Figure 4.1: R-square values from linear correlations between various phenology methods to determine the degree of lag between methods. Comparisons were between individual trees and their target traps, except for the site averages, which compare number of fruits per cubic metre for all 10 phenology trees for each species with the average number of fruits for each species over all 30 traps.

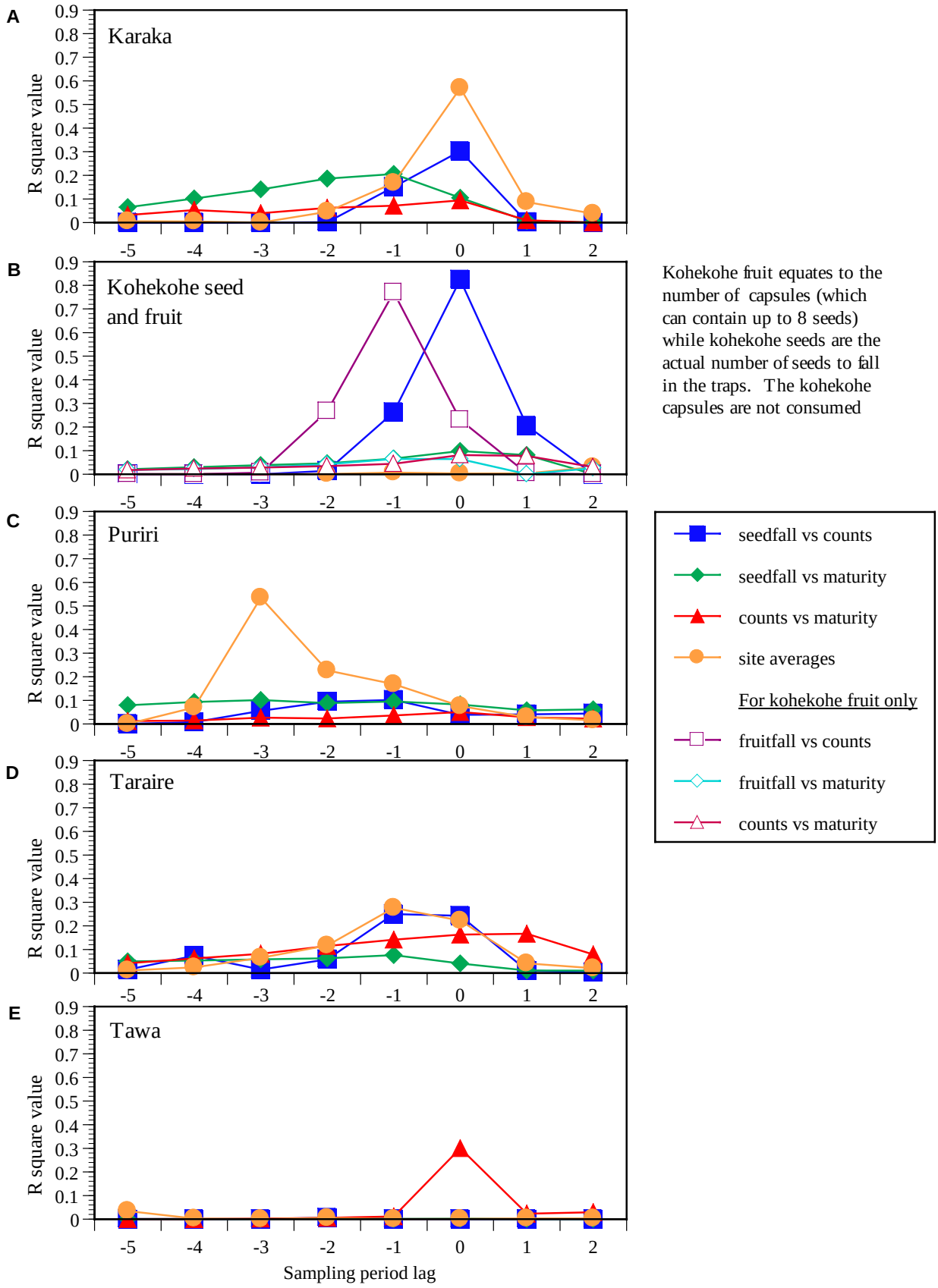


Figure 5.1: Number of fruits, from large-fruited species, caught in seedfall traps at Wenderholm, with an indication of flower phenology

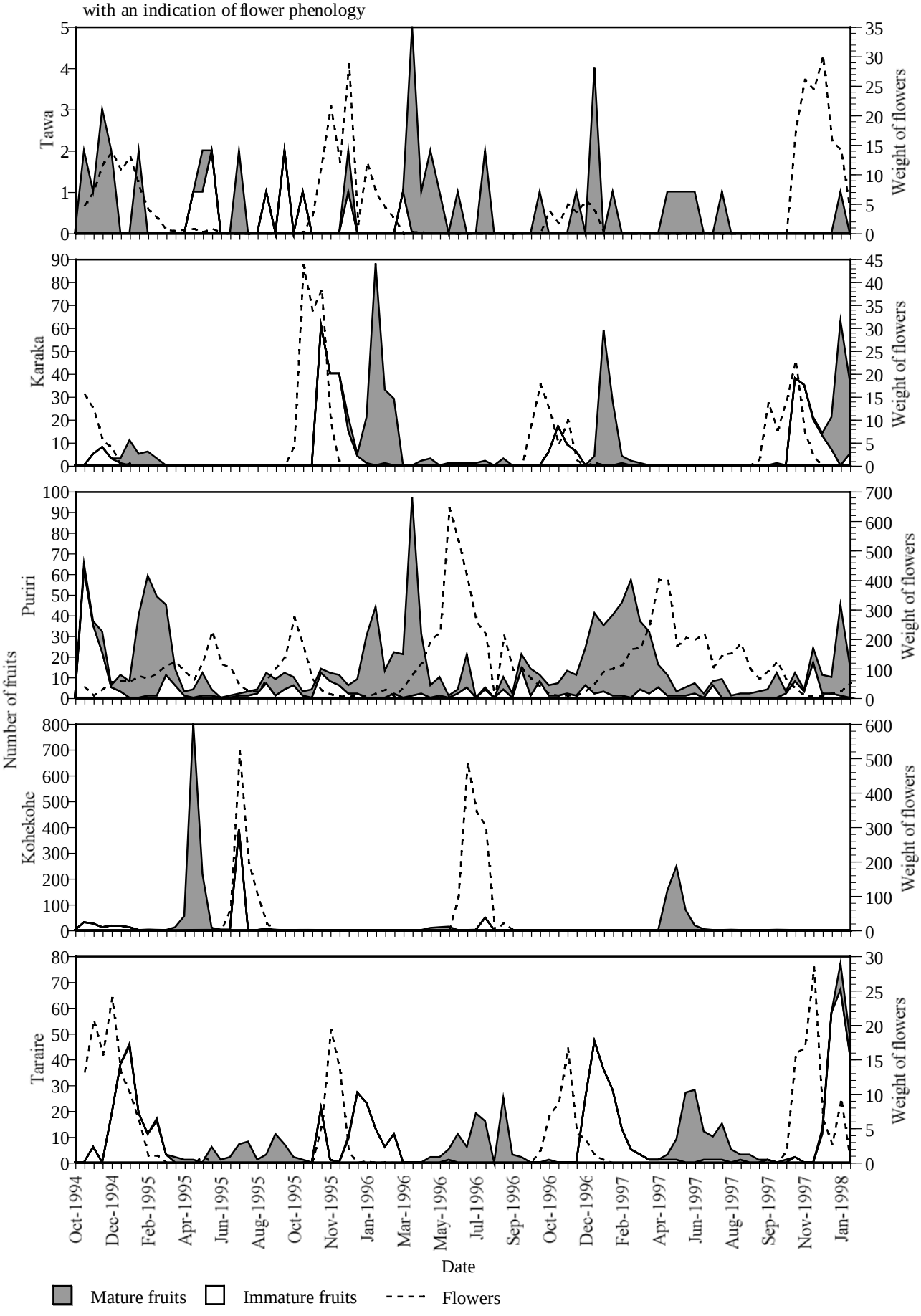


Figure 5.2: Number of fruits, from large-fruited species, caught in seedfall traps at Whitford, with an indication of flower phenology

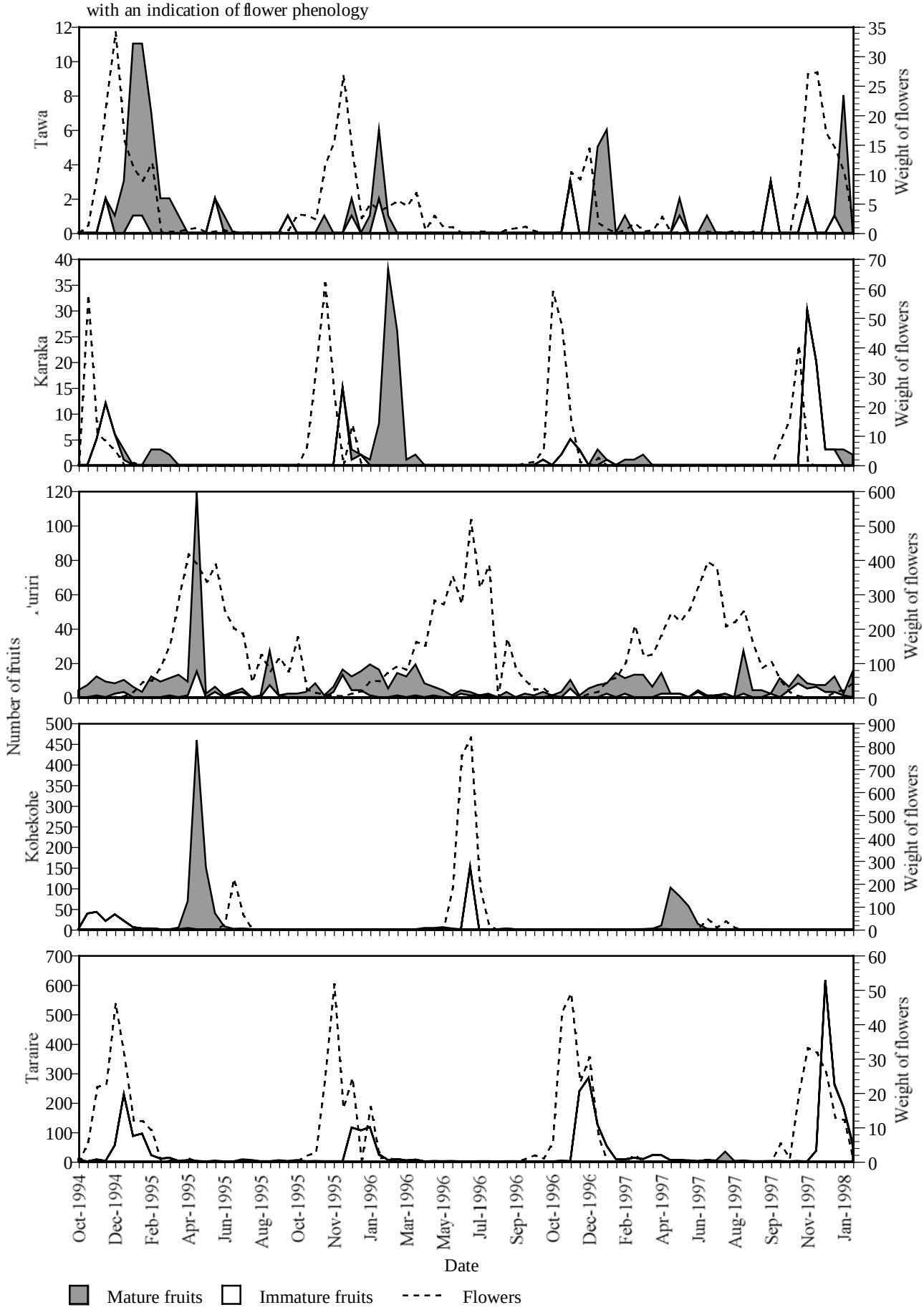
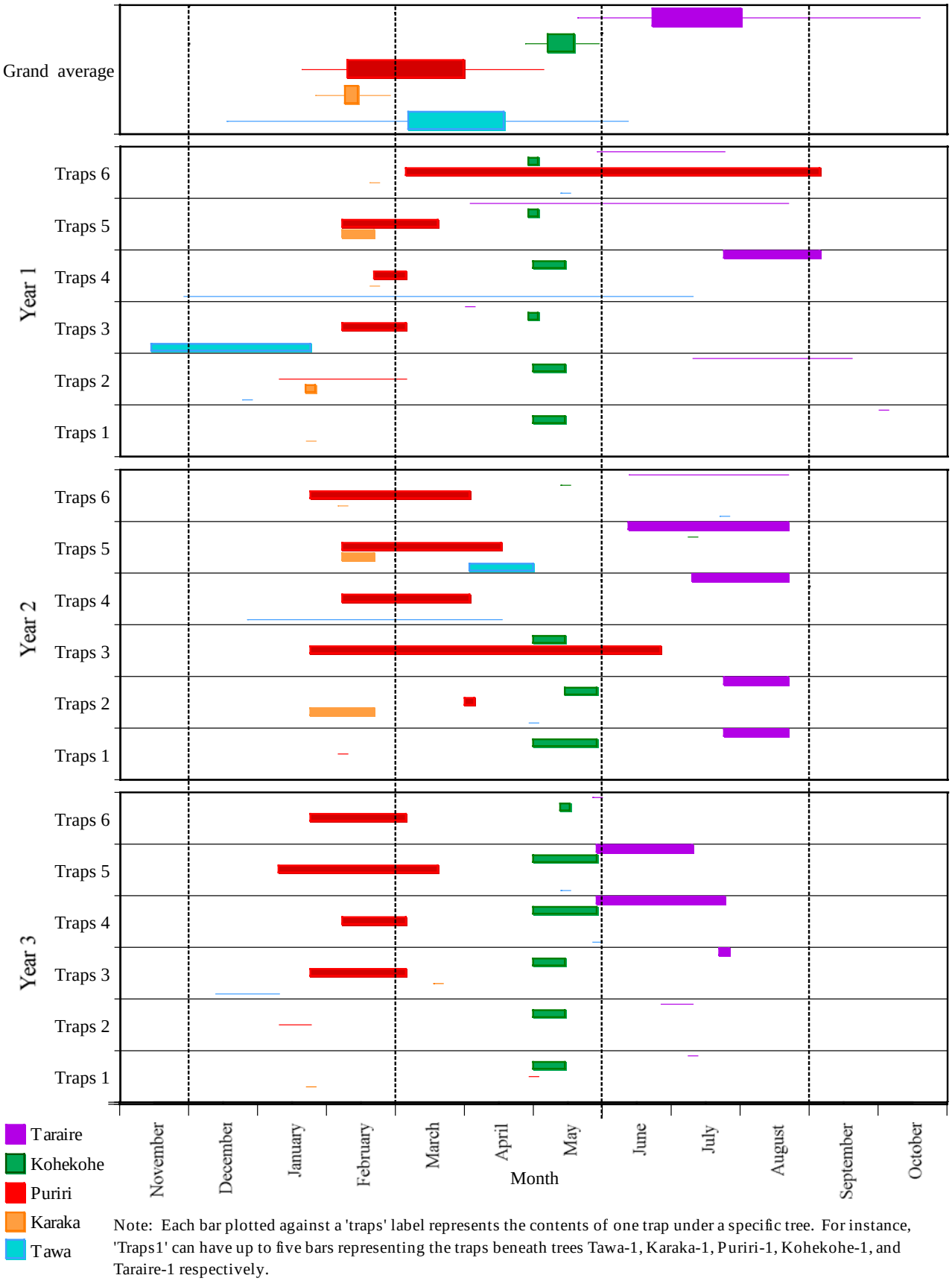
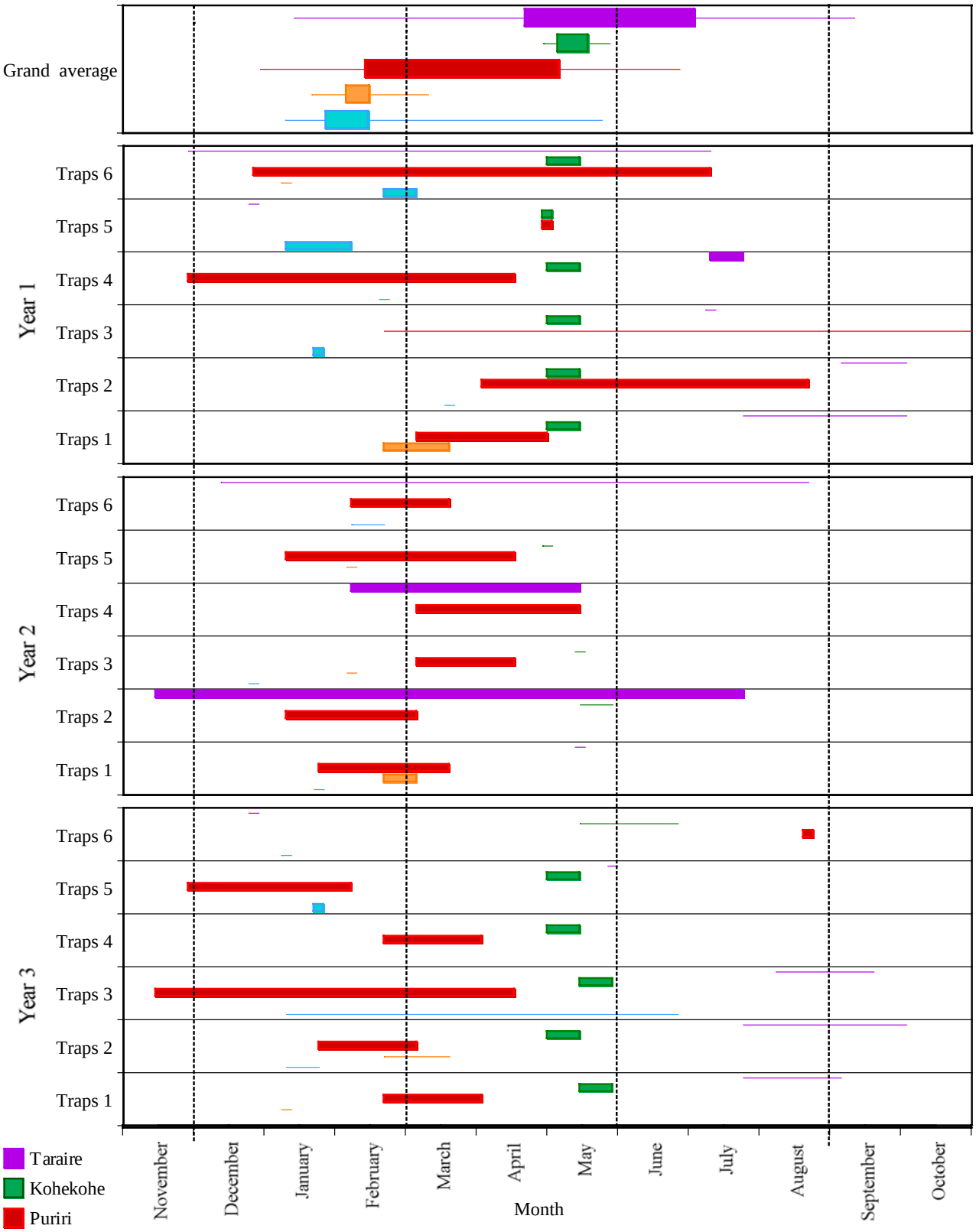


