incidence of silverleaf whitefly in 1997.

That's it for another week in the field Sarah"

July 11th, 1997

" Good morning Sarah, how are you?

Leafminer numbers continue to remain low, with 20% of the traps recording some leafminer activity, with no traps above threshold. However Trap 15 in the Delta area has consistently shown some activity the last 2 weeks. Tomato, capsicum and eggplant growers should examine their crops for signs of leafminer infestation. We will be checking the area thoroughly this week to determine the source.

It is pleasing to note that most farmers have cleaned up their 1996 fallow areas. But there are several farms that continue to remain with volunteer tomatoes. Not only are these tomatoes a host for leafminer but also a haven for tomato russet mite, virus and diseases.

Bacterial canker in tomatoes is still confined to the same variety and the same seed source. The initial symptoms to look for are wilting and a distinct brown, dry margin on lower leaflets. These areas are separated from the healthy green tissue by a narrow zone of yellow tissue. This week we have detected it on another farm, so that makes it 6 farms out of a possible 9. Again the same variety and the same seed source. Any growers who wish to know more about this problem, please contact us.

Heliothis activity is low to moderate with the variable temperature pattern influencing egg-laying behaviour. Green peach aphid is active and some mosaic is now being found in isolated areas. Recent showers have increased the disease risk with downy mildew reactivating in cucurbits, target spot in tomatoes and bacterial spot in capsicums.

Short and sweet this week Sarah".

April 17th, 1998

" Good morning Sarah, how are you?

Majority of traps are recording higher levels than the average for this time of the year. Last season at approximately the same week, we had an average of les s than 1 leafminer per trap. This year it is 33. This means growers are going to be hit hard by leafminer earlier this season unless there is a dramatic change in the weather. Earlier plantings than normal have picked up the leafminer population and continually warm night conditions have increased the build-up.

I urge all growers to carefully evaluate their plantings for 1998, and make sure you plan for leafminer in your farm plan. Avoid planting down wind, and do not plant young crops next to blocks being picked. Check you whole farm area especially late 1997 tomato ground for volunteers and plough in.

Silverleaf whitefly is also spreading from 1 area in Euri Creek, we are now picking up SLWF adults in tomatoes on several surrounding properties. The practice of growing alternate host crops through summer has been the main precursor to this pest. All recent information states that a host-free period is necessary for control. The Dry Tropics is rapidly losing its control on 2 important pests, due to a minority of growers not conforming to the Voluntary Code of Practice.

On the disease side, relatively low problems with mainly Sclerotium rolfsii, base rot, in tomatoes. The recent rain in the Burdekin has kicked off downy mildew in cucurbits, and some bacterial spot in capsicums.

So Sarah, a very interesting season ahead of us.

Appendix 3

Leafminer IPM Grower Survey

We would like your input for the current leafminer IPM milestone report which will form part of the major report to be completed in June this year. The survey should only take 10-15 minutes of your time. Please complete the survey and return by mail (return envelope enclosed) or fax by Monday 16th March. We would appreciate your signature or farm stamp on the last page of survey. Please be assured that all replies are confidential.

To answer each question, please tick the appropriate box. Please make comments in the spaces provided. A summary of these results will be presented at the next meeting of the BDGA IPM committee meeting in April.

Thank you for your valuable contribution.

Dale Abbott
Sally Abbott
Chris Monsour

Leafminer IPM Grower Survey

INFORMATION TRANSFER

1. Are you aware of the district Leafminer IPM program?

☐ **Yes**
☐ **No**

2. From which of the following do you obtain information about leafminer activity? (More than one box may be ticked)

☐ **Dale Abbott's ABC Radio report (Thursday mornings)**
☐ **Map & comments in Friday's *Bowen Independent***
☐ **BDGA grower newsletter**
☐ **BDGA IPM meetings**
☐ **Personal contact**
☐ **Other (please list) .....**

3. Do you listen to Dale Abbott's ABC Radio report (Thursday mornings) for information OTHER than leafminer activity?

☐ **Always**
☐ **Sometimes**
☐ **Never**

4. Do you read the weekly leafminer reports in the Bowen Independent?

☐ **Yes**
☐ **No**

5. Do you attend the monthly IPM meetings?

☐ **Yes**
☐ **No**
☐ **If not, why not? .....**

6. Please rate the means of communication you use to obtain information about leafminer activity .

1 (most effective) to 7 (least effective)

Means of Communication	Rating
Radio report	
IPM meeting	
Newspaper report	
Other Growers	
Consultants	
Grower's newsletter	
Resellers	

FARMING PRACTICES

7. Which of the following practices do you employ to reduce the threat from leafminer? (More than one box may be ticked)

☐ Regular insecticide applications
☐ Slashing crop immediately after final pick
☐ Lifting plastic and deep ploughing immediately after final pick
☐ Seasonal break
☐ Destruction of volunteer seedlings
☐ Destruction of alternate weed hosts

8. Is a seasonal break part of your farm plan?

☐ Yes
☐ No

9. Which of the following best describes your seasonal break? (Tick one box only)

☐ 15th Dec to 15th Feb
☐ 25th December to 1st February
☐ 1st January to 1st February
☐ Other .....

10. Do you think the leafminer problem in Bowen has been reduced as a result of the leafminer IPM project's initiatives?

☐ Yes
☐ No

If no, list reasons why not .....

.....

The funding for the leafminer IPM project finishes in June 1998. Which aspects, if any, of the project would you like to see continued beyond June 1998?

.....

.....

.....

.....

.....

Signature or Farm Stamp

Appendix 4

CODE OF PRACTICE FOR CONTROL OF AGRICULTURAL PESTS AND DISEASES - JULY 1995

- DO NOT HAVE TOMATOES IN THE GROUND FROM DECEMBER 25 TO FEBRUARY 15
- PLANT EACH PATCH UPWIND OF THE PREVIOUS ONE
- MONITOR CROP FREQUENTLY (AT LEAST TWICE PER WEEK)
- APPLY APPROPRIATE CROP PROTECTION CHEMICALS PROMPTLY (WITH REGULARLY CALIBRATED EQUIPMENT)
- CONTINUE TO CONTROL PESTS AND DISEASES DURING PICKING (CONSIDER THE CHEMICAL WITHHOLDING PERIOD)
- IF PICKING OR CROP REMOVAL IS DELAYED, CONTINUE PEST AND DISEASE CONTROL PROGRAM
- RAPIDLY DESTROY REJECT TOMATOES (WITHIN 24 HOURS) BY EITHER ROLLING WITH A TRACTOR OR FEEDING TO SUFFICIENT LIVESTOCK
- IF PLASTIC MULCH IS USED FOR A SECOND CROP, RUN AN EFFECTIVE HERBICIDE PLUS INSECTICIDE (E.G. VAPAM, VYDATE) THROUGH THE TRICKLE AFTER THE FIRST CROP. KEEP SOIL MOIST TO CONTAIN THE FUMIGANT
- SLASH OFF CROP IMMEDIATELY AFTER PICKING HAS FINISHED
- LIFT PLASTIC MULCH PROMPTLY
- DEEP PLOUGH AFTER PLASTIC MULCH IS REMOVED

