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Fruit carrying characteristics of travellers into a quarantine zone in New South Wales in 1999/2000

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Abstract

Data was collected from 11 955 travellers entering the Fruit Fly Exclusion Zone. There was a continuing decline in the proportion of travellers with fruit however carriers continued to carry about six items of fruit as in past years. Generally the highest fruit carriage occurred at the start of the program and we postulate that regular travellers know that fruit fly road blocks do not occur in winter, and these travellers were caught with fruit when the program restarts each spring. Travellers originating from near the road block site were less likely to carry fruit. Retirees were more likely to carry fruit although fruit carriage by all traveller types declined compared with previous years. The most commonly carried fruit were pome (mainly apples), tomatoes, citrus, bananas, stone fruit and tropical fruit in that order. The continuing decline in the proportion of traffic carrying fruit was seen as a contributor to the overall fruit fly management of the Zone.

Introduction

Fruit fly cost the Australian horticulture industry $128.7 million for the five year period July 2003 to June 2008 (Oliver 2007). Many strategies are used to maintain market access for the horticultural industry including pest eradication and prevention of re-entry into pest free regions after eradication campaigns. Strategies to prevent re-entry include pest monitoring, host and pest exclusion, community awareness and incursion controls. Roadside inspections to check vehicles for hosts of Queensland fruit fly (*Bactrocera tryoni* Froggatt) (Qfly) has been widely used in all states of Australia (Ballantyne 1992, Madge *et al.* 1997, Dominiak *et al.* 1998, Sproul 2001, Cantrell *et al.* 2002). In previous NSW programs, different host interception strategies were trialled and evaluated to further decrease the amount of fruit being carried from the Risk Reduction Zone (RRZ) into the Fruit Fly Exclusion Zone (FFEZ) (Dominiak *et al.* 2001, Dominiak and Barchia 2005a).

The effectiveness of the host exclusion program can be increased if the incursion risk factors are identified enabling vehicle inspections to target high risk times or travel groups. If these risks are not known, road side inspections of the general public must adopt one of two philosophies. Either inspections must aim to inspect all traffic (but at a significantly high cost), or alternatively, a smaller proportion of traffic is assessed and it is accepted that a larger proportion of traffic escapes inspection. This second strategy can be made more effective if travellers are intrinsically encouraged not to carry fruit.

Some risks are already known and these risks come from diverse sources. Different types of fruit pose different risks (Dominiak *et al.* 1998, Dominiak and Barchia 2005a). Infested tomatoes and stone fruit were more frequently detected Qfly hosts. Cherries are stone fruit, and if infested, may support high numbers of larvae for their comparatively small size (Jessup personal communication). However cherries and pome fruit (apples and pears) are generally grown in colder areas and are unlikely to be infested. Bananas are usually harvested in a green condition and hard green bananas are not susceptible to fruit fly attack. Backyard fruit was regarded as high risk because of the general lack of care in its production, compared with fruit supplied to supermarket stores. Traveller types also pose different risks. Retirees are consistently the traveller type that mostly frequently carries fruit, followed by families, although the percentage of fruit carriage continues to decline with all traveller types. Trip origins and destinations significantly influence the risk of introducing infested fruit. Travellers originating from or going to the FFEZ and RRZ carry fruit less frequently while travellers from Queensland and inland New South Wales carry fruit much more frequently. Different highways have different profiles for fruit carriage, traveller type and types of fruit (Dominiak *et al.* 1998, 2000a,b, 2001, 2005a,b, Dominiak and Barchia 2005a)

In New South Wales (NSW), the TriState Fruit Fly Committee conducts an awareness campaign for both travellers and residents of the RRZ and FFEZ. In the past, this campaign has been delivered into five states. But even this campaign needs to be targeted if it is to efficiently use financial resources. This paper reports on the NSW

roadblocks in 1999–2000 and the identification of higher risk traveller groups and the assessment of their relative risks. Knowledge of these risks can be used to conduct a targeted vehicle inspection program which maximizes the use of available financial resources in future programs.

Materials and methods

Survey operations

This report examines data from 11 955 vehicles surveyed over a twelve month period from June 1999 to April 2000 at three sites (Broken Hill – BH, Kamarah – K, and Sturt Highway – S) (Table 1). The Roadblocks consisted of the pullover site beside the roadway where vehicles were directed by inspectors. Travellers were asked to participate in a voluntary questionnaire and then the vehicle was checked for fruit.