Figure 5.3: Fruitfall timing for individual trees during three consequetive years at Wenderholm (25th to 75th percentiles) and average fruit-fall over three years (Grand average). Error bars top graph = average absolute differences from mean for 25th (left most) and 75th (right most) percentiles respectively. Thin lines on lower graphs indicate that less than 5 fruits fell into the trap that year.



Note: Each bar plotted against a 'traps' label represents the contents of one trap under a specific tree. For instance, 'Traps1' can have up to five bars representing the traps beneath trees Tawa-1, Karaka-1, Puriri-1, Kohekohe-1, and Taraire-1 respectively.

Figure 5.4: Fruitfall timing for individual trees during three consequetive years at Whitford (25th to 75th percentiles) and average fruit-fall over three years (Grand average). Error bars top graph = average absolute differences from mean for 25th (left most) and 75th (right most) percentiles respectively. Thin lines on lower graphs indicate that less than 5 fruits fell into the trap that year.



Note: Each bar plotted against a 'traps' label represents the contents of one trap under a specific tree. For instance, 'Traps1' can have up to five bars representing the traps beneath trees Tawa-1, Karaka-1, Puriri-1, Kohekohe-1, and Taraire-1 respectively

Figure 5.5a: Simpson plot of weight of all fleshy-fruits falling in to seedfall traps at Wenderholm

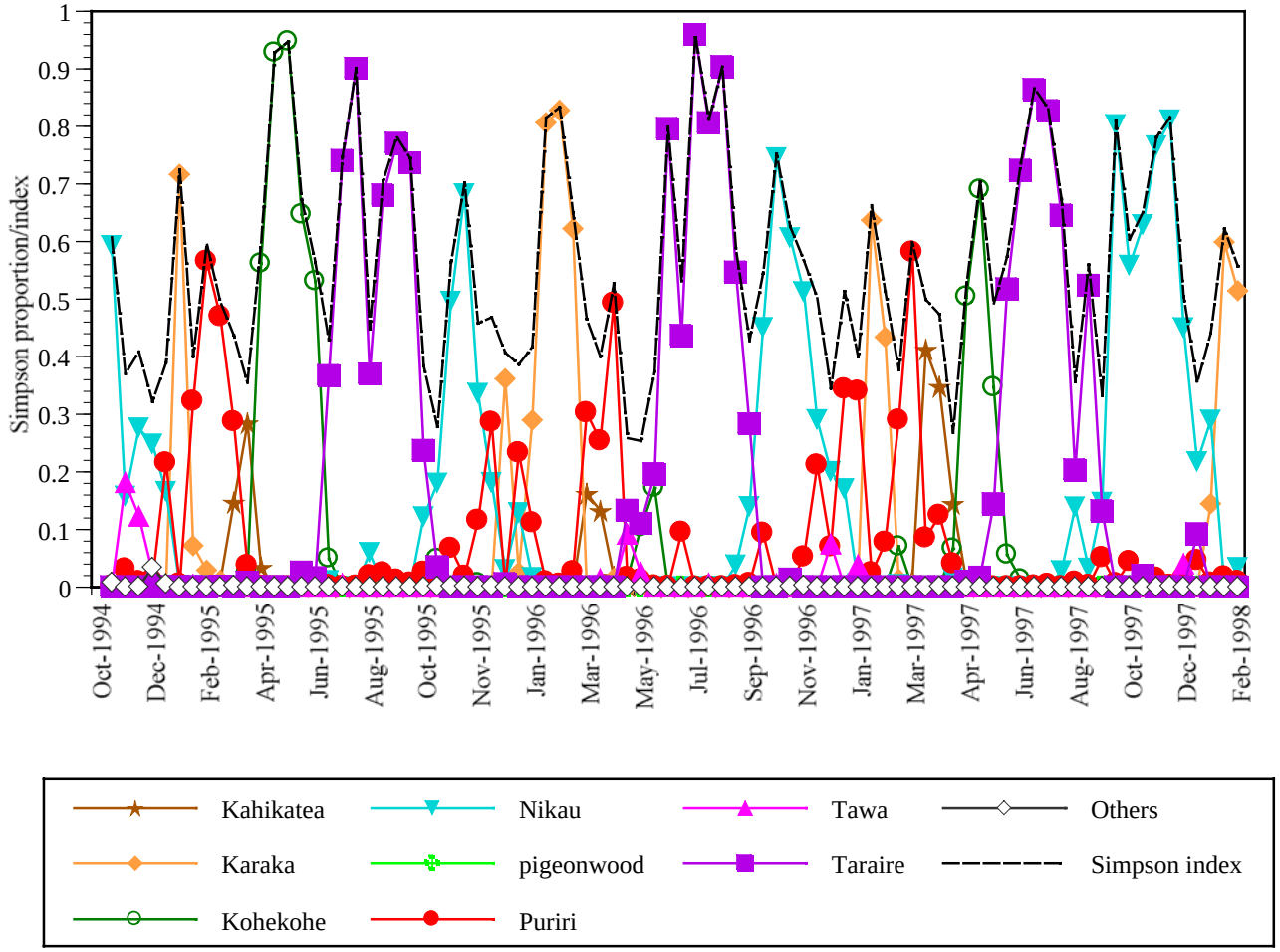
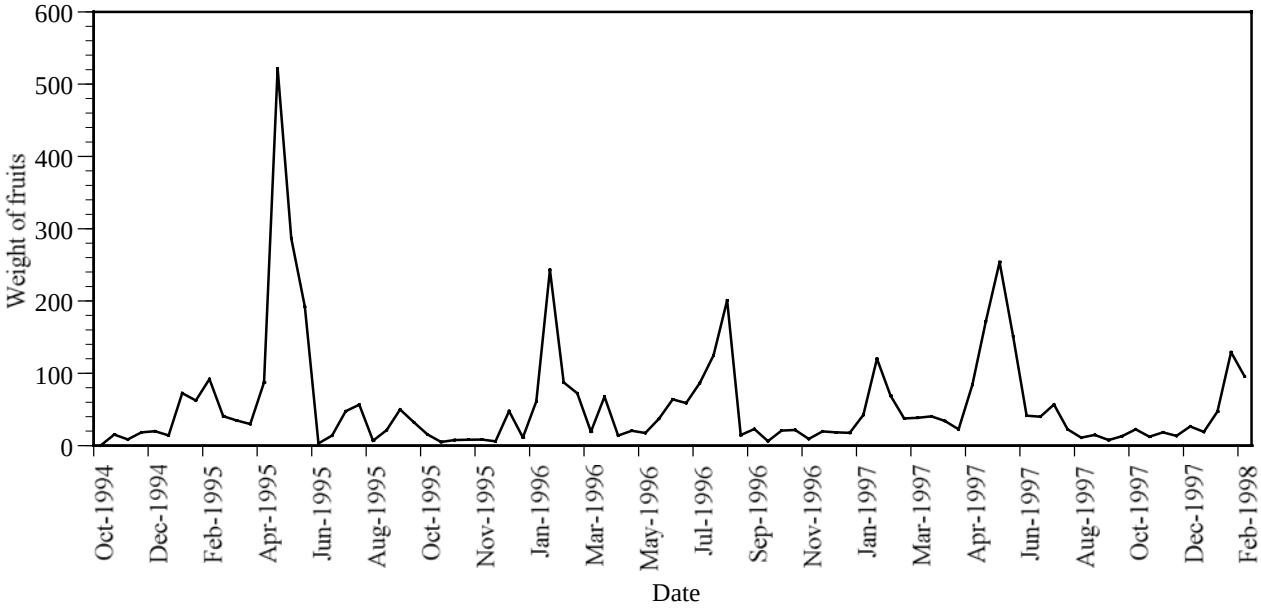


Figure 5.5b: Total weight of all fleshy-fruits falling in to seedfall traps at Wenderholm



A Simpson proportion or index approaching 1 equates to low species diversity. On occasion the large peaks on the bottom graph coincide with large peaks (often approaching 1) on the top graph, this indicates that nearly all the fruit to fall in to the seedfall traps was comprised of a single species.

Figure 5.6a: Simpson plot of number of all fleshy-fruits falling in to seedfall traps at Wenderholm

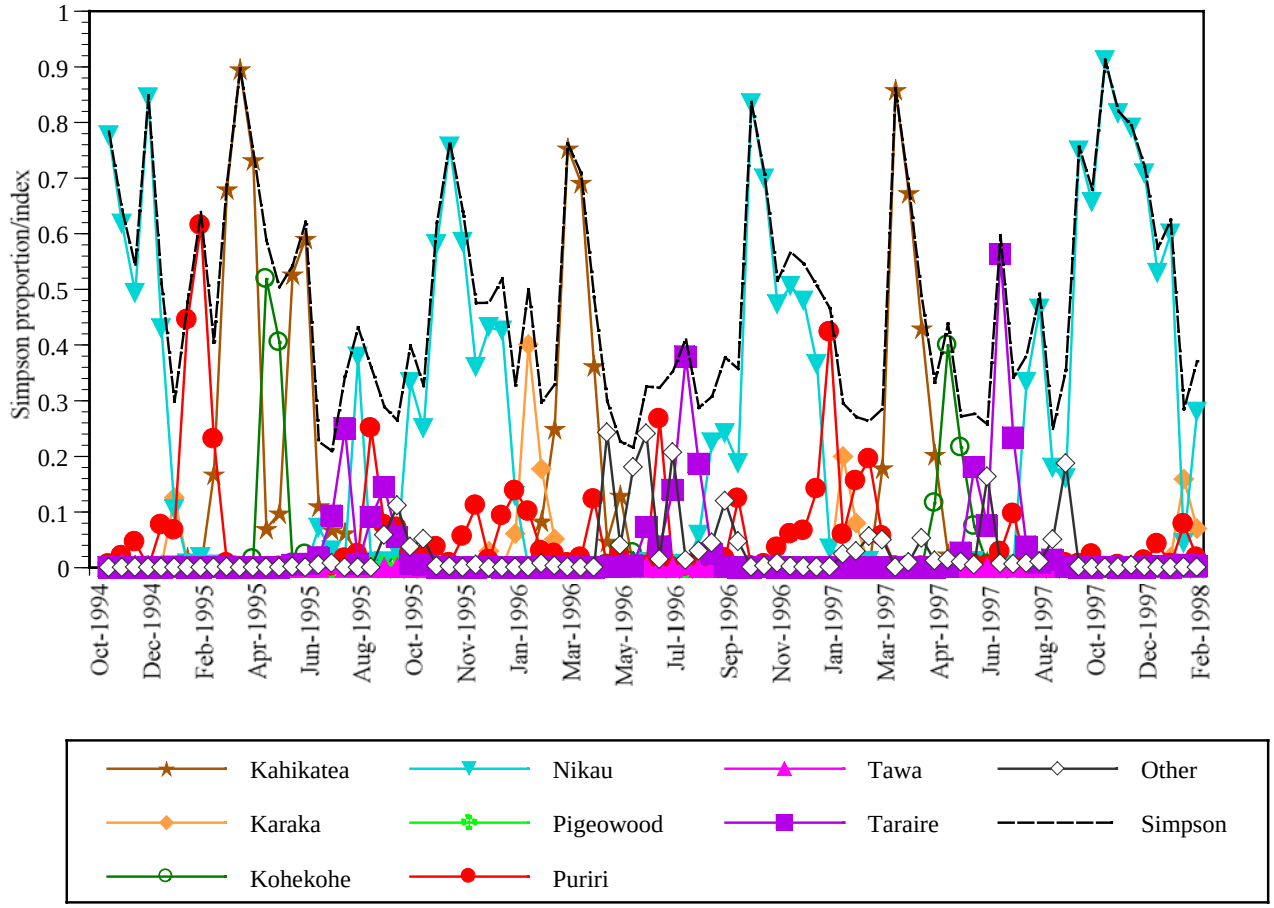
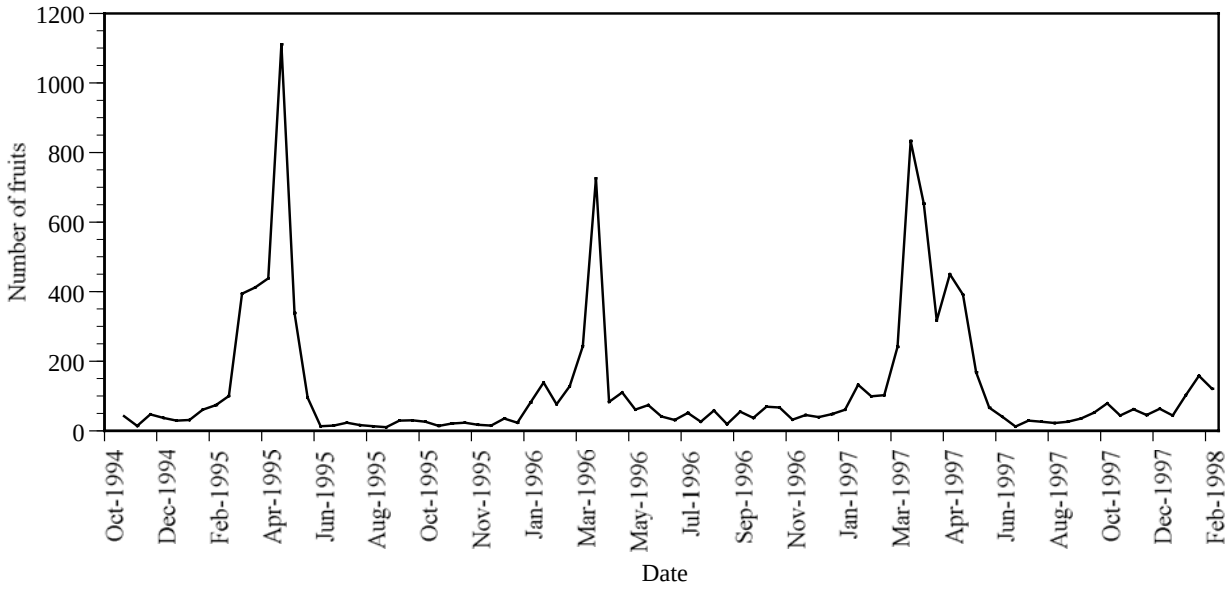


Figure 5.6b: Total number of all fleshy-fruits falling in to seedfall traps at Wenderholm



A Simpson proportion or index approaching 1 equates to low species diversity. On occasion the large peaks on the bottom graph coincide with large peaks (often approaching 1) on the top graph, this indicates that nearly all the fruit to fall in to the seedfall traps was comprised of a single species.