Appendix 5

Technology Transfer Bibliography

1. ABC Rural Radio - Live Reports
"The Bowen/Burdekin Integrated Pest Management Report" **The Principal Investigator gave these reports at 6.20 am every Thursday from March 1st to December 1st from July 1995 to June 1998**

2. Bowen District Growers IPM Sub-Committee Monthly Meetings - written reports on research progress, results and actions were presented by the Principal Investigator at all meetings from February to December in 1995 to 1998

3. ***The North Queensland Horticultural Journal*** **is a quarterly publication.**
Editorial material written by the researchers was published in this journal which has a circulation of 1000 copies to North Queensland growers. The following articles were published:

September 1995	***'Bowen - Code of Practice Move'***
March 1996	***'Round the Traps'***
	'Code of Practice Proves Beneficial'
November 1996	***'Round the Traps'***
November 1997	***'Round the Traps'***

4. ***Good Fruit and Vegetables*** **is a nationally recognised monthly horticultural magazine.**
A 1 page feature article was published in December 1997, Vol. 8 No.7
'Monitoring keeps leafminer at bay'

5. Queensland Fruit and Vegetable Growers Research Reports
'The Introduction of IPM Programs for Fruit and Vegetables in Bowen' **1996 p. 34-35**
'Strict Hygiene Controls Tomato Leafminer' **1997 p. 14-15**
'Growers Adopt IPM Initiatives' 1998 **p. 12**

6. ***Tomato Pest Management Bulletin*** **published by the CRCTPM (UQ) Vo.1 No.1 October 1995**
'Bowen Growers Draft Code of Practice' and 'Monitoring, Extension Success for Bowen'

Appendix 6 Leafminer Trap Counts 1995 - 1998

TRAP	7/7	14/7	21/7	28/7	4/8	11/8	18/8	25/8	1/9	8/9	15/9	22/9
1	7	15	56	24	0	2	1	2	1	25	47	50
2	5	2	7	22	6	1	0	0	0	23	38	60
3	15	20	35	19	70	32	5	9	2	136	95	165
4	14	9	73	119	7	8	1	1	1	53	60	65
5	5	3	39	28	0	2	0	1	1	33	33	83
6	5	6	22	6	1	10	4	6	21	33	50	65
7	16	9	63	43	n/a	4	2	1	3	14	45	68
8	4	6	11	12	3	1	0	0	0	8	59	24
9	30	33	157	85	6	3	2	4	2	22	80	54
10	37	81	163	178	4	10	0	1	10	93	115	115
11	10	32	98	61	2	2	1	0	4	18	43	73
12	10	9	35	40	2	2	3	0	0	18	36	22
13	1	4	27	5	1	6	2	3	3	65	38	76
14	40	23	164	57	3	5	0	0	4	47	37	122
15	25	19	87	8	4	5	4	3	2	86	100	65
16	25	39	74	33	11	10	0	0	2	50	168	135
17	20	31	100	44	8	7	2	4	3	55	150	165
18	28	73	114	14	125	84	12	35	5	90	210	45
19	155	53	230	105	80	85	35	55	6	130	43	440
20	4	9	17	4	0	0	0	0	0	5	22	16
21	12	15	n/a	11	15	10	6	6	3	35	82	148
22	3	12	22	20	3	6	0	2	1	42	63	72
23	26	56	94	45	3	1	0	1	1	32	44	112
24	3	4	12	9	1	1	2	3	1	15	22	62
25	35	25	40	N/A	45	50	11	8	12	135	82	102
26	17	15	35	35	60	0	3	1	1	110	83	86
27	3	8	8	4	4	4	0	0	0	32	12	12
28	0	1	0	1	0	0	1	0	1	0	0	0
29	1	0	1	1	0	1	1	0	1	1	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0
31	12	13	13	22	12	15	15	30	35	35	85	680
32	2	5	10	32	22	32	8	13	4	55	260	45
33	13	25	44	34	24	15	35	8	15	65	133	330
34	393	497	430	67	40	65	22	7	12	80	102	220
35	45	112	345	112	10	17	5	12	1	70	84	127
36	21	60	60	95	75	55	10	15	15	80	129	114
37	0	24	19	19	5	7	7	1	0	4	22	26
38	0	1	0	0	0	1	0	0	1	15	0	0
39	3	3	1	0	0	0	0	2	1	22	98	65
40	12	26	30	32	30	2	2	8	8	32	22	41
41	10	15	25	22	15	4	8	10	2	52	58	32
42	3	12	16	12	8	8	4	5	3	23	32	21
43	2	9	12	4	12	23	4	4	4	35	38	25
44	2	24	14	35	18	n/a	20	22	2	45	135	65
45	10	3	29	14	11	40	32	30	13	85	110	81
46	2	12	25	24	16	25	20	20	6	55	79	76
47	0	7	4	1	4	8	6	5	3	25	23	24
48	17	15	30	30	15	45	40	41	15	76	76	165
	23.0	30.7	61.5	33.8	16.6	15.2	7.0	7.9	4.8	48.2	69.6	96.7
	JULY				AUG				SEPT			
	37.3				11.7				54.8			