The method of conducting roadside inspections and collecting survey information was similar to operations in previous years (Dominiak *et al.* 1998, 2000a, 2001, Dominiak and Barchia 2005a). Details of the roadblock location (site), the date, and whether the vehicle was carrying fruit were recorded for every vehicle stopped at the roadblocks. Additionally, information was recorded for respondents on the travellers' home town, frequency of travel into the FFEZ, the type of occupant(s) in the vehicle, and the types and number of fruit carried. Where fruit was found, the fruit was confiscated and additional information collected for a possible legal response.

All travellers were asked the same questions (see Dominiak and Coombes, unpublished data) however not all questions were answered. The survey information was recorded in varying levels due to the different diligence of individual inspectors. Some details were missing, for example, one quarter of the vehicles recorded as carrying fruit through the BH site had no information about the fruit being carried (63/252). Nearly all vehicles recorded with fruit at the other two sites had the type of fruit recorded, (K 40/41; S 348/354).

Statistical analysis

The data were summarized in a set of tables. The proportions of vehicles carrying fruit were modelled using Generalized Linear Models (GLMs) with logit link function and assuming a binomial distribution. The full model and relative significance of the factors is provided in Table 2. This was based on a reduced number of vehicles with complete data for the factors concerned (7987 vehicles). The significant factors in the full model were then examined. Predictions for individual factors were obtained from the complete data for that factor. Predictions for component factors in the model were based on a variable number of vehicles (eg site = 11 955; site month = 11 955; occupant = 8970; home town = 9427; heard of FFEZ × often travel = 8439).

Relationships between sets of variables were examined using a Chi-squared test for independence or log-linear models assuming a Poisson distribution. The GenStat statistical package was used for analyses (Genstat 1997).

Results

Carriage of fruit

Of the 11 955 vehicles surveyed, 647 (5.4%) were carrying fruit. Of these, 547 (84.5%) had major fruit counts recorded. Major fruit was categorized as pome, bananas, citrus, stone fruit, tomatoes and tropical fruits. Some 3509 pieces of major fruit were carried by travellers, or 6.41 pieces of fruit per fruit carrying vehicle. The presence of fruit in vehicles was modelled as a binomial response in a GLM with logit link. The most significant factor related to the carriage of fruit was whether the traveller had 'Heard of the FFEZ' (Dominiak and Coombes unpublished data). Other significant factors in this model were site × month interaction, frequency of travel, home town, type of traveller and an interaction between the frequency of travel and whether the traveller had 'heard of the FFEZ' (Table 2).

Fruit carrying vehicles by site

The proportions of vehicles carrying fruit for the three sites are given in Table 3 and compared with previous years. The proportion of vehicles carrying fruit was significantly higher at the Broken Hill site than at the Kamarah or Sturt sites.

Fruit carrying vehicles by month

More detailed analysis of the site × month interaction was not possible because of the unbalanced nature of the information in the survey. Higher proportions of fruit carrying vehicles were observed in September and October (Table 4). The September figure (7.74%) represents the BH site only. The October figure (9.54%) encompasses

Table 1. Number of vehicles surveyed by site and month, including totals for site and month.

	Jun	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
BH	0	620	1117	469	602	0	0	0	0	2808
K	0	0	68	0	597	0	0	130	271	1066
S	509	0	1162	1941	1543	523	666	423	1314	8081
Total	509	620	2347	2410	2742	523	666	553	1585	11955

Table 2. Analysis of deviance showing factors significant in fruit carriage.

Change	d.f.	Deviance	Mean deviance	Deviance ratio	Approx. chi pr
Heard FFEZ	1	296.8092	296.8092	296.81	<.001
Home Town	15	105.0978	7.0065	7.01	<.001
Often Travel	2	29.2388	14.6194	14.62	<.001
Occupants	4	37.6283	9.4071	9.41	<.001
Site × Month	15	98.0911	6.5394	6.54	<.001
Heard FFEZ × Often Travel	2	12.7932	6.3966	6.40	0.002
Residual	7949	2912.8705	0.3664		
Total	7986	3479.7357	0.4357		

Table 3. Proportion (standard error in brackets) of vehicles carrying fruit at three sites (figures in the same column followed by the same letter are not significantly different).