Figure 5.7a: Simpson plot of weight of all fleshy-fruits falling in to seedfall traps at Whitford

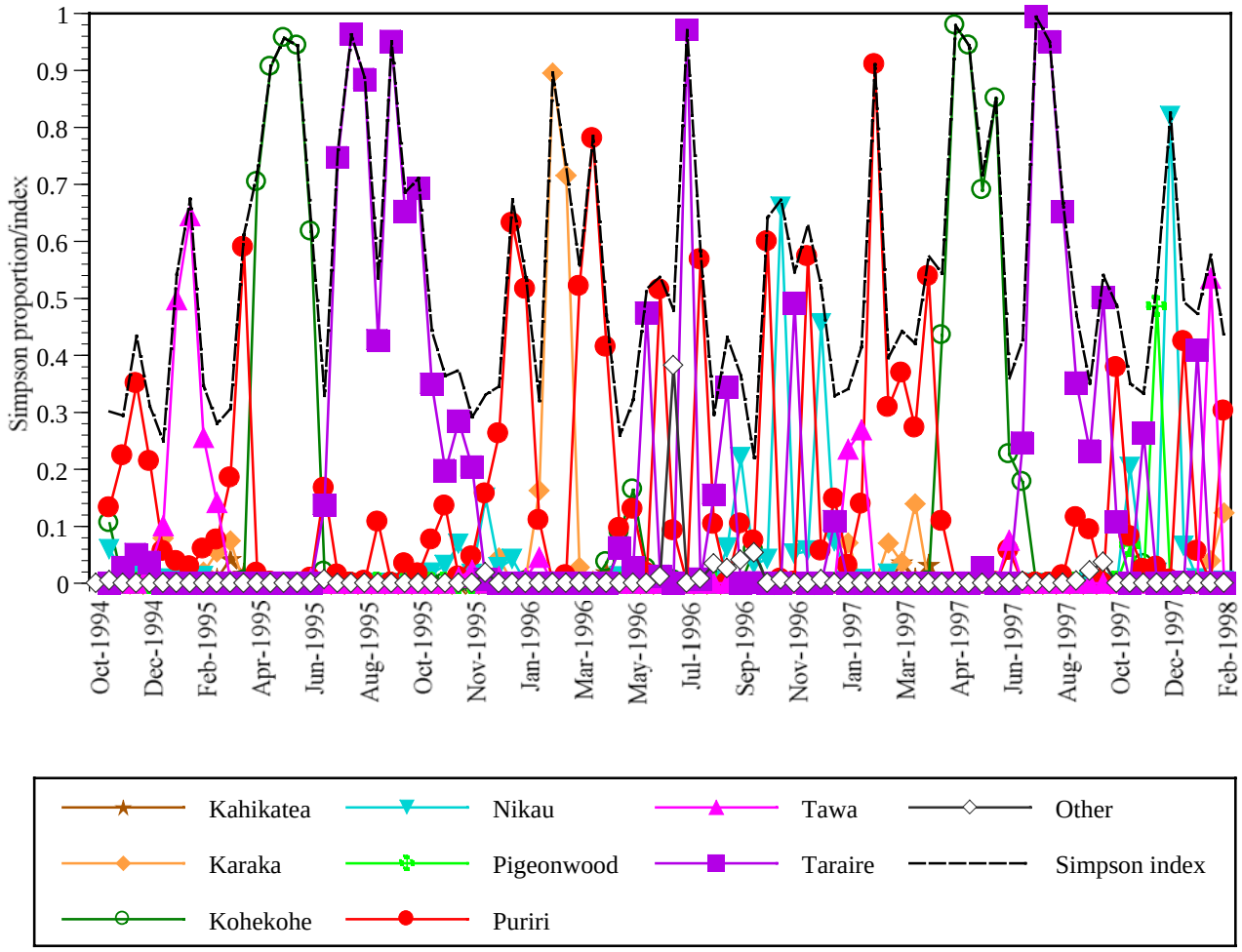
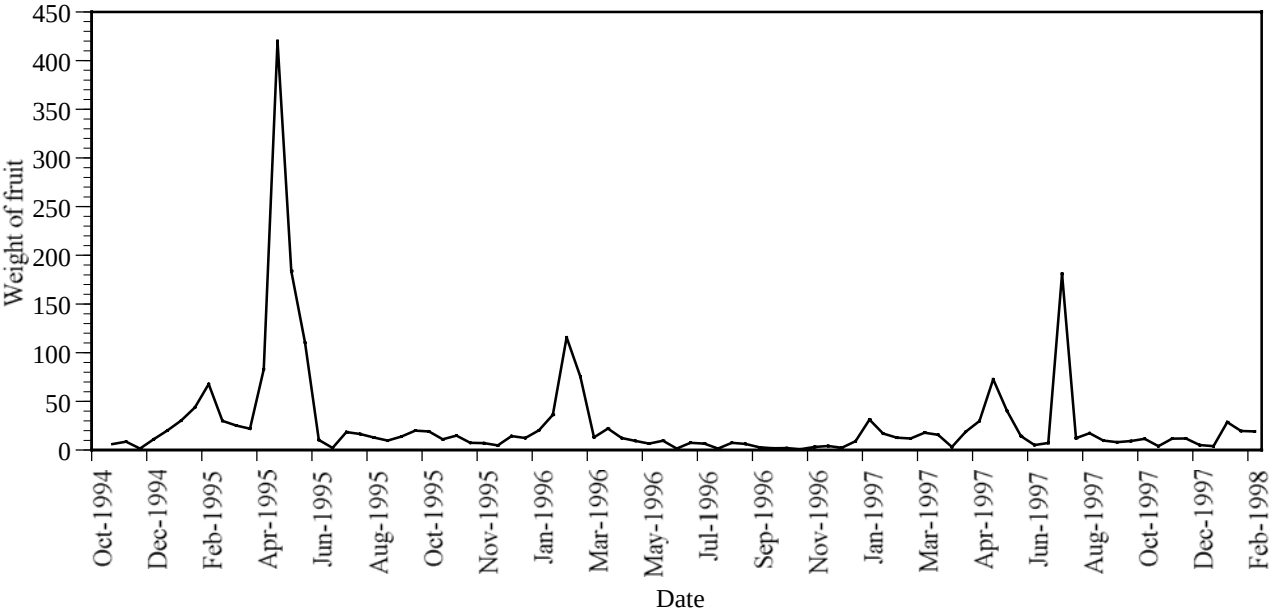


Figure 5.7b: Total weight of all fleshy-fruits falling in to seedfall traps at Whitford



A Simpson proportion or index approaching 1 equates to low species diversity. On occasion the large peaks on the bottom graph coincide with large peaks (often approaching 1) on the top graph, this indicates that nearly all the fruit to fall in to the seedfall traps was comprised of a single species.

Figure 5.8a: Simpson plot of number of all fleshy-fruits falling in to seedfall traps at Whitford

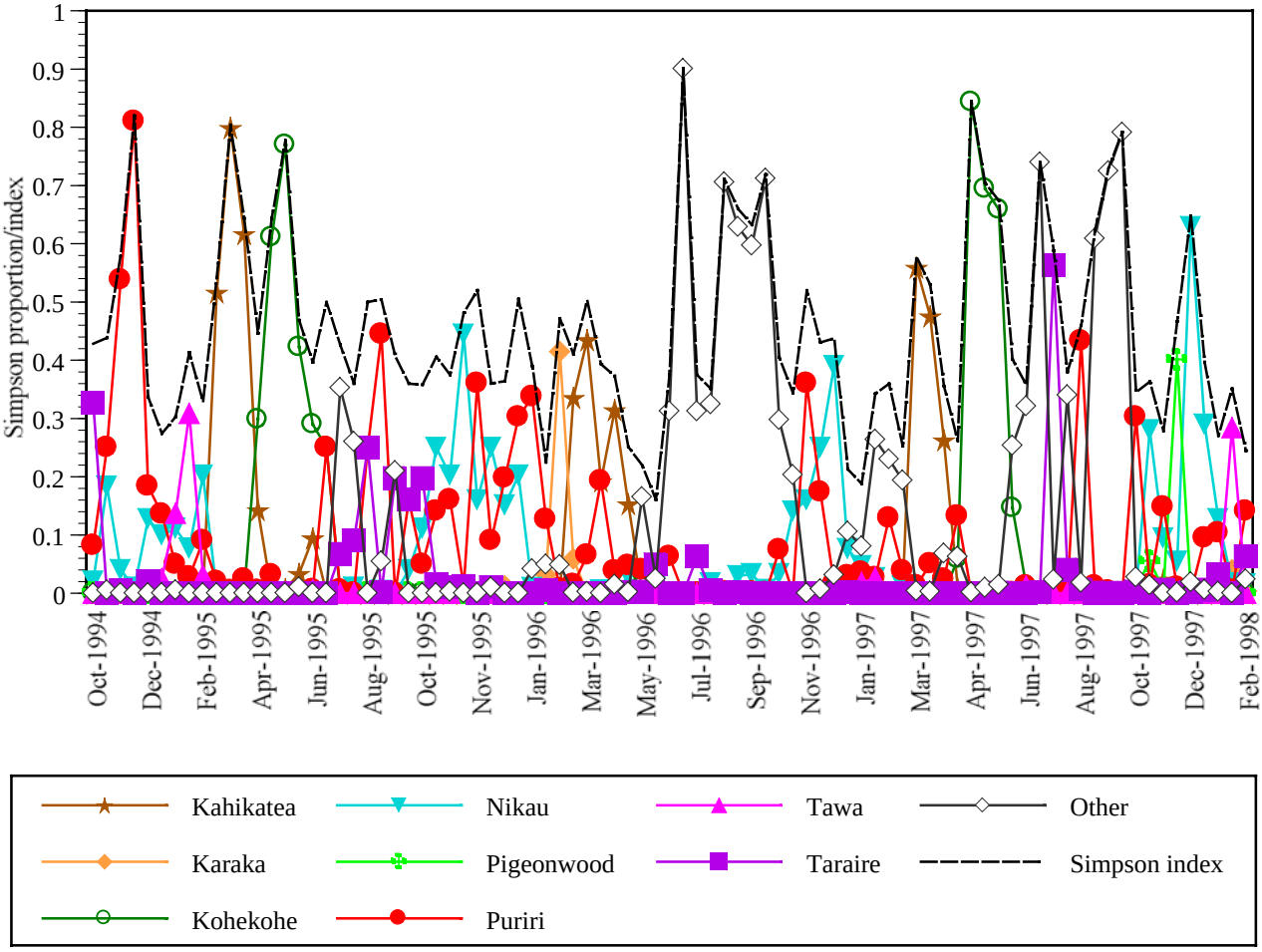
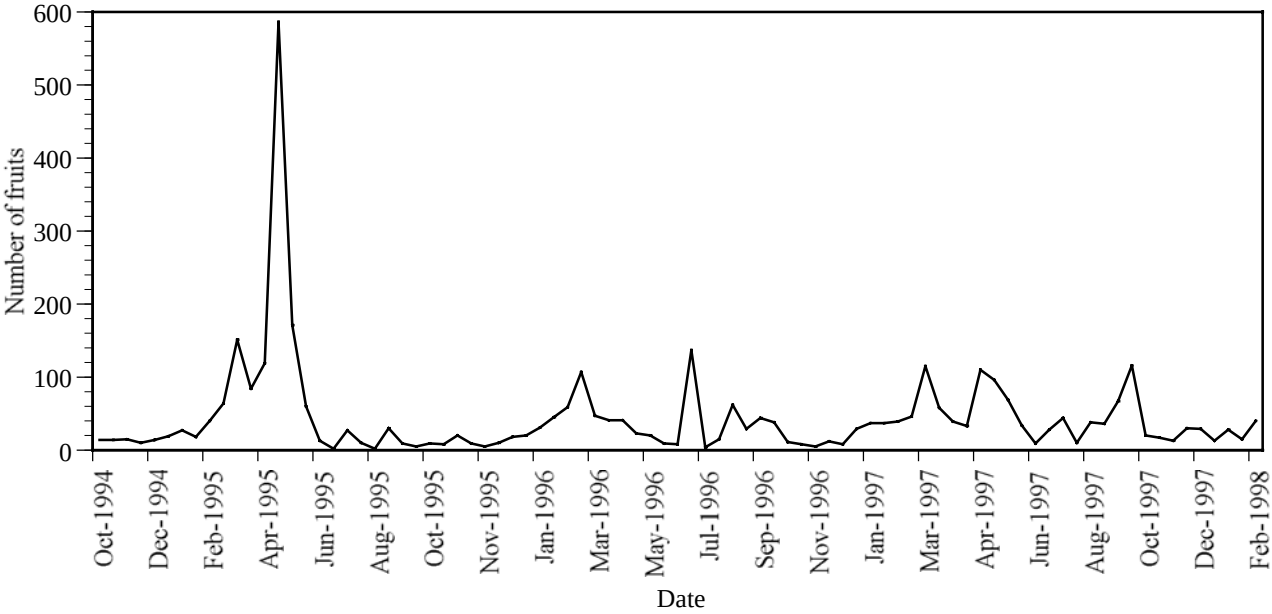
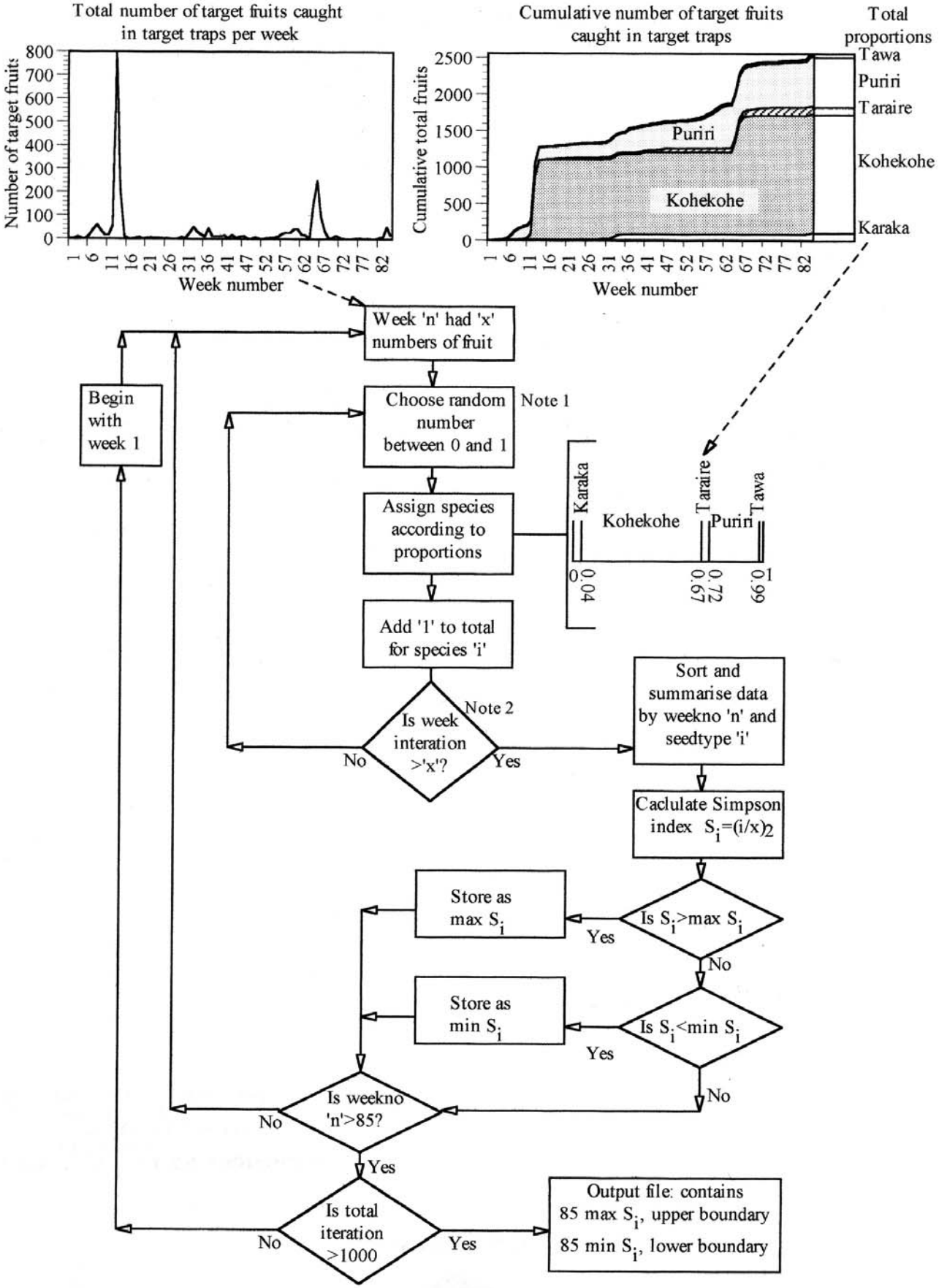


Figure 5.8b: Total number of all fleshy-fruits falling in to seedfall traps at Whitford