1995

1995 TRAP	6/10	13/10	20/10	27/10	3/11	10/11	17/11	24/11	1/12	8/12	15/12	22/12	29/12
1	85	165	165	21	260	240	n/a	60	325	80	91	35	32
2	73	135	130	110	170	108	105	150	90	45	55	43	19
3	145	25	180	265	470	520	770	310	615	385	440	108	33
4	33	220	55	85	180	215	490	500	600	395	150	69	12
5	32	34	44	61	148	166	255	185	120	n/a	55	12	34
6	115	23	20	10	167	165	465	135	225	176	131	85	38
7	130	110	34	110	65	130	255	240	190	92	110	44	51
8	35	208	48	65	200	195	250	300	270	190	255	68	12
9	165	51	40	170	173	200	245	155	470	190	245	73	39
10	123	123	120	91	230	150	11	250	115	66	35	18	18
11	130	170	165	165	395	96	295	355	125	40	15	9	38
12	86	195	28	49	179	176	355	435	250	175	131	62	n/a
13	165	220	225	140	395	157	660	360	270	175	100	64	21
14	112	18	210	192	190	355	500	383	290	385	360	76	34
15	96	55	26	30	90	n/a	140	136	270	165	135	58	5
16	180	170	115	33	53	n/a	100	170	455	275	300	94	40
17	330	245	145	16	4	16	29	270	785	395	145	165	72
18	155	155	150	85	155	270	300	400	405	90	310	18	53
19	145	320	320	65	92	25	12	4	420	400	220	105	75
20	44	53	42	15	57	80	88	78	120	48	40	9	55
21	148	70	123	110	34	80	34	19	45	35	145	190	220
22	193	140	115	140	220	105	105	10	325	250	200	n/a	165
23	173	45	125	85	110	75	110	450	260	95	121	42	29
24	90	16	82	15	36	22	20	315	28	40	25	17	31
25	75	245	310	112	270	340	75	55	52	4	135	59	83
26	72	235	12	72	95	290	0	0	0	15	126	38	35
27	33	230	190	85	55	80	55	35	11	11	N/A	55	46
28	12	6	24	75	155	160	85	85	85	2	0	55	63
29	N/A	10	1	28	55	60	75	1	1	2	85	78	72
30	22	115	125	230	290	110	110	25	9	8	64	140	128
31	32	430	210	35	350	250	30	8	18	12	8	108	180
32	22	35	65	85	22	11	6	2	6	5	5	93	143
33	135	145	55	210	280	120	143	26	30	11	175	79	84
34	73	185	140	40	270	130	38	4	10	10	N/A	103	112
35	132	175	175	170	595	178	n/a	55	55	20	125	42	97
36	144	44	44	55	350	220	220	95	65	22	N/A	29	8
37	15	38	4	2	32	2	55	0	0	0	0	0	6
38	N/A	85	85	110	140	60	62	12	11	11	2	59	57
39	155	126	96	95	95	48	65	8	0	0	0	13	51
40	73	90	38	37	65	95	195	92	62	35	33	28	54
41	23	115	165	170	240	230	77	15	30	18	140	103	195
42	11	96	110	12	180	140	40	0	0	8	115	56	61
43	38	38	22	12	12	6	2	0	0	1	2	5	61
44	170	320	295	190	190	240	240	65	0	n/a	0	n/a	n/a
45	155	165	165	210	52	330	320	330	120	32	410	142	192
46	130	135	95	12	155	190	15	6	4	5	4	20	49
47	25	3	n/a	120	N/A	25	20	34	2	n/a	2	11	10
48	160	70	38	130	210	240	48	16	13	12	4	79	152
	102.0	127.1	110.0	92.2	175.1	154.4	164.6	138.3	159.4	98.5	116.6	62.2	66.6
	OCT	107.8			NOV	158.1			DEC	125.8			

1996

1996													
	5/1	12/1	19/1	26/1	2/2	9/2	16/2	23/2	1/3	8/3	15/3	22/3	29/3
TRAP													
1	19	no	6	6	n/a	4	0	0	0	0	0	0	0
2	62	record	6	11	4	2	2	1	0	0	0	0	0
3	65		13	4	12	8	3	1	0	0	0	0	0
4	32		24	3	11	13	1	1	0	0	0	0	0
5	39		17	3	n/a	1	0	0	0	0	0	0	0
6	27		9	9	1	1	0	0	0	0	0	0	0
7	50		7	2	n/a	3	1	1	0	1	0	0	0
8	25		12	2	1	2	0	0	0	0	0	0	0
9	62		22	2	4	0	0	0	0	0	0	0	0
10	39		9	5	n/a	5	1	0	0	0	0	0	0
11	69		14	13	0	0	0	0	0	0	0	0	0
12	28		16	1	3	2	2	0	0	0	0	0	0
13	25		3	2	0	3	0	0	0	0	0	1	0
14	86		25	9	3	15	2	0	0	0	1	0	0
15	44		9	2	2	3	0	1	0	0	0	0	0
16	119		39	9	5	4	1	0	0	0	0	0	0
17	121		42	n/a	11	2	1	1	0	0	0	0	0
18	51		36	3	6	3	0	0	0	0	0	0	0
19	106		111	41	21	4	3	1	1	0	0	0	0
20	19		8	6	0	0	2	1	0	0	0	0	0
21	142		n/a	14	n/a	8	0	0	0	0	0	0	0
22	108		52	n/a	8	2	n/a	0	0	0	0	0	0
23	33		11	3	0	1	0	0	0	0	0	0	0
24	17		15	0	0	0	0	0	0	0	0	0	0
25	64		49	25	15	1	0	n/a	n/a	n/a	0	0	0
26	22		29	14	0	0	n/a	0	0	0	0	0	0
27	71		98	0	n/a	5	0	2	0	0	0	0	0
28	27		17	9	0	0	0	0	0	0	0	0	0
29	18		9	5	0	0	0	0	0	0	0	0	0
30	102		39	26	5	2	0	0	0	0	0	0	0
31	87		35	32	17	6	0	0	2	0	0	0	0
32	72		38	18	5	5	0	0	0	0	0	0	0
33	69		40	20	n/a	1	n/a	n/a	0	0	0	0	0
34	71		39	15	11	0	0	1	1	0	0	0	0
35	96		34	21	13	n/a	n/a	0	0	0	0	0	0
36	20		8	7	2	0	0	0	0	0	0	0	0
	0		2	19	0	0	n/a	n/a	0	n/a	0	0	0
38	23		24	12	2	1	2	0	0	0	0	0	0
39	15		35	2	2	0	0	0	0	0	0	0	0
40	31		37	10	1	1	0	0	0	0	0	0	0
41	91		47	85	75	6	0	0	0	0	0	0	0
42	56		35	5	0	0	0	0	0	0	1	0	0
43	39		52	4	2	0	0	0	0	0	0	0	0
44	n/a		n/a	8	n/a	0	2	0	0	0	0	0	0
45	115		42	48	35	2	2	2	0	0	0	0	0
46	49		20	3	0	0	0	0	0	0	0	0	0
47	14		n/a	1	2	2	0	0	0	0	0	0	0
48	128		49	28	42	11	0	0	0	0	2	1	0
	56.8		28.5	12.3	8.0	2.7	0.6	0.3	0.1	0.0	0.1	0.0	0.0
	JAN	32.5			FEB	2.9			MAR	0.1			