	Years of operation			
Site	1999/2000	1998/1999[C]	1997/1998[D]	1996/1997[E]
BH	0.08974 (0.00539) a	*	*	*
S	0.04381 (0.00226) b	0.09	0.13	0.14
K	0.03846 (0.00582) b	0.05	0.07	0.09

[C] Source Dominiak and Barchia (2005b). [D] Source Dominiak *et al.* (2000a). [E] Source Dominiak *et al.* (2001). * No data available.

Table 4. Proportion of vehicles carrying fruit by month. SE = standard error.

Proportion of vehicles carrying fruit		
Month	Prediction	SE
Jun	0.05305	0.00993
Sep	0.07742	0.01073
Oct	0.09544	0.00606
Nov	0.04938	0.00441
Dec	0.04923	0.00413
Jan	0.02677	0.00705
Feb	0.03003	0.00661
Mar	0.05606	0.00978
Apr	0.01830	0.00334

all three sites including some holiday periods, with observed proportions of fruit carrying vehicles: BH 0.1092 (122/1117), K 0 (0/68) and S 0.0878 (102/1162). The March figure (5.60%) does not include the BH site and was higher than average but represents a relatively low volume of traffic (553 vehicles).

Fruit carrying vehicles by home town

Table 5 shows differences in the proportions of vehicles carrying fruit for the traveller's home town. Standard errors are approximate because the model was not linear. There are clear trends in the proportions shown. Home towns close to or in the FFEZ (such as Broken Hill, MIA, Wagga Wagga, Sunraysia and the Risk Reduction Zone) have lower proportions of fruit than home towns in other regions. The home towns of MIA, Wagga Wagga and Risk Reduction Zone were regarded as 'local' traffic for K and S sites, and made up 36.1% of the 9147 vehicles of the Riverina traffic flow. The local traffic for BH was 340 (12.1%) of 2808 vehicles. Of the other home towns with high traffic volume, the Sydney, Newcastle and Wollongong region (all in NSW) and South Australia excluding Riverland have the highest proportions of vehicles carrying fruit.

Fruit carrying vehicles by type of occupant

Table 6 shows differences in proportions of vehicles carrying fruit for types of occupants. The type with the highest proportion carrying fruit was adults retired, while single adults and commercial drivers have the lowest proportions. Comparisons with other recent years are also provided.

Type of fruit carried

The main types of fruit carried were provided in Table 7 with the higher preference being (in order of highest to lowest) pome fruit (mainly apples), tomatoes, citrus, bananas, stone and tropical fruit. In

Table 5. Total number and number of fruit carrying vehicles, proportion of vehicles with fruit (standard error in brackets) by home town.

Home town	Number of vehicles with fruit	Total number of vehicles	Proportion of vehicles with fruit (SE)
North Coast NSW	27	191	0.1414 (0.0252)
Other	36	261	0.1379 (0.0213)
Vic excluding Sunraysia	33	260	0.1269 (0.0206)
Southern Qld	39	347	0.1124 (0.0170)
Sydney/Newcastle/Wollongong	143	1353	0.1057 (0.0084)
SA excluding Riverland	82	862	0.0951 (0.0100)
South Coast NSW	9	110	0.0818 (0.0261)
Northern Qld	7	87	0.0805 (0.0292)
ACT	34	456	0.0746 (0.0123)
Sunraysia	6	92	0.0652 (0.0257)
Inland NSW	94	1628	0.0577 (0.0058)
Broken Hill	16	340	0.0471 (0.0115)
Risk Reduction Zone	5	111	0.0451 (0.0197)
Riverland SA	1	41	0.0244 (0.0240)
Wagga Wagga	21	1024	0.0205 (0.0044)
Murrumbidgee Irrigation Area	35	2264	0.0155 (0.0026)

Table 6. Total number and number of fruit carrying vehicles, proportion of vehicles with fruit (standard error in brackets) by type of occupant.