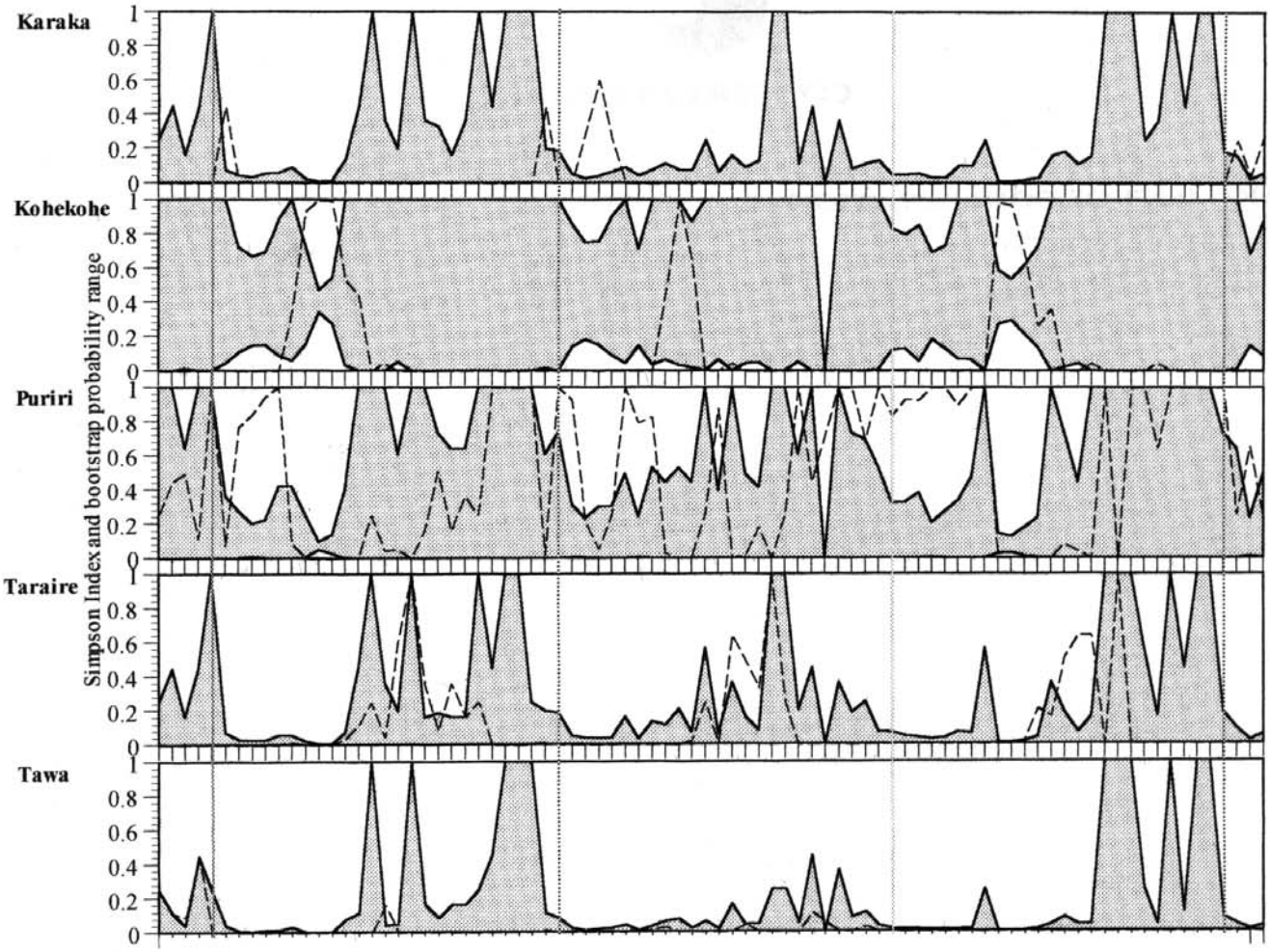
A Simpson proportion or index approaching 1 equates to low species diversity. On occasion the large peaks on the bottom graph coincide with large peaks (often approaching 1) on the top graph, this indicates that nearly all the fruit to fall in to the seedfall traps was comprised of a single species.

Figure 5.9: Flow diagram of Monte Carlo procedure for estimating parameters for target species fruits to fall in to target traps



Note 1: Akin to choosing a random fruit, e.g. if the number falls between 0.67 and 0.72 then the fruit is assigned as taraire.
Note 2: 'x' is the number of fruit to fall into seedfall traps during that sampling period.

Figure 5.10: Simpson analysis for number of target fruits to fall in target traps at Wenderholm Regional Park
The probability limits ▨, generated by resampling the original data 1000 times are shown.
The probability of the Simpson index – – – exceeding the bootstrap boundaries by chance is $p<0.001$



Number of fruits produced by target species at Wenderholm
shown in two graphs; for those species that produced low numbers of fruits, and those species that numerically dominated the total fruit production amongst the target species.

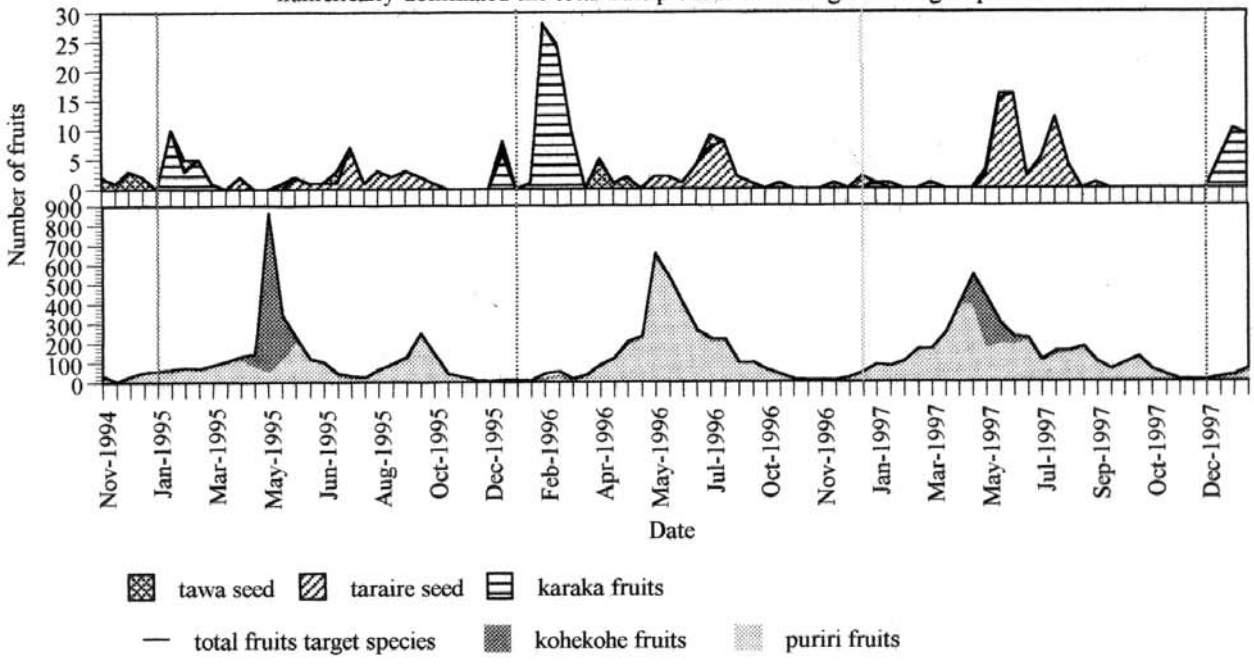
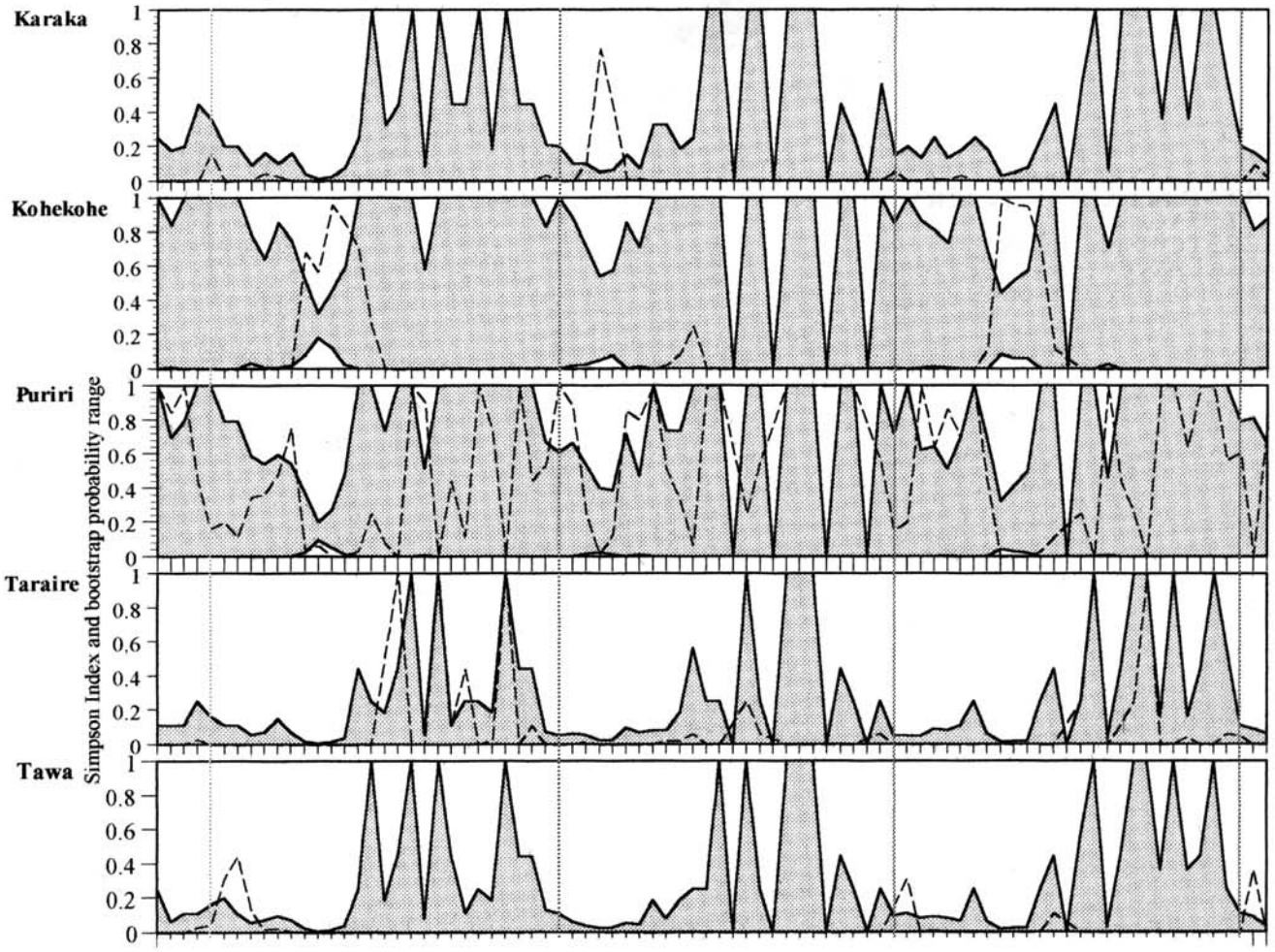


Figure 5.11: Simpson analysis for number of target fruits to fall in target traps at Whitford Bush
The probability limits ▭, generated by resampling the original data 1000 times are shown.
The probability of the Simpson index – – – exceeding the bootstrap boundaries by chance is p<0.001



Number of fruits produced by target species at Whitford,
shown in two graphs; for those species that produced low numbers of fruits, and those species that numerically dominated the total fruit production amongst the target species.

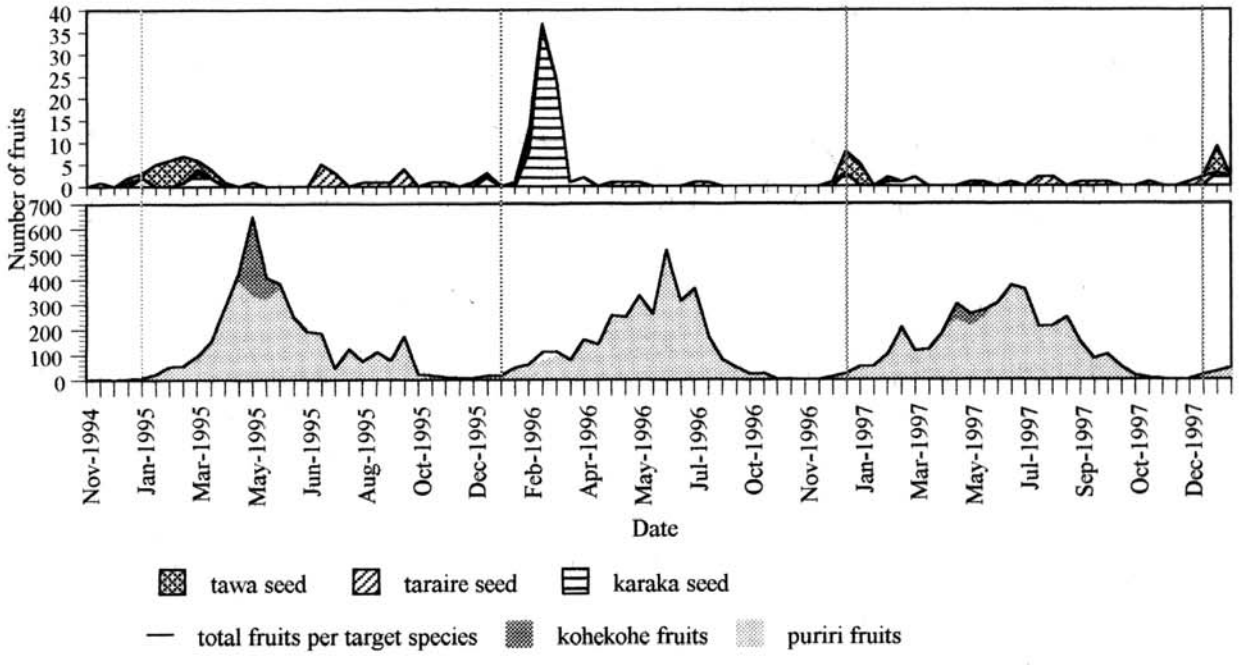


Figure 5.16: Occasions that phenology trees at Wenderholm had one or more ripe fruits

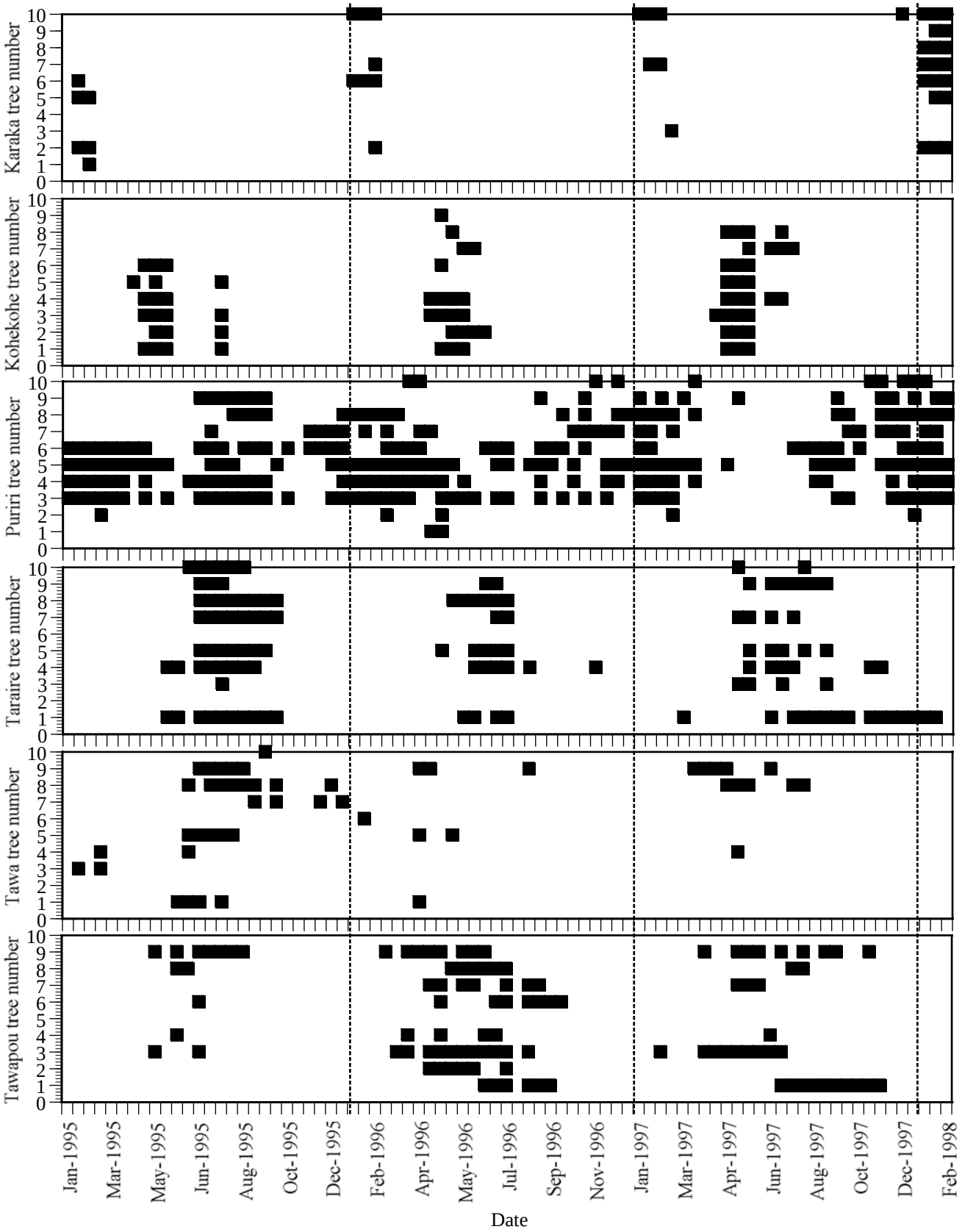


Figure 5.17: Occasions that phenology trees at Whitford had one or more ripe fruits