1996

TRAP	Easter	12/4	19/4	26/4	2/5	10/5	17/5	24/5	31/5
1		0	0	N/A	0	0	0	0	1
2		0	0	Cyclone	0	0	0	1	0
3		0	0	Celeste	n/a	0	1	0	0
4		0	0		0	1	1	0	0
5		0	0		0	0	0	0	0
6		0	0		0	0	0	1	0
7		0	0		n/a	0	0	0	0
8		0	0		0	0	0	0	n/a
9		0	0		0	0	0	0	0
10		0	0		0	0	1	0	0
11		0	0		0	2	0	0	0
12		0	0		0	0	0	4	0
13		0	0		0	1	0	2	1
14		0	0		0	0	0	0	0
15		0	0		0	1	1	1	0
16		0	0		n/a	0	0	0	1
17		0	0		0	0	0	0	0
18		0	0		0	0	0	0	2
19		0	0		n/a	0	1	0	1
20		0	0		0	0	0	1	0
21		0	0		0	0	0	0	0
22		0	0		n/a	0	0	0	0
23		0	0		0	0	0	0	1
24		0	0		0	0	0	0	0
25		0	0		n/a	n/a	0	1	0
26		0	0		0	0	0	0	0
27		n/a	n/a		n/a	n/a	0	0	0
28		0	0		n/a	0	0	0	0
29		0	0		n/a	0	0	0	0
30		0	0		0	0	0	0	0
31		0	0		0	0	0	1	0
32		0	0		0	1	0	0	0
33		0	0		0	0	0	1	0
34		0	0		n/a	n/a	0	1	1
35		0	0		0	0	0	0	0
36		0	0		0	0	0	0	0
37		0	0		0	0	0	3	1
38		0	0		n/a	0	0	0	0
39		0	0		n/a	1	0	0	0
40		0	0		0	0	1	0	0
41		0	0		n/a	0	1	0	0
42		1	1		n/a	0	0	0	0
43		0	0		n/a	0	0	0	0
44		0	0		n/a	0	0	0	0
45		0	0		0	1	0	0	0
46		0	0		0	0	0	0	0
47		0	0		n/a	0	0	0	0
48		0	n/a		n/a	n/a	0	0	0
		0.0	0.0		<1	<1	<1	<1	<1
		APR	0.0		MAY	<1			

1996
TRAP

	7-Jun	14/6	21/6	28/6	5/7	12/7	19/7	26/7	2/8	9/8	16/8	23/8	30/8
1	0	1	0	0	1	0	0	1	0	1	0	0	1
2	1	0	0	0	1	0	0	0	1	1	0	0	1
3	0	0	0	0	2	2	0	0	0	n/a	0	2	0
4	0	0	0	2	1	0	1	0	0	1	0	1	3
5	0	0	0	0	1	0	0	0	0	0	0	0	3
6	0	1	1	0	1	2	3	0	0	0	0	0	2
7	0	0	0	0	0	0	0	0	0	0	0	0	1
8	0	0	0	0	3	1	1	2	1	0	0	0	1
9	0	0	0	0	2	1	2	0	0	1	0	0	2
10	0	0	0	0	1	0	1	0	0	1	0	0	4
11	0	0	0	0	0	0	0	0	0	0	0	0	1
12	0	0	2	2	0	2	3	0	0	1	2	9	4
13	1	0	1	0	0	0	1	0	0	1	0	0	0
14	0	1	1	1	1	1	0	0	2	1	1	0	0
15	0	0	0	0	1	1	1	0	0	n/a	0	0	1
16	1	0	0	0	2	0	0	n/a	n/a	n/a	0	0	1
17	0	0	1	1	3	0	1	6	0	1	0	0	1
18	0	0	0	0	0	2	3	3	0	5	0	0	5
19	0	0	0	0	0	0	0	0	0	0	0	0	2
20	0	0	0	0	n/a	0	n/a	0	n/a	0	1	n/a	0
21	0	0	0	1	1	2	1	8	1	9	5	1	1
22	0	0	1	0	3	4	0	n/a	0	1	0	6	1
23	1	1	0	0	2	2	1	0	0	2	0	4	
24	0	0	0	0	0	0	0	0	0	1	0	0	0
25	0	0	0	1	0	0	0	0	0	3	0	1	n/a
26	0	0	0	0	n/a	n/a	0	1	0	n/a	0	n/a	n/a
27	0	0	1	1	n/a	n/a	1	0	0	0	0	6	
28	0	0	0	0	0	0	1	0	0	0	1	1	1
29	0	0	0	0	0	0	0	0	0	0	1	2	
30	0	0	0	0	0	0	0	0	n/a	0	1	1	1
31	0	0	0	0	0	0	0	0	0	2	1	4	1
32	0	0	5	17	0	1	2	1	1	12	65	40	8
33	1	0	1	0	0	0	0	1	0	7	1	4	
34	0	1	0	0	0	1	1	3	2	8	4	4	
35	0	0	0	0	0	0	0	0	0	n/a	1	0	0
36	2	0	0	0	2	0	1	1	0	1	1	3	2
37	0	0	0	0	1	0	0	0	0	1	1	1	
38	0	0	1	4	0	0	n/a	1	0	6	11	11	
39	0	0	0	1	1	0	0	n/a	1	4	0	14	2
40	0	0	0	0	1	0	0	0	0	0	0	0	
41	N/A	0	0	1	1	0	1	1	0	0	1	12	
42	0	0	1	n/a	0	0	0	0	n/a	0	0	0	
43	0	0	0	0	0	0	0	0	0	0	1	n/a	0
44	0	0	0	0	2	0	0	0	0	0	0	0	
45	0	0	0	0	0	0	1	0	0	0	0	0	
46	0	0	0	0	1	0	0	0	0	0	0	0	0
47	0	0	0	n/a	0	0	0	0	0	0	n/a	n/a	n/a
48	0	0	1	0	1	0	0	0	0	0	0	0	
	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.6	2.1	5.3	