	Number of vehicles with fruit	Total number of vehicles	Proportion of vehicles with fruit (SE)	Proportion of vehicles with fruit (SE)		
Occupants	1999/2000			1998/99	1997/98	1996/97
Adults retired	123	1108	0.11101 (0.00944)	0.19	0.23	0.24
Adults not retired	237	3536	0.06702 (0.00421)	0.06	0.14	*
Family	104	1977	0.05260 (0.00502)	0.11	0.16	0.16
Single adult	62	2268	0.02734 (0.00342)	0.04	0.06	*
Commercial driver	1	81	0.01235 (0.01192)	0.04	0.04	0.06

* Data not available.

Table 7. Number of fruit per fruit carrying vehicle for each main fruit type.

	Total fruit	No. of vehicles with fruit	Min.	Lower quartile	Median	Mean	Upper quartile	Max.
Pome	998	244	1	2	3	4.09	4.00	50
Tomatoes	746	208	1	2	3	3.59	5.00	19
Citrus	691	149	1	1	3	4.64	6.00	50
Bananas	569	164	1	2	3	3.47	4.00	45
Stone	290	44	1	2	4	6.59	6.00	50
Tropical	215	49	1	1	2	4.39	3.25	30
All fruit	3509	547	1	2	4	6.41	8.00	61

the model, the fruit carrying vehicles were more likely to be carrying pome fruit at the BH and S sites than at site K (Table 8). The presence of bananas was higher at the S site than at the BH site. Citrus was more likely at the BH site than at the other sites, with the lowest proportion of vehicles carrying citrus at the K site. Tropical fruit was found in a higher proportion of the fruit carrying vehicles at the K and BH sites than at the S site.

Proportion of fruit carrying vehicles with major fruit type by month

Higher proportions of fruit carrying vehicles carried citrus from June to November (Table 9). The highest proportions of fruit carrying vehicles with pome fruit were in June, September and October. The proportions of fruit carrying vehicles with stone and tropical fruit showed seasonal effects, with the highest proportion for stone fruit recorded in February and the highest for tropical fruit in December.

Proportion of fruit carrying vehicles with pome fruit by occupant type

Since pome fruit was the fruit confiscated in the largest numbers (Table 7), this fruit was examined in relation to other data. The fruit carrying vehicles of families with children were more likely to be carrying apples, than were the fruit carrying vehicles of other occupant types (Table 10).

Proportion of fruit carrying vehicles with tropical fruit by home town

Tropical fruit was considered very high risk because it comes from endemic areas where there is no cessation in fruit fly activity. The only significant difference between the proportion of vehicles carrying fruit for occupants' home towns was observed in tropical fruit where zero observations for many home towns contrasted with proportions of 0.1825 for Sydney/Newcastle/Wollongong and 0.1515 for Southern Queensland (Table 11).

Number of fruit carried per vehicle

The number of fruit carried per vehicle for each fruit type was skewed with most fruit carrying vehicles carrying low numbers of fruit, and a few vehicles carrying high numbers. The data needed to be transformed prior to analysis. There were no significant differences between classifications for log fruit numbers carried by fruit carrying vehicles for any fruit type, apart from a month effect for stone fruit.

Discussion

Some of the changes in trends in this report may be due to the larger sample size compared with previous reports by Dominiak *et al.* (1998, 2000a, 2001), Dominiak and Barchia (2005a). This program surveyed 11 955 travellers and was the largest sample size in recent years. This was also the first year where the activity was tendered out to external contractors in the MIA; Broken Hill operations were tendered out several years ago.

Fruit carriage

The progressive decline, compared with previous reports, in the proportion of vehicles carrying fruit on the Sturt and Kamarah sites was encouraging (Table 3). This result suggests that the overall program was effective at reducing the number of vehicles carrying fruit into the FFEZ.

Table 8. Proportion of fruit (standard error in brackets) carrying vehicles with type of fruit recorded, by site.

Fruit type	BH	K	S
Pome	0.4074 (0.0357)	0.2500 (0.0683)	0.4511 (0.0267)
Bananas	0.2169 (0.0299)	0.3250 (0.0739)	0.3161 (0.0249)
Citrus	0.3492 (0.0346)	0.1250 (0.0523)	0.2241 (0.0223)
Stone	0.0794	0.1500	0.0661
Tomatoes	0.3545	0.3750	0.3621
Tropicals	0.1111 (0.0229)	0.2250 (0.0659)	0.0546 (0.0122)
Vehicles with detail of fruit type recorded	189	40	348

Table 9 Proportion (standard error in brackets) of fruit (citrus, pome, stone and tropical) carrying vehicles by month.