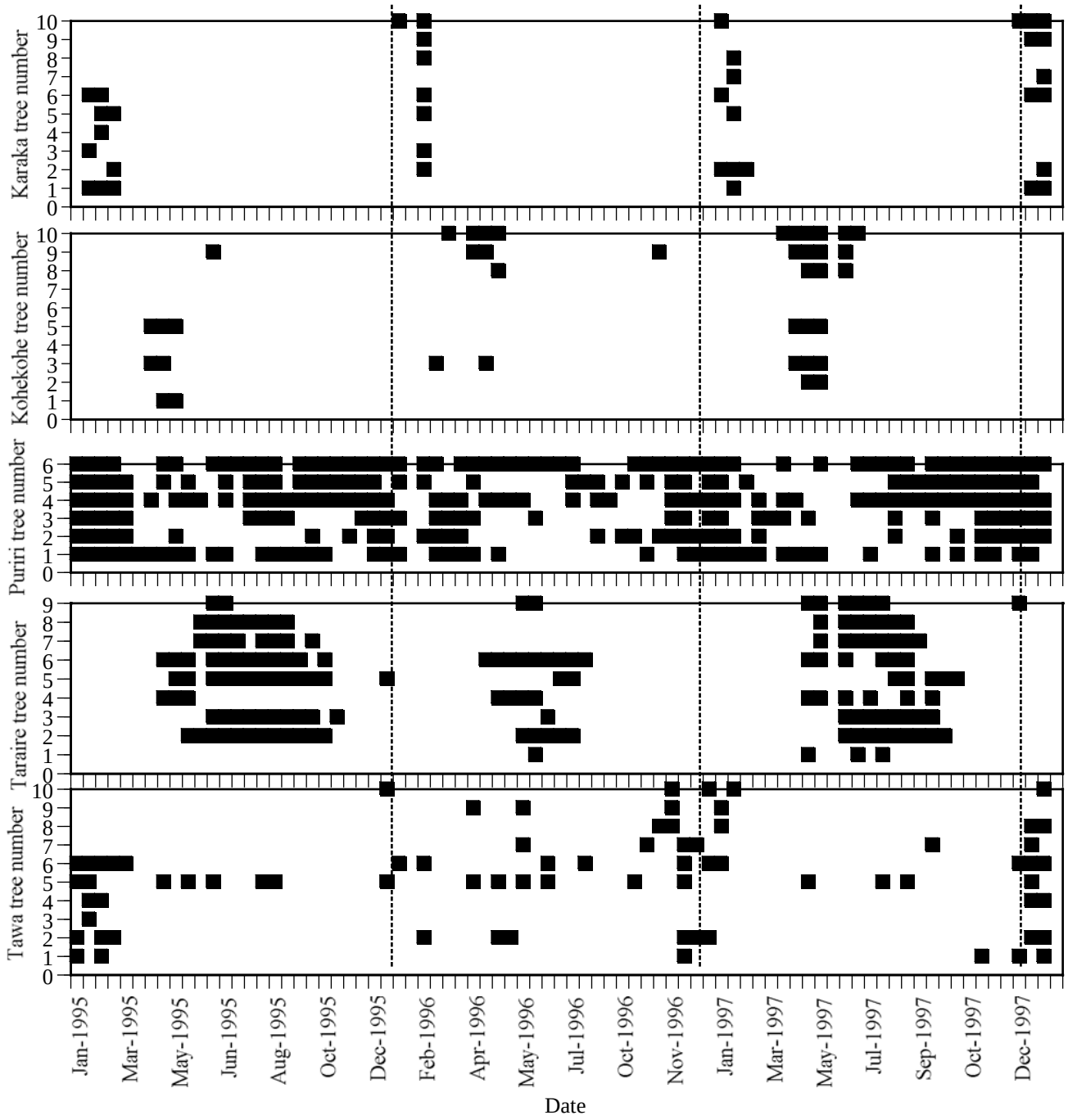


Figure 6.1: Cluster analysis of fruit nutritional characteristics, grouped by fruit traits.
A. Nutritional data only, no physical parameters included.
B. Nutritional and physical attributes

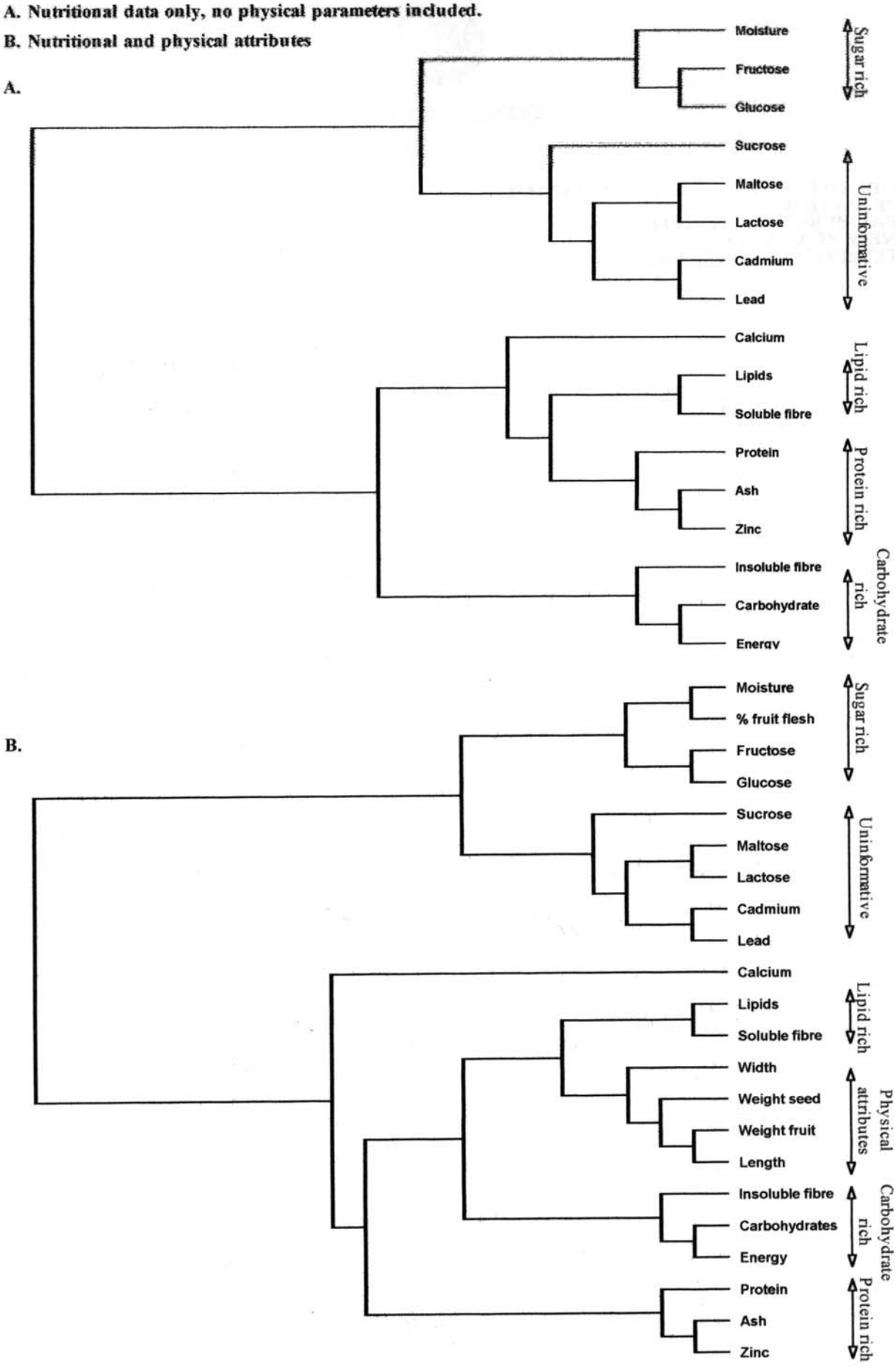


Figure 6.2: Cluster analysis of fruit species, grouped by nutritional characteristics.
A. Nutritional data only, no physical parameters included. B. Nutritional and physical attributes

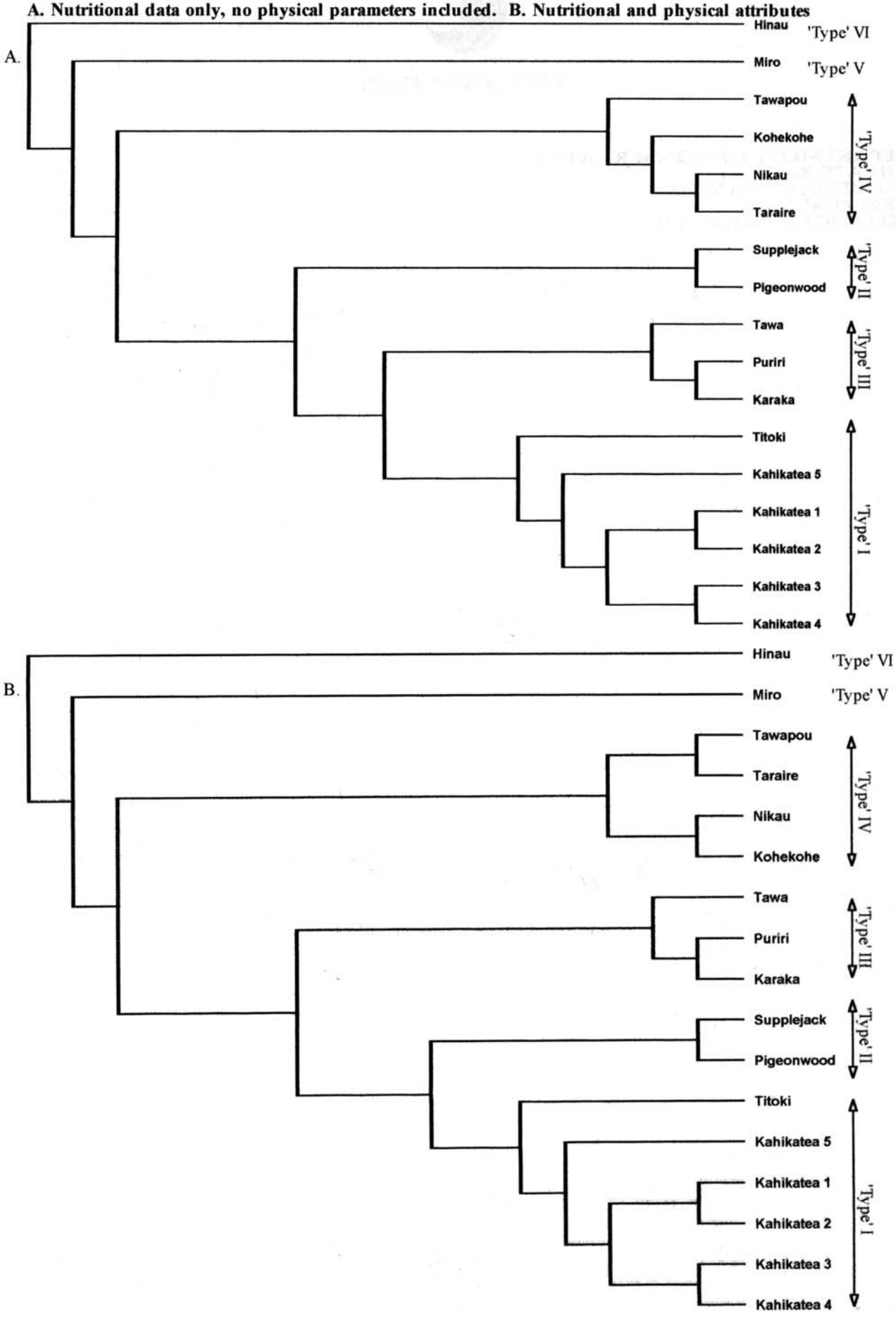


Figure 6.3: Nutritional characteristics of fruits, grouped by cluster results.

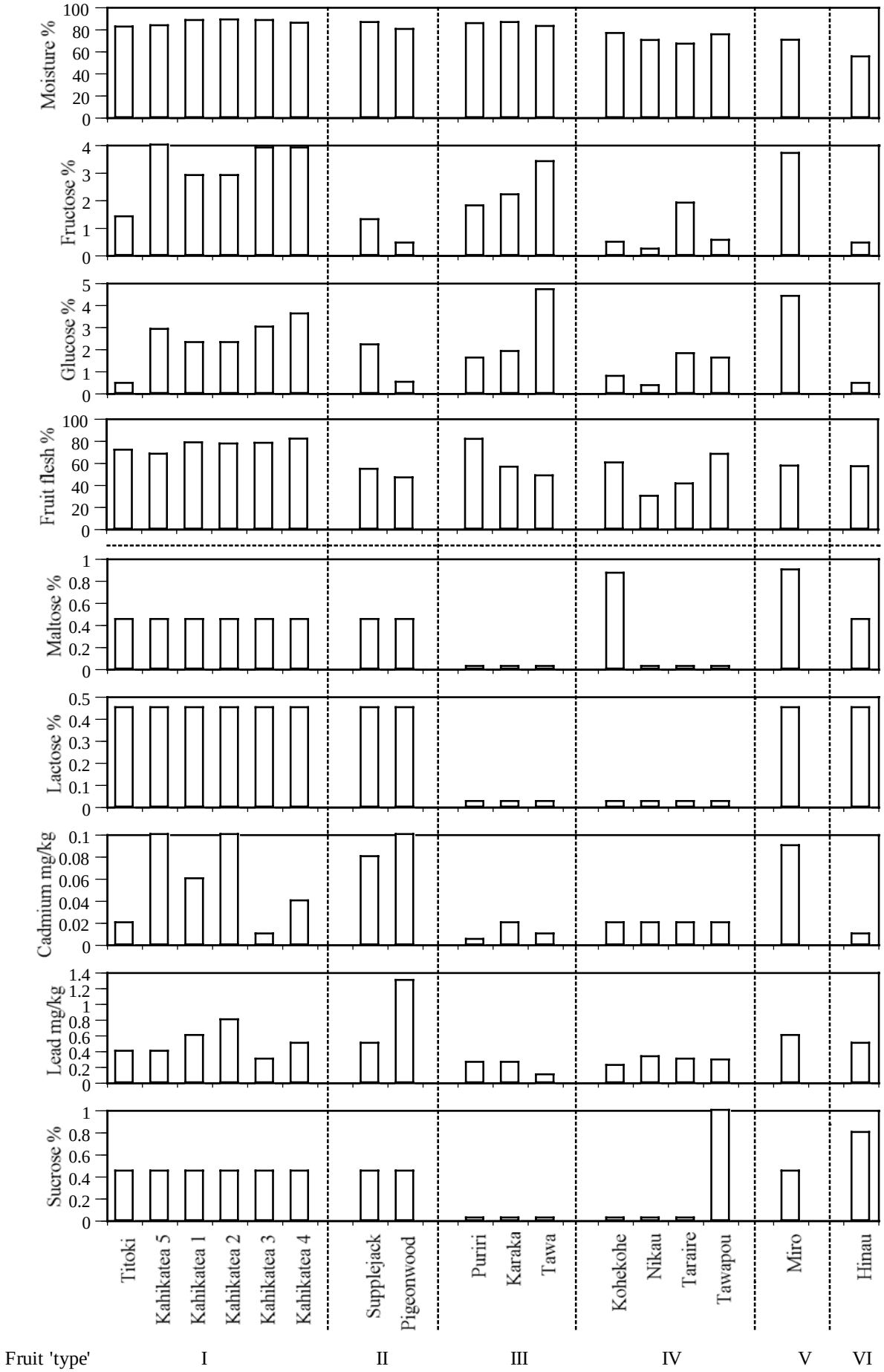


Figure 6.3 cont.: Nutritional characteristics of fruits, grouped by cluster results (p.2).