JUNE <1 JULY <1 AUG 2.3

1996

TRAP	5/9	12/9	20/9	27/9	4/10	11/10	18/10	25/10	1/11	8/11	15/11	22/11	29/11
1	1	1	2	2	7	2	2	3	7	10	28	29	13
2	1	1	3	4	4	27	25	30	51	28	47	68	96
3	5	3	5	4	3	22	19	45	60	13	0	5	n/a
4	7	5	12	15	52	118	47	73	91	397	28	264	230
5	2	1	3	3	23	12	8	60	60	116	120	n/a	135
6	8	7	8	3	23	21	70	42	115	70	0	132	95
7	9	0	1	6	3	8	24	35	90	54	34	71	123
8	1	1	4	5	6	20	17	16	69	58	18	7	149
9	2	1	3	2	19	28	15	26	52	15	0	2	325
10	2	2	3	15	20	n/a	36	53	33	35	8	3	1
11	4	1	5	5	13	36	8	203	187	22	0	6	4
12	4	4	3	15	4	22	12	65	212	175	2	1	0
13	2	1	4	13	19	44	55	28	63	61	32	41	110
14	1	2	5	2	1	5	n/a	n/a	n/a	n/a	61	1	220
15	1	3	8	5	0	13	9	9	14	21	7	2	185
16	2	3	2	9	25	22	20	130	315	165	218	156	425
17	6	7	10	30	29	66	36	133	280	123	24	3	500
18	1	1	5	11	47	120	139	190	433	415	253	800	217
19	10	7	23	26	63	84	51	165	280	1005	855	1000	305
20	3	0	0	0	0	n/a	0	0	n/a	n/a	0	0	0
21	1	34	18	85	72	83	90	190	30	400	267	21	0
22	N/A	N/A	N/A	95	87	74	85	170	n/a	195	115	190	15
23	5	0	3	3	8	8	21	40	70	22	73	127	94
24	2	0	1	1	2	1	5	0	0	1	3	45	20
25	1	3	10	23	10	n/a	22	n/a	50	550	300	n/a	360
26	N/A	0	1	12	2	n/a	10	6	n/a	n/a	n/a	n/a	75
27	1	5	4	37	N/A	7	5	90	230	260	182	72	n/a
28	1	1	N/A	N/A	2	1	1	12	5	2	200	110	60
29	1	0	1	4	N/A	2	0	2	5	10	150	95	55
30	20	20	65	83	57	62	102	125	120	150	n/a	112	110
31	15	36	55	85	75	57	115	11	11	30	8	11	20
32	25	33	33	56	125	101	127	180	290	330	525	260	260
33	1	1	18	2	18	4	3	7	10	22	49	41	105
34	7	6	20	8	13	11	12	73	6	82	154	340	550
35	1	1	2	6	10	3	2	6	6	n/a	n/a	42	110
36	2	2	2	8	5	3	3	8	15	18	19	24	78
37	12	2	3	10	10	9	3	20	47	65	58	37	185
38	4	3	60	34	120	n/a	112	55	150	45	n/a	52	60
39	2	2	8	18	21	16	20	22	45	n/a	20	n/a	40
40	0	0	0	4	N/A	4	3	4	4	40	30	46	35
41	1	4	5	14	21	42	51	42	85	120	130	130	70
42	3	3	0	4	N/A	5	6	0	0	2	2	52	n/a
43	1	1	0	0	0	4	2	8	8	10	13	13	33
44	1	0	N/A	0	2	2	n/a	n/a	2	5	n/a	n/a	n/a
45	0	0	0	0	0	0	1	0	0	1	0	0	0
46	0	0	0	1	0	4	0	0	1	0	2	0	10
47	0	N/A	N/A	2	N/A	10	6	30	35	36	60	n/a	149
48	1	0	0	1	0	1	0	3	16	n/a	11	80	25
	3.9	4.5	9.5	16.4	23.7	27.5	30.4	53.6	83.4	123.3	95.5	106.9	128.5
	SEPT		8.6		OCT	33.8					NOV	107.5	

1996 TRAP				
	6/12	13/12	20/12	27/12
1	81	0	2	18
2	95	0	0	25
3	n/a	4	7	12
4	n/a	1	2	31
5	9	0	0	19
6	2	0	2	32
7	45	2	6	8
8	311	75	13	n/a
9	260	13	n/a	22
10	157	11	3	5
11	0	0	0	14
12	0	0	0	2
13	19	1	1	41
14	154	5	18	28
15	94	5	2	10
16	216	12	10	17
17	319	1	19	30
18	613	n/a	0	8
19	695	8	37	53
20	n/a	0	0	1
21	0	1	51	79
22	4	43	n/a	48
23	109	3	2	14
24	19	1	0	9
25	65	26	23	24
26	55	40	n/a	6
27	7	11	7	n/a
28	4	2	10	25
29	n/a	1	15	38
30	n/a	65	41	21
31	n/a	22	38	34
32	85	75	23	74
33	18	11	45	59
34	250	110	62	36
35	60	32	11	11
36	3	2	6	5
37	75	55	16	9
38	n/a	15	31	55
39	n/a	n/a	n/a	n/a
40	15	10	48	35
41	30	45	39	103
42	4	6	28	41
43	17	2	9	11
44	10	n/a	12	58
45	0	65	49	82
46	0	0	0	3
47	65	22	26	26
48	35	55	53	65
	100.0	19.1	17.4	29.9
		DEC	41.6	

1997

TRAP	3/1	10/1	17/1	24/1	31/1	7/2	14/2	21/2	28/2	7/3	14/3	21/3	28/3
1	11	25	14	14	59	9		1		1	0	1	
2	41	19	31	15	108	4		1		1	0	0	
3	29	n/a	12	31	118	6		5		0	0	0	
4	21	58	6	120	175	14		0		1	n/a	0	
5	19	89	48	50	81	n/a	C	n/a	C	n/a	n/a	0	C
6	85	25	66	46	48	40	Y	2	Y	2	1	0	Y
7	25	11	13	14	18	2	C	2	C	1	0	0	C
8	14	29	65	13	n/a	n/a	L	4	L	0	0	0	L
9	59	55	52	40	96	5	O	1	O	1	1	0	O
10	7	14	15	10	15	6	N	2	N	2	0	0	N
11	64	23	26	47	35	n/a	E	n/a	E	1	0	0	E
12	69	25	40	36	136	10		6		0	0	0	
13	91	40	29	29	n/a	31	I	7	J	0	n/a	0	J
14	42	32	64	32	70	8	T	n/a	U	1	0	0	U
15	20	28	24	7	19	31	A	1	S	0	0	0	S
16	24	42	81	17	55	4		2	T	3	0	0	T
17	32	12	73	44	110	26		1	I	1	0	0	I
18	21	37	29	74	47	35		18	N	0	0	0	N
19	121	78	56	124	255	73		5		6	0	1	
20	8	21	11	2	6	4		1		0	1	n/a	
21	200	60	8	n/a	n/a	4		1		0	0	0	
22	61	97	8	n/a	n/a	18		6		3	0	1	
23	22	15	10	17	10	2		1		0	0	0	
24	20	17	9	7	8	2		0		0	0	0	
25	288	33	38	32	185	30		12		2	0	n/a	
26	88	3	79	8	75	10		n/a		1	0	0	
27	18	29	82	65	355	n/a		38		n/a	n/a	0	
28	28	72	n/a	6	12	0		1		0	0	0	
29	42	43	31	12	9	0		0		0	0	0	
30	44	130	120	39	30	n/a		0		0	0	0	
31	206	205	302	89	120	32		0		0	0	0	
32	198	194	258	155	130	n/a		12		0	0	0	
33	84	65	76	35	110	n/a		n/a		n/a	0	0	
34	92	83	95	68	210	35		2		0	0	0	
35	46	32	51	38	60	37		3		0	0	0	
36	25	20	45	21	60	15		2		1	0	0	
37	9	13	12	19	60	3		3		0	0	0	
38	89	92	78	34	33	2		2		n/a	0	0	
39	169	73	60	24	26	n/a		1		n/a	n/a	0	
40	122	26	36	16	35	5		n/a		0	1	0	
41	92	105	25	63	70	n/a		12		1	0	0	
42	102	98	48	37	110	5		1		0	0	0	
43	29	33	27	15	n/a	3		0		0	0	0	
44	102	76	69	41	60	n/a		n/a		n/a	n/a	0	
45	79	87	33	32	60	22		6		0	0	0	
46	33	18	8	6	5	0		0		0	0	0	
47	52	28	19	11	n/a	5		3		0	0	0	
48	152	206	51	24	130	20		12		3	n/a	1	
	68.6	55.7	51.8	36.5	81.3	14.7		4.3		0.8	0.1	0.1	
	JAN	58.8					FEB	9.5			MAR	0.3	