Month (vehicles)	Citrus	Pome	Stone	Tropical
Jun (27)	0.3704 (0.0928)	0.5555 (0.0955)	0	0
Sep (17)	0.5882 (0.1191)	0.7647 (0.1028)	0	0.0588
Oct (194)	0.3608 (0.0344)	0.4794 (0.0359)	0.0103	0.0773
Nov (115)	0.2174 (0.0384)	0.3565 (0.0446)	0.1130	0.0609
Dec (132)	0.1667 (0.0324)	0.3864 (0.0423)	0.1591	0.1894
Jan (14)	0.1429 (0.0935)	0.2857 (0.1204)	0.1429	0
Feb (19)	0.1579 (0.0836)	0.2632 (0.1007)	0.2632	0
Mar (30)	0.1333 (0.0621)	0.3333 (0.0859)	0.0333	0
Apr (29)	0.1034 (0.0566)	0.4138 (0.0914)	0	0.0345

Table 10. Proportion (standard error in brackets) of fruit carrying vehicles (number of vehicles in brackets) with pome fruit, by occupant type.

Types of travellers (vehicles)	Proportion
Families with children (97)	0.5773 (0.0501)
Adults, not retired (211)	0.3934 (0.0336)
Adults, retired (103)	0.3884 (0.0480)
Single adult (58)	0.3621 (0.0630)

Table 11. Proportion of fruit carrying vehicles (number of vehicles in brackets) with tropical fruit (standard error in brackets), by home town of occupants.

Home town (vehicles)	Proportion
North Queensland (7)	0.2857 (0.1707)
Sydney basin (126)	0.1825 (0.0344)
South Queensland (33)	0.1515 (0.0624)
Other (32)	0.0938 (0.0515)
Broken Hill (11)	0.0909 (0.0867)
North Coast NSW (25)	0.0870 (0.0588)
SA exc. Riverland (69)	0.0580 (0.0281)
Inland NSW (82)	0.0366 (0.0207)
Victoria excl. Sunraysia (31)	0.0323 (0.0317)
MIA (35)	0
Sunraysia (6)	0
Riverland SA (1)	0
South Coast NSW (8)	0
ACT (32)	0
Wagga (21)	0
Risk Reduction Zone (5)	0

However, the average number of major fruits carried in each fruit carrying vehicle was 6.4, compared with 5.9 in 1998/1999, and 7.4 in 1996/1997 (Dominiak *et al* 2000a) suggesting that there was no real change in the fruit carrying habits of travellers who still choose to carry fruit.

Fruit carriage by month

The proportion of traffic carrying fruit seems the highest in the early season, with the highest months in October (9.5%) and September (7.7%) compared with the overall average of 5.4%. We postulate that regular travellers have learned that roadside inspections do not occur in winter and we suggest that fruit carriage increases accordingly in winter. Regular and local travellers are caught with fruit during the initial operations in spring and fruit carriage declines rapidly as a result of information dissemination by word of mouth (Dominiak and Coombes unpublished data). This early season pattern was also reported by Dominiak *et al*. (2000a, 2001). There may be some value to spreading the inspections into the winter period to reverse this pattern. This proposed strategy poses a dilemma as it would reduce the number of inspections in the peak summer period due to the annual fixed funding for these operations. Additionally, DNA studies (Sved *et al*. 2003, Gilchrist *et al.* 2006) indicate that fruit flies were transported from local areas (within about 200 km), rather than warmer areas such as Queensland and coastal NSW or the Sydney basin. It was theoretically unlikely that fruit would be infested in southern NSW in winter and therefore it may be considered there would be little value in conducting inspections in winter.