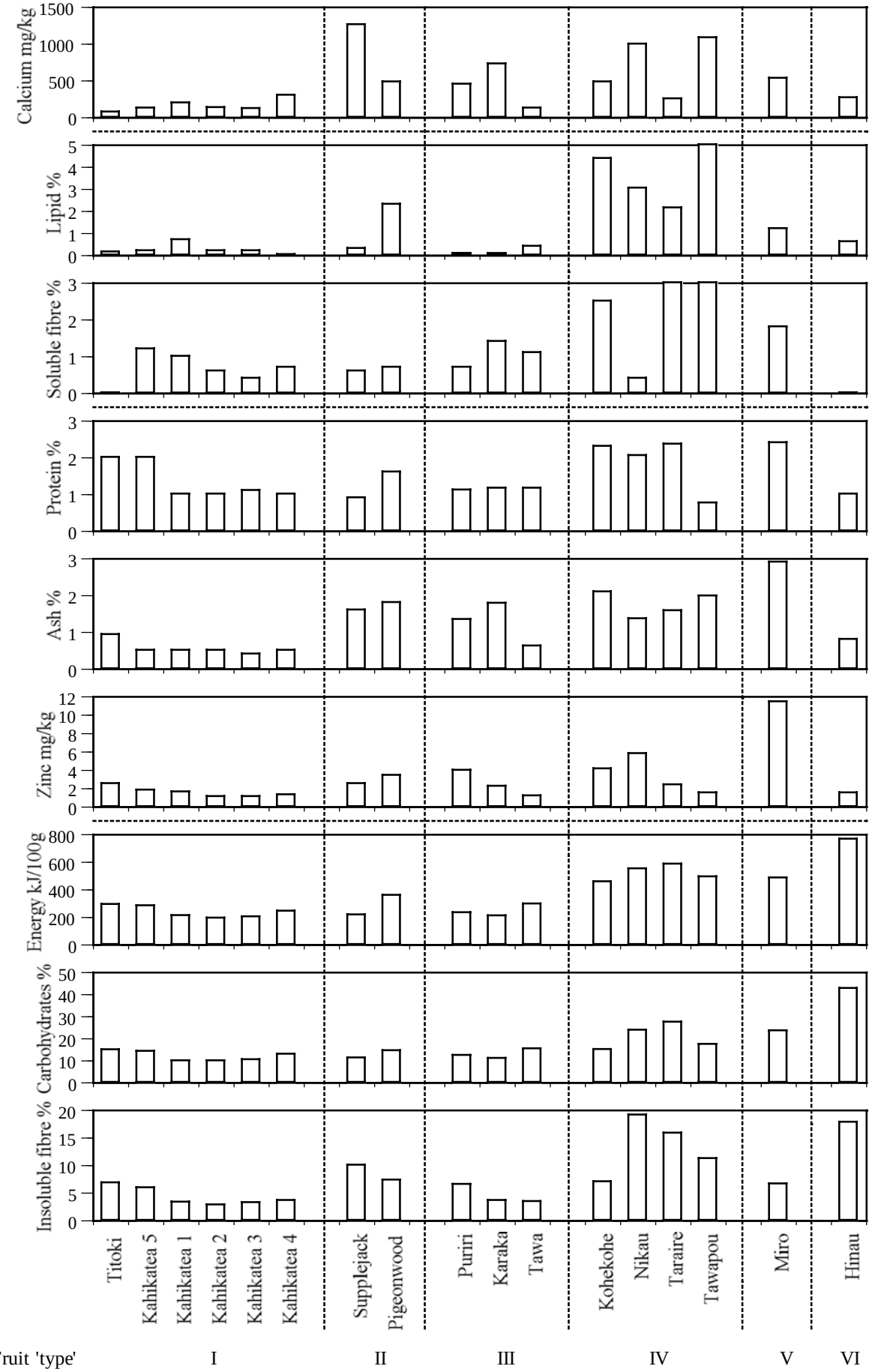


Figure 6.3 cont.: Physical characteristics of fruits, grouped by cluster results (p.3).

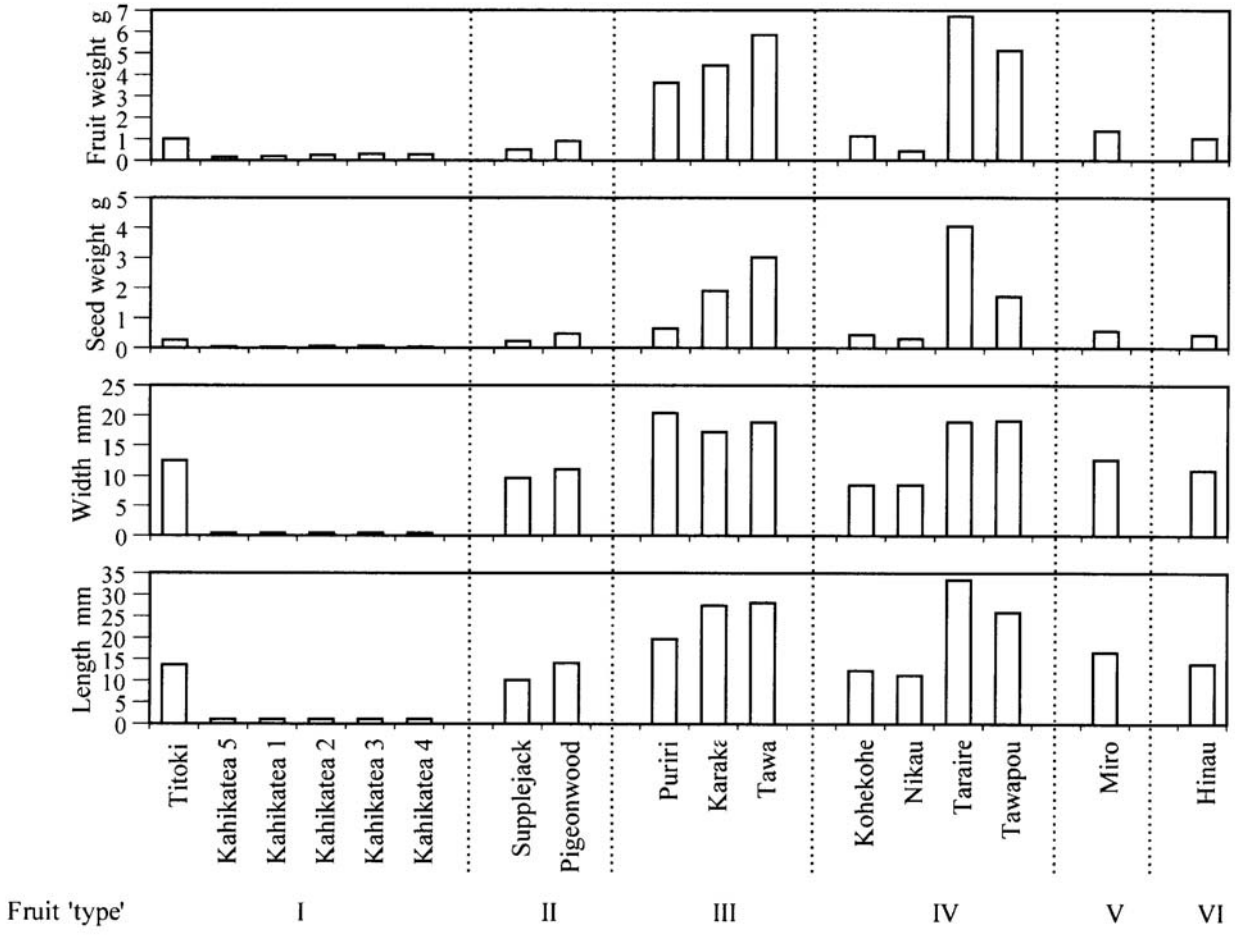


Figure 6.4: Mean fruit characteristics for fruit 'types' presented as averages for cluster 'categories'.

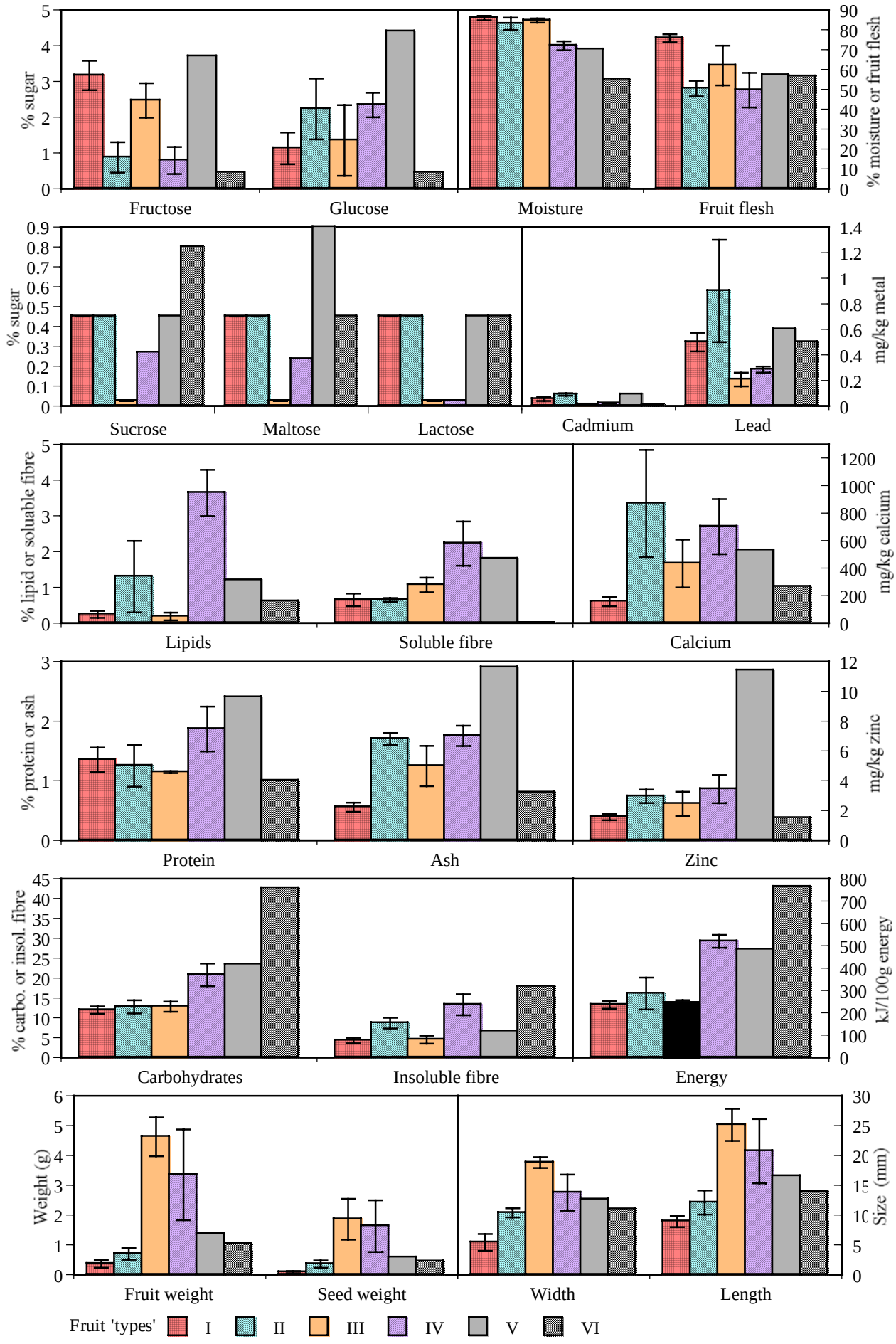


Figure 6.5: Observations of relative abundance for each fruit species throughout a generalised year.

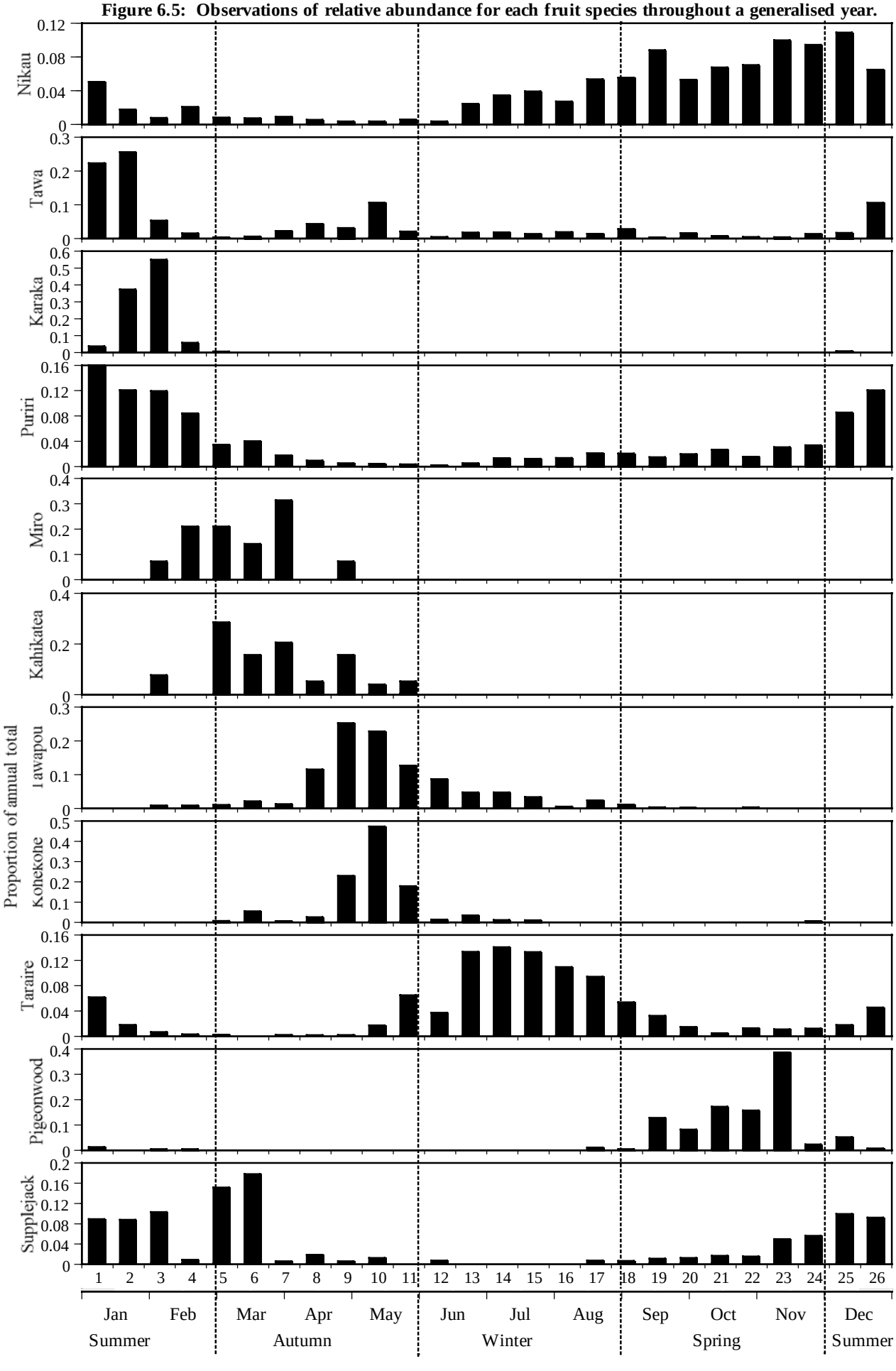
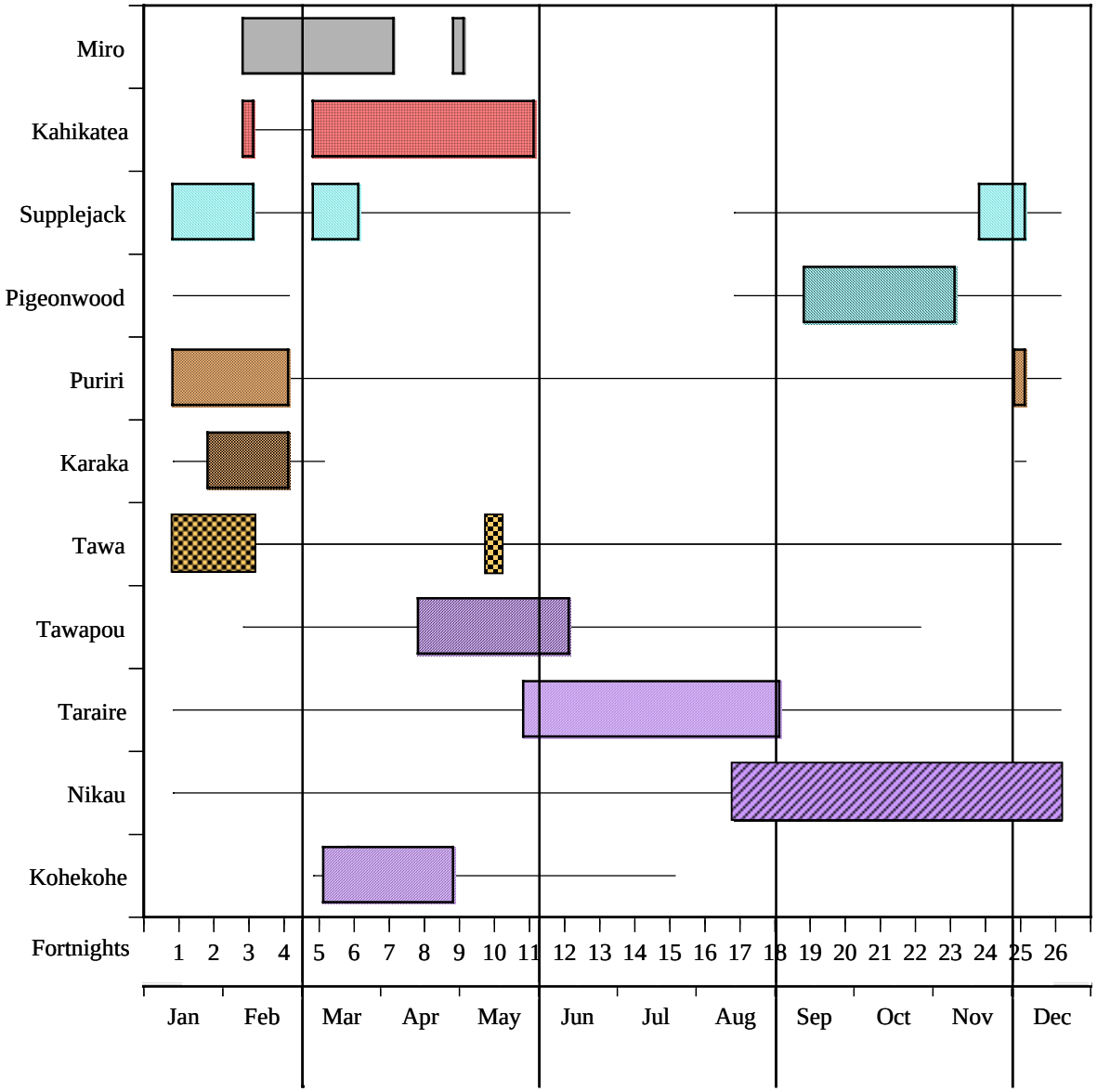


Figure 6.6: Observed availability of fruits in Auckland throughout a generalised year by nutritional fruit 'types'.
Boxes indicate more than 5% of the yearly production of a species,
while lines indicate fruit is present at less than 5% of yearly production



Key to fruit 'types'. These colour and pattern combinations are used throughout this Chapter.