1997

TRAP	4/4	11/4	18/4	25/4	2-May	9-May	16-May	23-May	6-Jun	13-Jun	20-Jun	27-Jun
1	0	0	0	0	0	0	0	0	0	0	1	0
2	0	0	0	1	0	0	0	0	1	1	0	0
3	1	1	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	1	1	0	0	0	0	1
5	1	1	0	0	0	0	0	0	1	1	0	1
6	0	0	0	0	0	0	0	n/a	1	1	0	0
7	1	n/a	1	0	0	0	0	n/a	0	n/a	0	n/a
8	n/a	1	1	1	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	1	0	0
10	1	0	0	1	1	0	0	0	n/a	0	0	1
11	0	0	0	0	0	2	1	1	0	0	0	0
12	0	1	0	1	1	0	2	1	1	1	0	0
13	1	0	2	0	0	0	n/a	1	2	1	0	0
14	0	0	n/a	2	1	0	1	1	n/a	0	0	0
15	0	1	0	1	3	0	0	1	0	4	1	6
16	n/a	0	3	1	1	0	0	0	1	0	0	2
17	0	0	0	0	0	0	0	0	2	1	0	1
18	2	1	1	0	0	1	0	0	0	0	0	0
19	2	0	0	2	0	0	1	1	3	2	3	3
20	0	0	0	1	1	0	0	0	0	0	0	0
21	1	n/a	1	1	1	n/a	n/a	0	1	n/a	0	0
22	1	2	0	0	0	n/a	n/a	0	0	0	1	n/a
23	0	0	0	0	0	n/a	0	0	0	0	0	1
24	0	0	0	0	0	n/a	0	n/a	0	0	0	1
25	0	1	0	0	0	0	n/a	n/a	0	1	3	n/a
26	0	0	0	0	0	n/a	0	0	n/a	n/a	0	0
27	n/a	n/a	0	0	n/a	n/a	n/a	0	0	0	0	2
28	0	0	0	0	0	0	0	0	0	0	0	1
29	0	0	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0	1	0
31	0	0	0	0	0	1	0	0	0	0	0	n/a
32	0	0	0	1	0	0	n/a	0	2	1	0	6
33	0	0	0	0	0	n/a	0	0	0	0	0	0
34	0	0	0	0	0	0	0	1	1	1	3	3
35	0	0	n/a	n/a	0	0	0	0	0	n/a	0	n/a
36	0	0	1	0	0	0	0	0	n/a	n/a	0	0
37	0	0	1	0	n/a	0	0	0	0	0	0	1
38	0	0	0	0	0	1	n/a	0	n/a	0	0	1
39	0	0	n/a	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a
40	0	0	1	1	0	0	0	0	0	0	0	1
41	0	0	0	1	0	0	1	n/a	1	0	0	0
42	1	1	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	n/a	0	0	0	n/a	n/a	0	0	0	1	n/a
45	1	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	n/a	n/a	n/a	n/a	n/a	0	0	0	1
48	2	1	0	0	0	0	0	0	0	0	2	2
	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.9
		APR	0.3			MAY	0.2			JUNE	0.5	

1997

4-Jul	11-Jul	18-Jul	25-Jul	1-Aug	8-Aug	15-Aug	22-Aug	29-Aug	5-Sep	12-Sep	19-Sep	26-Sep
0	2	0	2	0	0	3	1	1	0	5*	0	1*
0	0	0	1	0	0	0	0	11*	10	5	52*	32
0	1	0	0	4	3	6	2	2	1	14*	11	24*
0	0	0	0	1	0	1	3	2	0	2*	2	3*
0	0	0	0	0	0	0	0	0	1	1	3*	3
0	3	0	1	6	1	2	1	10*	13*	21*	24*	16
0	0	1	0	6	5	1	2	2	0	4*	7*	1
0	0	n/a	0	1	0	3	1	1	0	2*	0	2*
0	0	0	0	1	0	0	3	3	0	4*	1	1
0	0	0	0	0	1	1	3	3	2	3*	7*	1
1	0	0	0	1	0	0	4	1	3*	1	2*	0
1	0	n/a	0	2	1	0	3	3	1	0	0	0
1	0	0	2	0	1	2	1	1	3*	7*	7	2
0	0	0	0	1	0	2	4	2	0	5*	3	1
9	13	3	1	5	5	2	3	2	2	1	0	0
1	n/a	0	0	n/a	3	2	0	4*	7*	27*#	5	7*
1	0	0	0	1	1	3	1	2*	3	13*#	8	1
0	0	1	0	0	0	2	1	1	13*	3	2	1
13	2	1	3	13	2	13	3	17*	12	26*	32*	38*
0	0	0	0	0	1	0	2	0	0	1*	1	0
0	0	0	0	1	0	1	2	0	1*	1	2*	0
1	1	0	1	2	0	2	0	1*	2*	15*	2	8*
0	0	0	0	0	0	0	4	2	1	2*	0	0
0	0	0	0	0	1	0	1	0	0	0	2	0
2	0	0	1	1	0	1	2	1	4*	3	12*	16*
1	0	0	n/a	0	n/a	0	5	4	0	4*	3	10*
0	n/a	n/a	1	1	n/a	3	3	1	4*	3	8*	12*
0	0	0	0	0	3	4	n/a	0	2*	1	2*	3*
0	1	0	1	1	1	n/a	n/a	3	4*	2	5*	2
0	0	0	0	3	9	15	10	7	4	8*	8	14*
4	0	0	0	0	0	4	0	3*	6*	12*	14*	6
0	0	1	1	3	0	4	2	1	3*	43*	32	51*
0	0	0	2	0	0	3	4	3*	1	0	0	2*
3	0	0	0	0	0	5	9	2	1	4*	2	9*
n/a	0	0	0	0	2	4	3	0	1*	n/a	5	7*
0	0	0	0	0	0	0	1	0	1*	1	2*	0
2	0	1	1	0	1	1	5	5	2	2	0	2*
1	1	1	1	1	6	2	12	0	3*	18*	16	24*
0	n/a	n/a	0	1	n/a	n/a	n/a	3	2	1	4*	3
n/a	0	0	1	0	n/a	1	0	0	1*	8*	1	7*
2	0	0	0	0	n/a	3	2	0	3*	3	3	3
0	0	0	0	0	n/a	3	1	0	4*	1	4*	0
0	0	0	0	2	0	3	2	0	1*	3*	0	0
n/a	n/a	n/a	n/a	0	n/a	2	1	2*	2	35*	16	16
0	0	0	0	0	0	3	2	3*	3	9*	8	8
0	0	0	n/a	0	0	1	0	0	1	2	7*	4
1	0	4	1	n/a	3	1	1	0	n/a	1	2*	n/a
2	1	n/a	n/a	1	4	4	2	31*	39*	61*	36	103*
1.0	0.5	0.3	0.4	1.3	1.4	2.4	2.4	1.1	1.0	8.3	7.6	9.4
	JULY	0.6			AUG	1.7			SEPT	6.6		