Fruit carriage by home town

The home town of travellers was also important with the proportion of local traffic being important to the fruit carrying profile at each site. Travellers from the MIA had the lowest carriage rate of 1.55% of the traffic flow. This was understandable given that the MIA has been a quarantine zone since the early 1960s at least (Braithwaite 1963). This group made up 24% of the total traffic flow and was the largest home town group. Similarly travellers from Wagga Wagga and other RRZ towns carried fruit in 2.1% and 4.5% of traffic respectively. Together these three groups were regarded as local traffic and made up 36.1% of the total traffic flow. This local traffic proportion was a decrease compared with previous years (Dominiak *et al.* 1998, 2001, Dominiak and Barchia 2005a), however this may be related to dates of operation, rather than other factors. In comparison, local traffic from Broken Hill carried fruit at 4.7% and this may be a reflection of the quarantine around Broken Hill being established comparatively recently in 1990. Clift and Meats (2005) used a Bayesian scenario analysis linking sites of outbreaks spatially with other risk factors; they found that introductions by local inhabitants seemed to contribute more than passing travellers. Sved *et al.* (2003) and Gilchrist *et al.* (2006) concluded that the origin of Qfly incursions came from towns to the north and east within 100 km of the FFEZ. Given these more recent publications and the high proportion of traffic flow, local travellers remain a high risk.

Fruit carriage by type of traveller

The patterns for type of travellers did not change in this survey compared with previous surveys, with retirees remaining the type most likely to carry fruit (Dominiak *et al.* 1998, 2001, Dominiak and Barchia 2005a). However the decline from 24% in previous year to 11% was a considerable change in behaviour as they made up 12.3% of the traffic flow. Families made up 22% of the traffic flow and 6.7% carried fruit, a large decline from 16% in 1997/98. The largest traveller type was adults not retired; their proportion of fruit carriage (about 6%) has not changed notably since 1998/99, however there was a considerable drop from 1997/98. These may be more alert drivers and possibly responded more quickly to the changed road signs in the previous year. Road signs, advertising the spot fines, were erected in the middle of the 1998/99 season and caused a 50% decline in fruit carriage (Dominiak and Barchia 2005a). This lowered rate appears to have carried through into this year.

Type of fruit carried

In this survey, apples were the most frequently carried fruit of the major fruit carried and made up 28.4% of all fruit carried (Table 7). Similarly apples were more frequently carried than tomatoes in 1996 (Dominiak *et al.* 1998). This trend was encouraging given that apples are a relatively low preference as fruit fly hosts, and have a low chance of being grown in backyards, compared with tomatoes and stone fruit. In the 1998/99 season, apples were ranked second after tomatoes (Dominiak and Barchia 2005a). This change was beneficial for the fruit fly control program given the frequent backyard nature of tomatoes and their associated higher risk of infestation.

Tomatoes were the second most frequently carried fruit (21.3% of all fruit). Citrus was ranked third compared with fifth in the previous year. This change in ranking may be caused by the larger sample size of the larger spread of operations (covering more non-holidays periods), compared with smaller sample sizes in previous years. Stone fruit was ranked fifth in this survey compared with third in the previous year. This fruit was available for a relatively short time and our results may be an artefact of different sampling days between the two surveys. Stone fruit was carried in higher quantities than any other fruit with an average of 6.59 pieces per fruit carrying vehicle, while other fruits were carried at less than 4.64 fruits per vehicle. Tropical fruit would superficially seem to be high risk as it originates in infested regions of Australia; however the Queensland DNA fingerprint has not been detected in recent incursions into the FFEZ. This absence of DNA suggests that tropical fruit is not carried from Queensland into the FFEZ, or that if it was, the adult fruit flies do not survive due to the challenging environment (Gilchrist *et al.* 2006, Dominiak *et al.* 2006).

Summary

Our data indicate that retirees remain the highest risk group carrying more fruit than other types of travellers. Given Australia's aging population and their increasing travel across quarantine borders, there is likely to be an increasing need to inform retirees of quarantine requirements. Local residents and travellers made up a high proportion of the traffic flow and need continually to be reminded of fruit carriage restrictions to maintain their high level of compliance (Dominiak and Barchia 2005b, Clift and Meats 2005). Host exclusion activities need to be maintained. If the roadside inspection declines, then travellers may increase fruit carriage based on the assumption that there was a low chance of being caught and fined, as currently happens in the early months of operations in our current and previous programs (Dominiak *et al.* 2000a, 2001). Tomatoes need to be targeted increasingly due to their high rates of carriage.

The continuing general decrease in the amount of fruit entering the FFEZ was encouraging. The roadside inspection program has continued to contribute to the overall program of fruit fly control in the FEZZ by minimizing the chance of potentially infested fruit entering the zone. This therefore minimizes the chance of an introduced population from establishing (Clift and Meats 2001), being detected in the monitoring grid and adversely affecting horticultural domestic and export trade.

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