- I - sugar rich, small fruit (Always light red)
- II - moderate lipid + calcium (Always light blue, and left diagonal stripe)
- III - sugar rich, large fruit (Always yellow, hatched pattern)
- IV - lipid rich (Always lilac, and right diagonal stripe)
- V - protein rich (miro)

Figure 6.7: Observed availability and nutritional fruit 'type' throughout the year compared with kereru behaviour and seed deposition over all sites during this study.

The data for observed kereru feeding behaviour and deposition of consumed fruits in seedfall traps have been compiled from all six sites. **Graph a**: Availability of fruit 'types' throughout the year;. **Graph b**: Feeding observations; **Graph c**: Total fruit deposition; **Graph d**: Fruit deposition when kahikatea fruits are excluded.

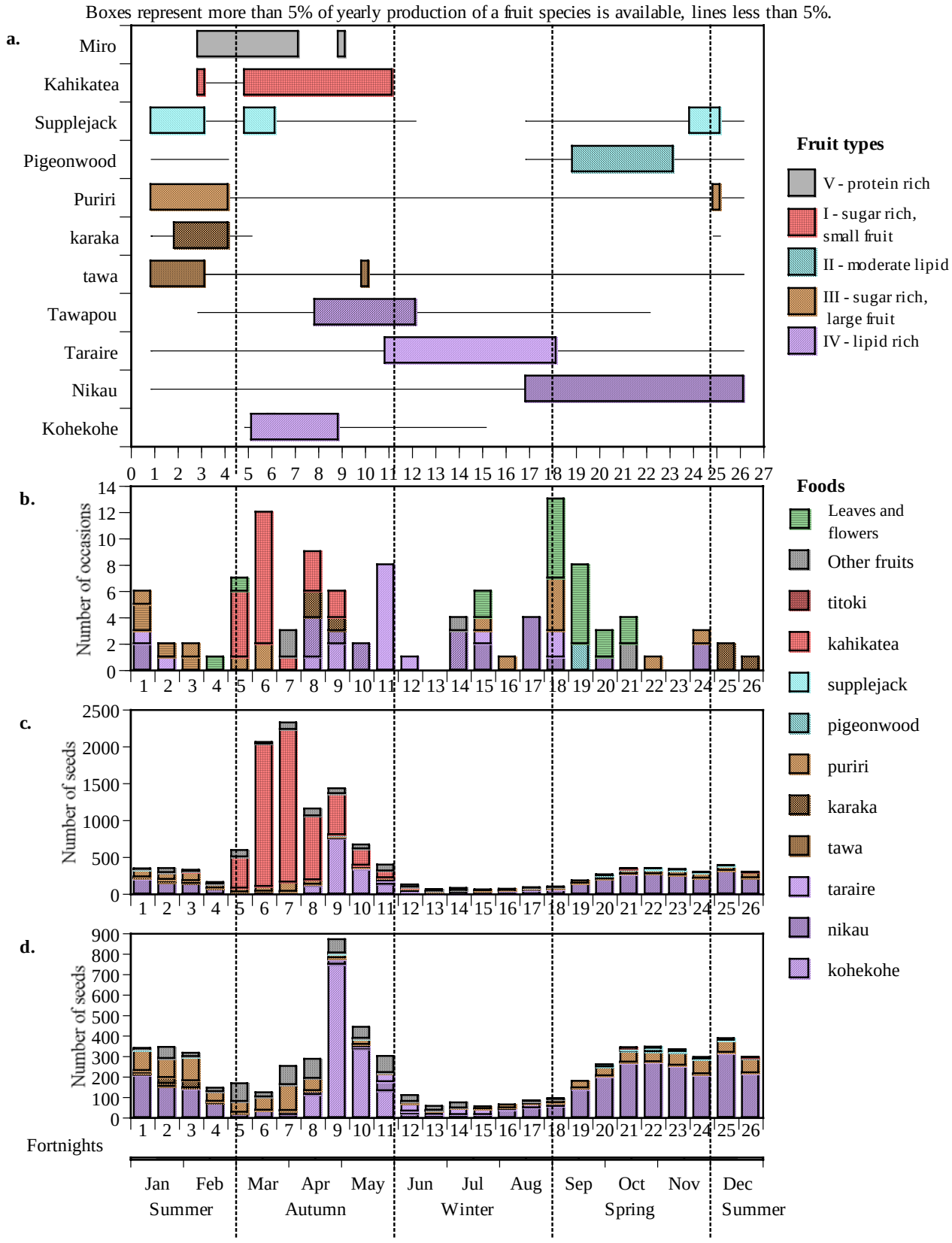


Figure 6.8: Availability and nutritional value of fruits throughout the year compared with observed kereru feeding and nesting.

Graph a: Availability and nutritional value of fruits (data this study).
Graph b: Observed kereru feeding data from September 1988 to September 1989 at Wenderholm (unpublished data M. Clout). These data are direct feeding observations of birds per fortnightly period.
Graph c: Number of new nests found per month at Wenderholm; data from Clout et al. (1995b).

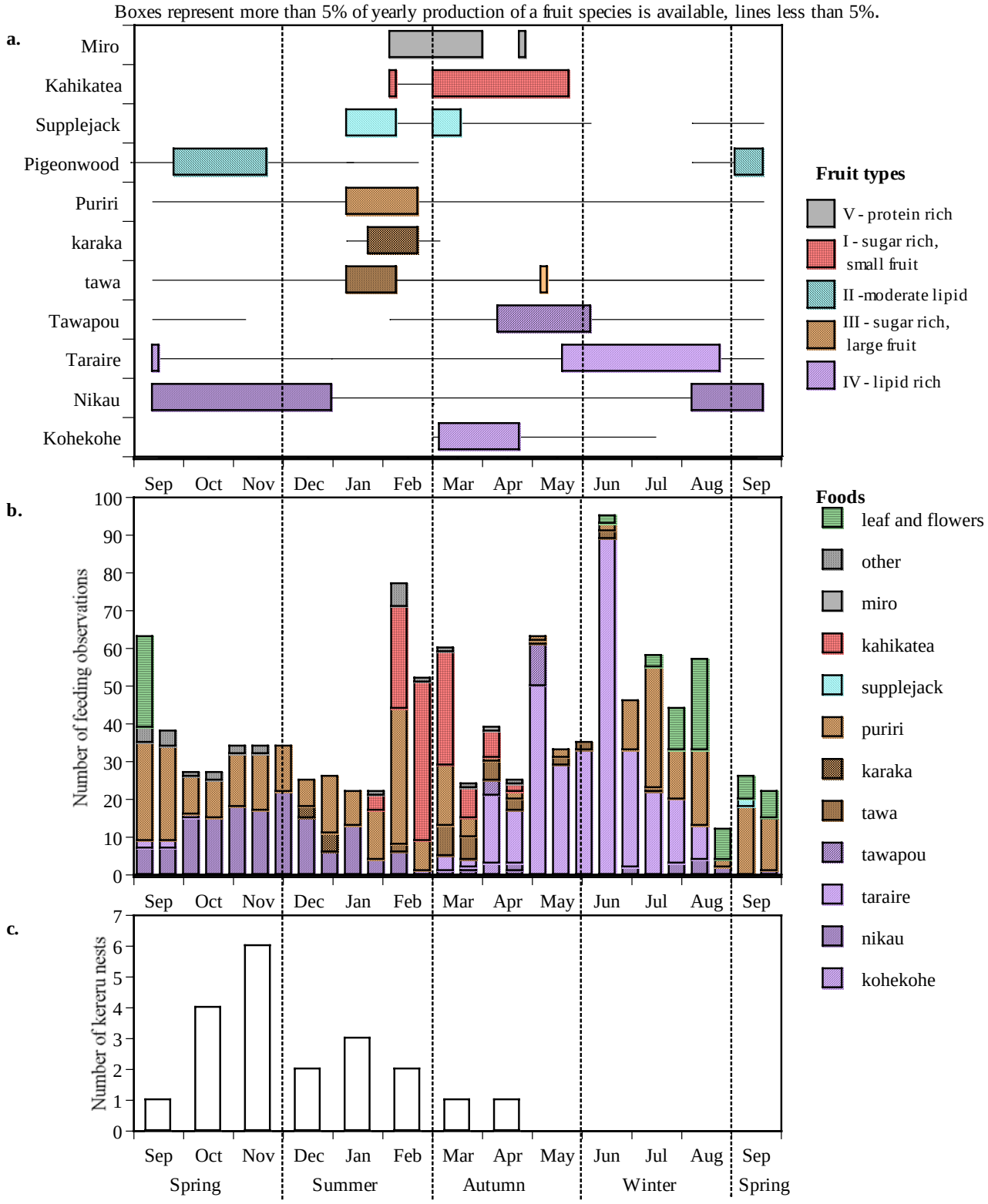


Figure 6.9: Availability and nutritional value of fruits throughout the year compared with observed kereru feeding and nesting in 1993/94.

Observed kereru behaviour during breeding periods at Wenderholm (data from James, 1995);
Graph a: Availability of fruit 'types'; **Graph b**: Kereru feeding observations; **Graph c**: Fruit deposition below kereru nest; **Graph d**: Detection of new kereru nests

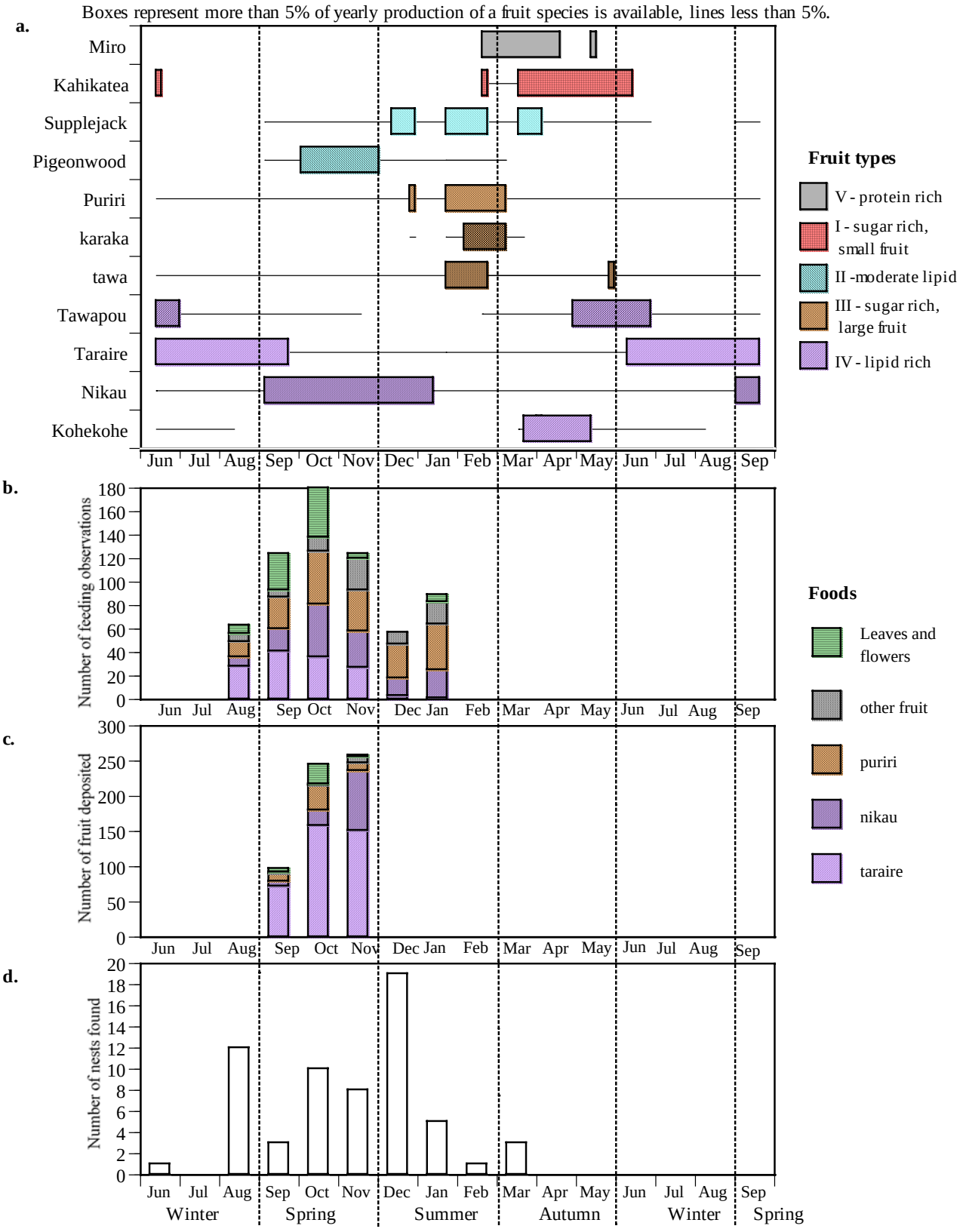


Figure 6.10: Number of consumed and uneaten fruits to fall into seedfall traps, summed over all sites by sampling fortnight

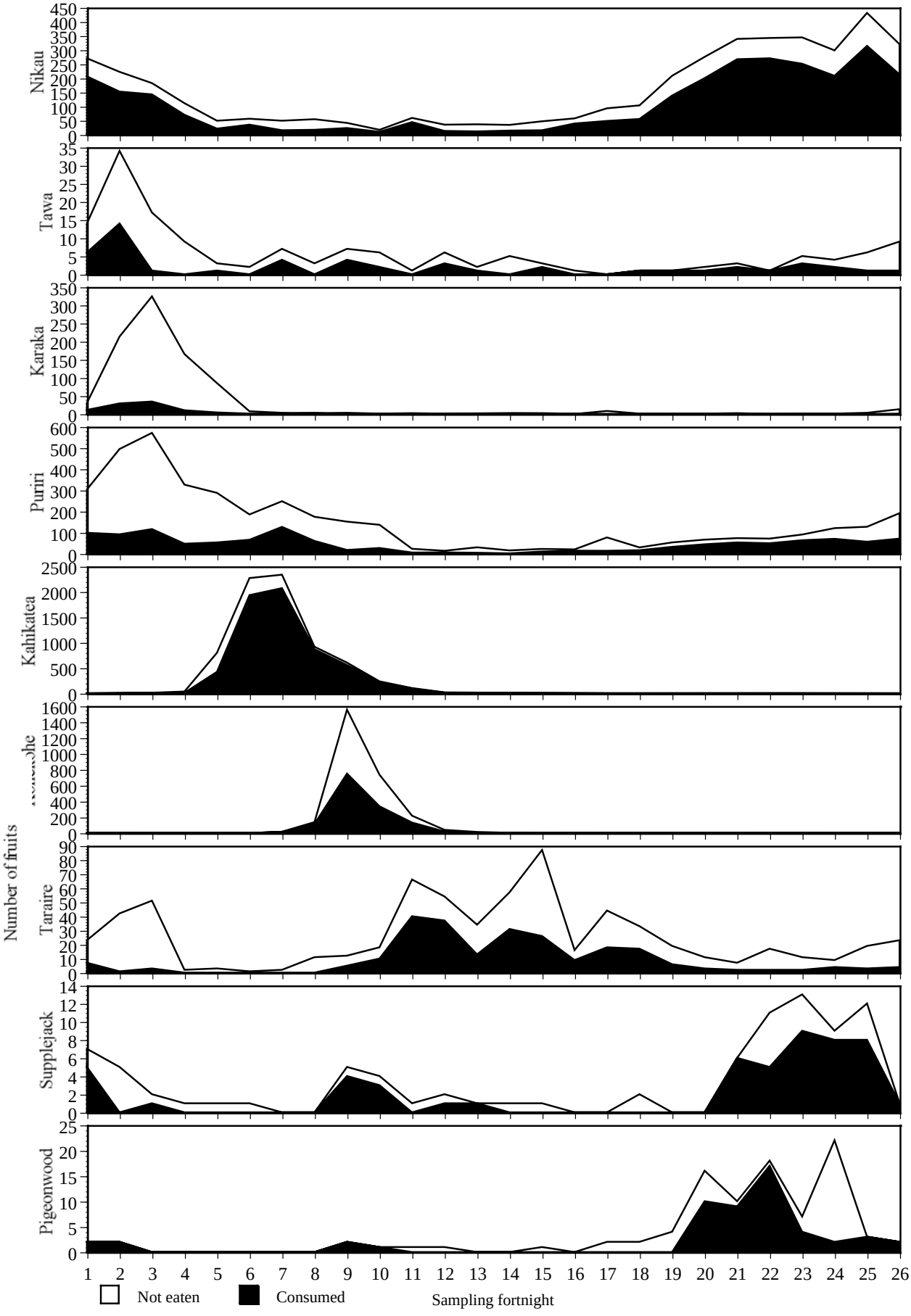


Figure 6.11: Relative abundance of fruits (observation and seed deposition) and kereru feeding observations.