1997

3-Oct	10-Oct	17-Oct	24-Oct	31-Oct	7-Nov	14-Nov	21-Nov	28-Nov	5-Dec	12-Dec	19-Dec	26-Dec
2*	2	3*	11*	16*	3	29*	49	2	8	8	6	Rain
17	44*	22	13*	28*	30*#	32*	12	8	2	3	22*	No counts
24	41*	40	52*	11	55*	49	82	9	26	6	12*	
1	17*	7	26*	10	55*#	31	86	86	16	0	22*	
3	1	6*	6	2	10*	53*	77	23	12	0	20*	
28*	33*	38*	36	3	14*	73*#	72	45	12	17	1	
3*	3	5*	19*	20*	16	36*	54	6	1	2	2	
7*	12*	44*	41	n/a	31	61*	210	25	5	14	10	
4*	9*	3	16*	9	4	2	26	30*	0	3	10*	
0	5*	2	6*	1	4*	27*	30	3	0	0	6*	
1*	2*	0	7*	19*	15	13	6	35*	2	0	0	
0	2*	2	0	22*	11	6	16	14	1	0	3*	
2	10*	6	20*	13	19*	15	17	66*	0	2	2	
2*	2	12*	13*	2	27*	43*	94	12	8	12	12	
3*	6*	4	7*	10*	30*	41*	128	3	3	9	10*	
12*	7	33*	26	5	20*	25*	15	31*	0	0	46*	
7*	9*	14*	6	3	11*	5	4	1	0	0	n/a	
2*	0	1*	11*	5	20*	34*	32	28	2	0	0	
31	12	16*	30*	59*	52	47	240	48	8	0	32*	
0	2*	0	2*	2	5*	4	24	10	5	3	0	
2*	2	6*	n/a	0	2*	na	n/a	60	4	n/a	0	
n/a	n/a	39*	n/a	n/a	20	na	n/a	n/a	n/a	3	n/a	
1*	0	0	0	n/a	5	1	32	13	0	0	2	
1*	0	1*	0	1	0	9*	8	2	0	4	4	
11	15*	4	3	8*	15*	19*	12	0	18	26	55*	
13*	6	16*	6	1	0	0	n/a	n/a	0	0	6*	
6	13*	34*	39*	2	25*	2	61	45	0	0	n/a	
4*	11*	0	n/a	0	24*	8	n/a	n/a	n/a	n/a	n/a	
6*	13*	18*	13	5	28*	18	41	n/a	0	0	n/a	
31*	32*	58*	55	51	60*	193*	207	35	67	42	30	
8*	6	6	6	0	0	5*	4	60	21	0	2*	
55*	71*	32	16	38*	9	3	167	12	19	48	60*	
13*	2	2	0	n/a	n/a	15	43	0	18	0	15*	
15*	7	9*	5	19*	30*	52*	104	36	0	1	20*	
11*	8	9*	5	5	26*	17	31	15	30	6	94*	
3*	3	0	0	2*	n/a	0	6	6	n/a	0	n/a	
2	n/a	5	0	0	n/a	0	5	4	0	0	n/a	
14	46*	51*	22	3	72*	19	58	35	0	4	n/a	
0	2*	2	3*	n/a	n/a	5	12	0	0	0	n/a	
0	6*	27*	16	11	57*	13	n/a	n/a	48	0	n/a	
n/a	15*	0	4*	n/a	n/a	na	n/a	n/a	n/a	0	n/a	
2*	3*	0	n/a	n/a	1	0	0	n/a	12	2	25*	
0	1*	2*	0	2*	0	2	7	3	5	11	45*	
n/a	2	0	5*	0	n/a	38	50	45	4	0	n/a	
6	23*	29*	n/a	53*	10	na	47	8	16	9	23*	
8*	5	5	18*	6	0	45*	60	4	7	0	0	
3	1	7*	8*	9*	5	8*	16	n/a	3	0	n/a	
116*	118*	81	60	6	n/a	92	42	14	3	2	n/a	
10.7	13.7	14.6	14.0	11.0	20.2	27.0	54.5	22.0	8.8	5.2	17.5	
	OCT	12.8			NOV	30.9				DEC	10.5	

1998

Trap	2-Jan	9-Jan	16-Jan	23-Jan	30-Jan	6-Feb	13-Feb	20-Feb	27-Feb
1	Rain	2	2	6	15	2	4	17*	6#
2	No counts	6	13	17	73	3	11	24*	9
3		n/a	11	21	100	18	n/a	56*#	21#
4		n/a	9	75	250	30	40	62*#	75*#
5		23	6	38	40	4	9	55*#	11#
6		0	5	24	59	1	4	10*	1
7		6	6	n/a	15	0	2	0	1*
8		0	4	29	60	10	10	12*	4#
9		3	25	71	23	6	4	20*#	6
10		14	7	52	23	n/a	4	32*	3
11		1	5	18	20	5	3	2	2
12		8	3	6	10	0	4	6*	3
13		26	0	15	33	6	10	28*	2
14		n/a	6	18	55	2	6	2	4*
15		9	3	19	20	0	1	0	0
16		59	19	49	100	0	30	22	12
17		24	18	53	54	8	13	35*	n/a
18		12	4	23	26	6	12	n/a	n/a
19		n/a	n/a	n/a	n/a	n/a	n/a	32	45*#
20		18	0	5	4	0	3	0	1*
21		n/a	n/a	2	11	n/a	n/a	0	n/a
22		n/a	30	n/a	3	0	0	0	0
23		0	3	11	6	0	n/a	n/a	0
24		2	0	2	0	0	1	1	0
25		n/a	n/a	n/a	n/a	16	16	125*#	24#
26		n/a	0	8	49	n/a	n/a	28	12#
27		n/a	n/a	19	65	n/a	n/a	n/a	n/a
28		n/a	n/a	36	25	1	0	n/a	n/a
29		n/a	1	45	17	0	0	n/a	n/a
30		n/a	35	95	155	39	0	4*	0
31		4	26	100	65	5	n/a	0	0
32		53	31	83	80	13	12	n/a	n/a
33		4	4	21	10	0	12	10	4
34		6	5	48	70	0	0	57*#	25#
35		18	1	62	22	8	36	53*#	7
36		0	n/a	7	2	n/a	3	5*	0
37		n/a	0	27	52	n/a	n/a	75#	15#
38		n/a	22	79	65	2	n/a	15	0
39		n/a	3	12	17	0	0	n/a	n/a
40		n/a	15	33	35	0	n/a	n/a	n/a
41		71	4	8	45	0	0	n/a	n/a
42		3	n/a	28	6	n/a	n/a	n/a	n/a
43		15	5	22	8	0	6	2	0
44		n/a	3	10	8	0	0	0	0
45		5	10	52	22	0	12	16*	5
46		n/a	9	19	35	1	1	10*	4
47		4	2	16	6	n/a	2	3*	2
48		n/a	16	39	30	0	n/a	0	n/a
		13.7	9.0	32.3	41.1	4.8	8.0	21.0	8.0
				Jan				Feb	
				24.0				10.4	

1998

6-Mar	13-Mar	20-Mar	28-Mar	3-Apr	10-Apr	17-Apr	24-Apr
1	5*	8*	1	5*	1	0	0
0	4*	0	1	3*	0	2*	1
1#	1	1	1	1	0	10*	0
0	7*	2	2	2	0	20*	15
2	4*	11*	0	4*	0	16*	6
2#	0	2*	0	0	1	N/A	3
1	1	4*	0	0	0	2*	3*
1	3*	4*	2	2	1	16*	0
0	2*	1	0	2*	2	15*	15
0	2*	8*	6	7*	3	53*	53
2	0	2*	0	0	5*	9*	6
0	0	2*	4*	0	3*	15*	6
5#	6*	8*	3	1	0	1*	3
0	4*	2	0	0	1*	0	n/a
0	0	4*	4	0	3*	11*	0
2	0	1*	0	3*	1	3*	n/a
0	0	0	n/a	1	5*	2*	0
4	0	5*	3	10*	2	27*	29*
3#	2	18*	25*	18	192*	380*	n/a
0	0	0	0	0	17*	50*	25
0	0	0	0	n/a	0	3*	0
0	2*	7*	0	0	0	12*	3
0	0	0	0	0	1*	0	n/a
0	0	0	0	0	2*	3*	1
2	1	2*	1	0	0	35*	25
0	0	0	0	n/a	3	N/A	n/a
0	0	4*	0	0	3*	3	16*
1	0	2*	3*	0	0	6*	9*
0	1*	0	4*	1	3*	1	n/a
0	0	1*	1	0	1*	32*	16
0	0	3*	16*	3	12*	88*	97*
0	0	6*	5	1	4*	11*	37*
0	0	0	4*	0	53*	14	1
4#	1	4*	7*	1	7*	44*	4
0	0	1*	1	2*	3*	39*	13
0	0	0	0	n/a	1	0	1
0	6*	7*	3	3	0	5*	6*
n/a	0	0	1*	n/a	n/a	26*	31*
0	2*	10*	13*	2	7*	9*	43*
0	0	3*	0	0	4*	24*	24
n/a	0	6*	1	2*	12*	N/A	85
n/a	0	2*	0	1*	n/a	56*	80*
0	0	0	0	0	0	N/A	0
0	0	3*	12*	12	96*	137*	136
0	1*	7*	6	1	24*	47*	48*
0	0	3*	2	1	12*	63*	37
0	0	0	0	n/a	0	1	0
0	4*	15*	13	14*	82*	152*	360*
1.0	1.0	4.0	3.0	2.4	12.3	32.8	29.5

March	April
2.3	19.3

1998

1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun	3-Jul
1*	0	17*	13	3	0	2*	4*	2	31*
4*	27*	7	15*	0	0	2*	2	n/a	3
4*	48*	53*	70*	0	0	6*	4	12*	9
10	28*	320*	375*	16	71	26	60*	40	60*
8*	16*	169*	170*	2	2	9*	42*	5	35*
2	10*	39*	30	3	0	3*	6*	1	14*
1	18*	89*	46	8	5	3	7*	8*	21*
11*	19*	165*	87	5	0	4*	15*	6	42*
21*	82*	168*	152	31	6	6	16*	50*	81*
45	53*	n/a	n/a	141	90	82	90*	25	190*
3	7*	34*	24	7	2	11*	1	14*	22*
3	9*	80*	82*	23	27*	4	8*	21*	18
1	7*	35*	28	7	1	3*	4*	2	13*
0	6*	46*	21	3	1	6*	5	2	42*
21*	10	164*	158	50	12	26*	26	55*	225*
7	168*	111	125*	15	9	46*	45	49*	23
n/a	n/a	95	74	24	14	n/a	n/a	7	10*
27	69*	70*	138*	n/a	7	39*	20	17	44*
10	406*	403	240	285	298*	91	100*	75	216*
5	33*	122*	113	12	19*	5	12*	30*	36*
n/a	10	n/a	38	26	0	6*	n/a	0	6*
5*	7*	48*	n/a	12	6	9*	12*	9	9
0	98*	128*	56	15	10	12*	n/a	n/a	n/a
6*	22*	22	24*	5	7*	5	2	18*	26*
50*	186*	192*	240*	82	78	91*	39	n/a	360
4	5*	61*	30	n/a	11	13*	6	n/a	0
n/a	n/a	24	n/a	32	13	16*	45*	26	31*
7	1	68*	65	42	10	20*	21*	21	22*
8	4	87*	115*	26	11	33*	38*	33	54*
n/a	n/a	n/a	450	142	n/a	10	51*	120*	144*
18	5	420*	171	45	5	4	43*	250*	67
30	121*	122*	235*	58	15	5	46*	244*	97
11*	7	15*	36*	18	6	26*	80*	6	n/a
55*	5	67*	120*	32	63*	58	21	23*	64*
3	31*	43*	35	77	29	41*	70*	35	26
0	0	26*	40*	8	26*	13	22*	13	13
1	7*	27*	30*	10	12*	12	4	5*	7*
125*	8	190*	220*	82	58	n/a	n/a	155*	117
0	n/a	164*	360*	59	n/a	120*	105	180*	87
45*	38	42*	65*	42	8	4	3	13*	22*
20	22*	36*	140*	29	18	70*	n/a	19	43*
54	4	68*	260*	44	6	133*	150*	135	8
n/a	n/a	22	0	0	0	3*	2	4	0
83	186*	150	80	63	28	75*	21	78*	65
23	200*	155	110	32	15	12	15*	25*	33*
25	n/a	105*	n/a	42	45	63*	41	54*	74*
n/a	n/a	15	n/a	5	42*	0	8*	9*	6
72	360*	300	n/a	53	90*	120*	52	103*	131*
20.0	57.0	106.0	116	37	25	28.1	28.4	42.0	55.1
				May					35.72
				67.2					