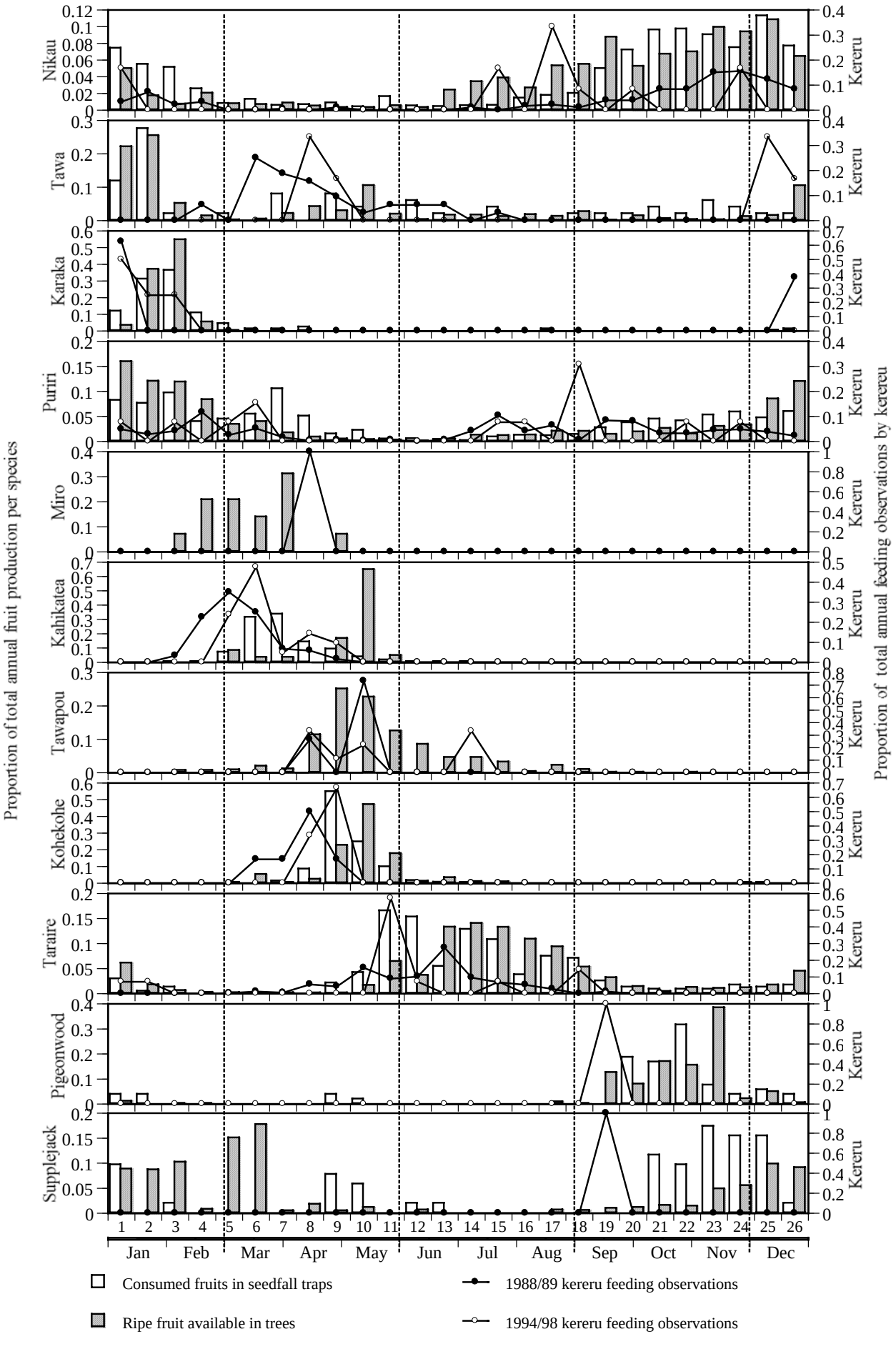


Figure 7.7: Number of possums trapped per site.

The data are separated into male and female, and mature and juvenile animals

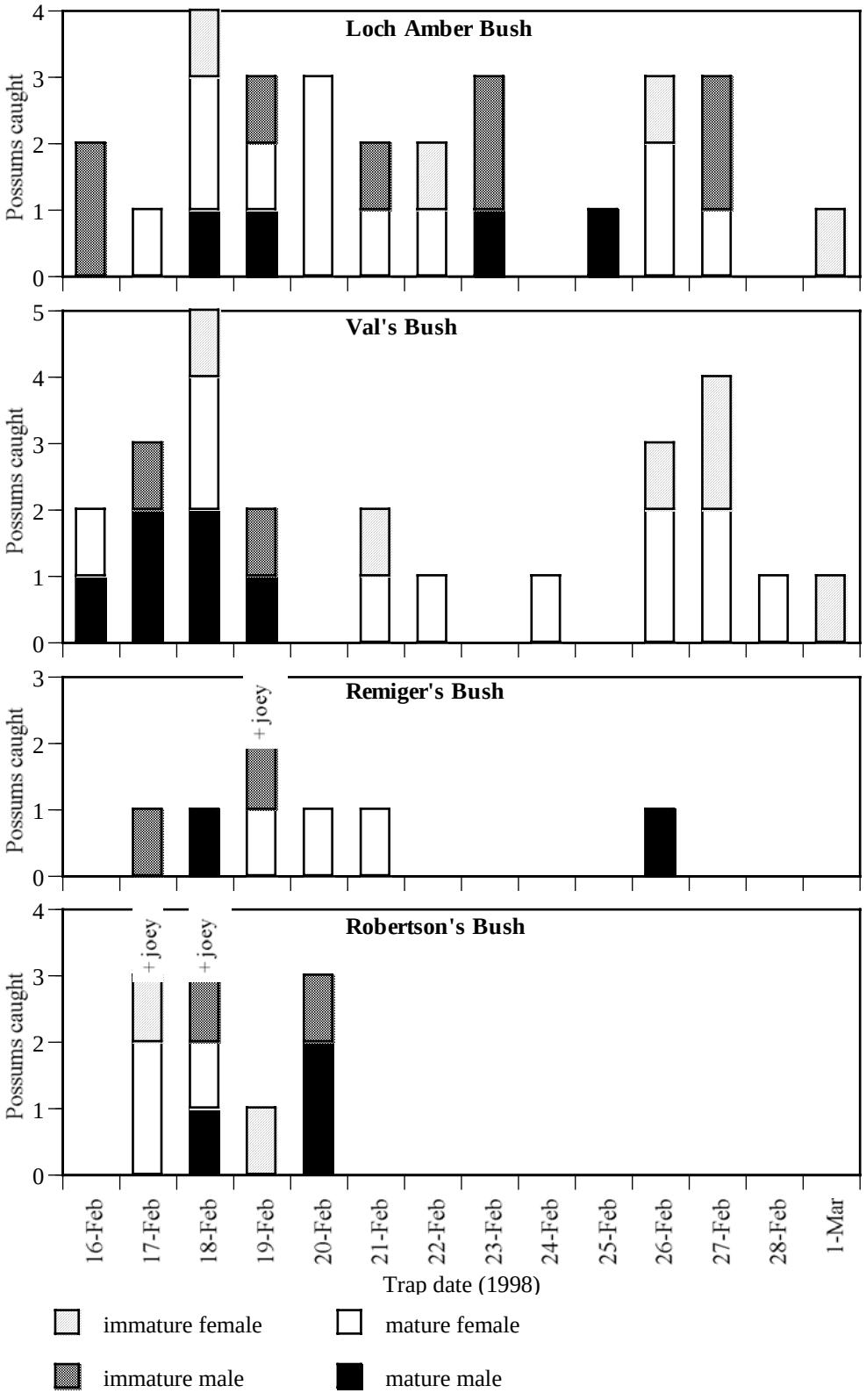


Figure 7.8 a to c: Number of seedfall traps at each site containing one or more possum droppings

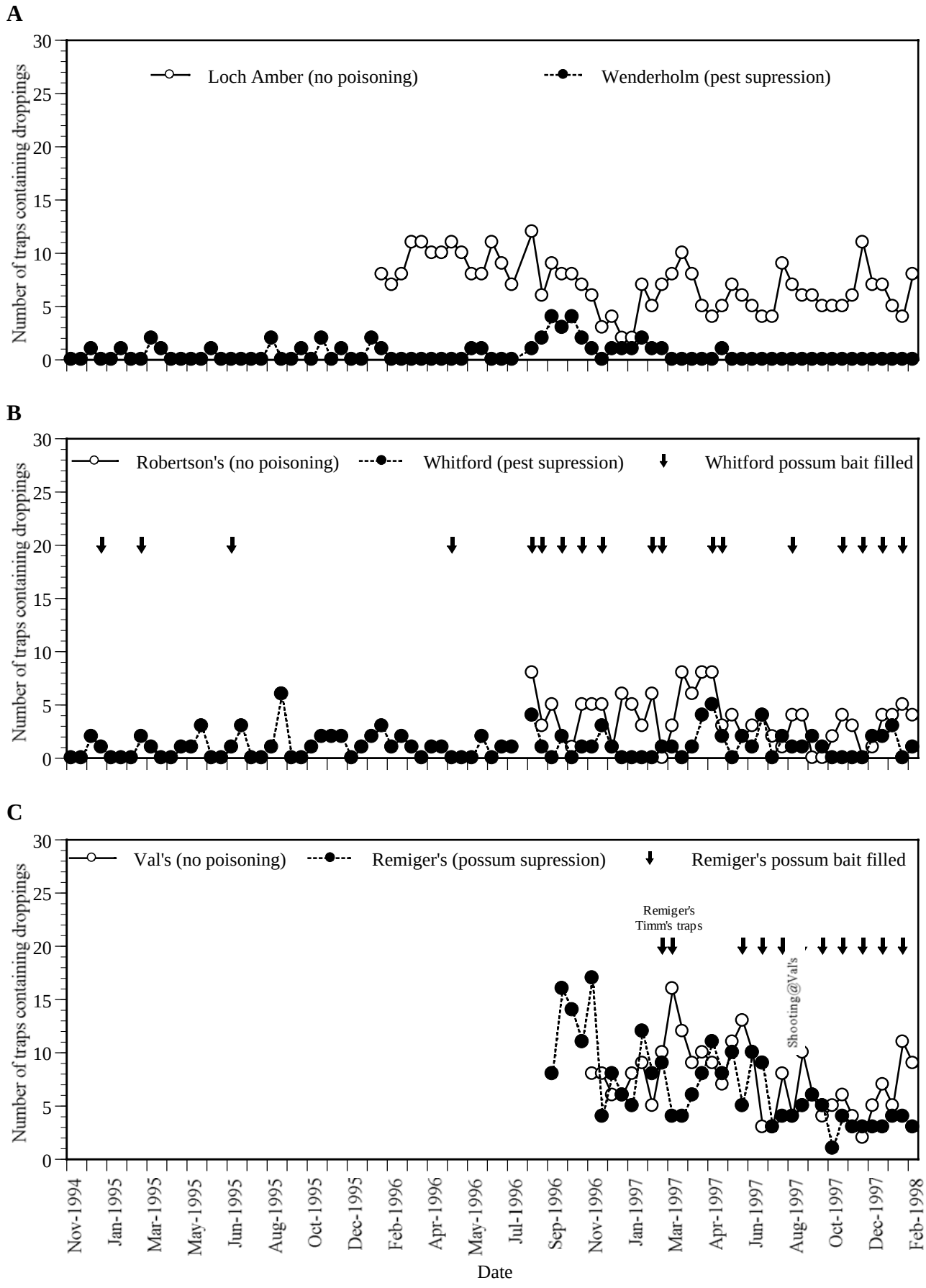


Figure 7.9 a to c: Number of seedfall traps at each site containing one or more rodent droppings

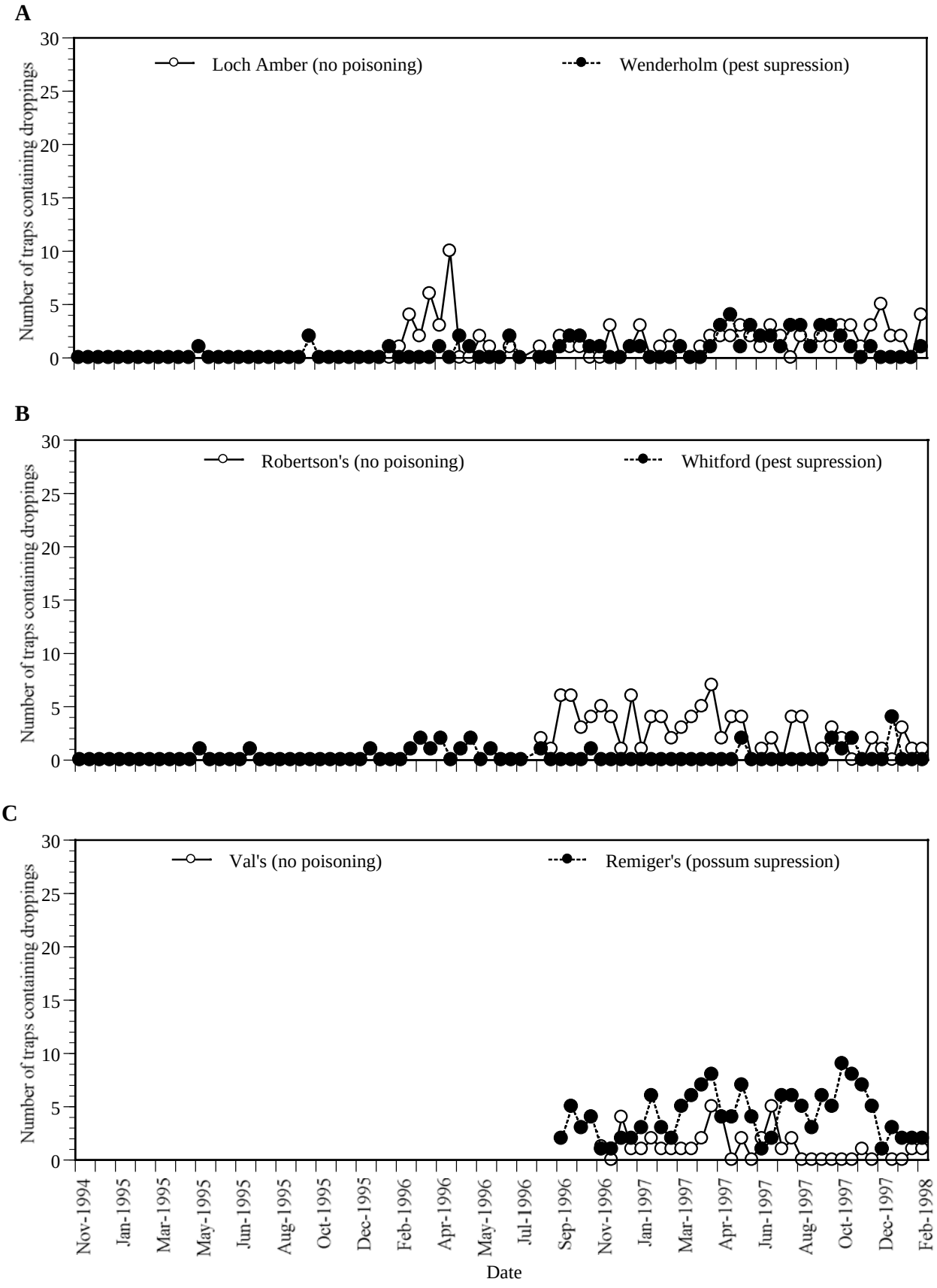
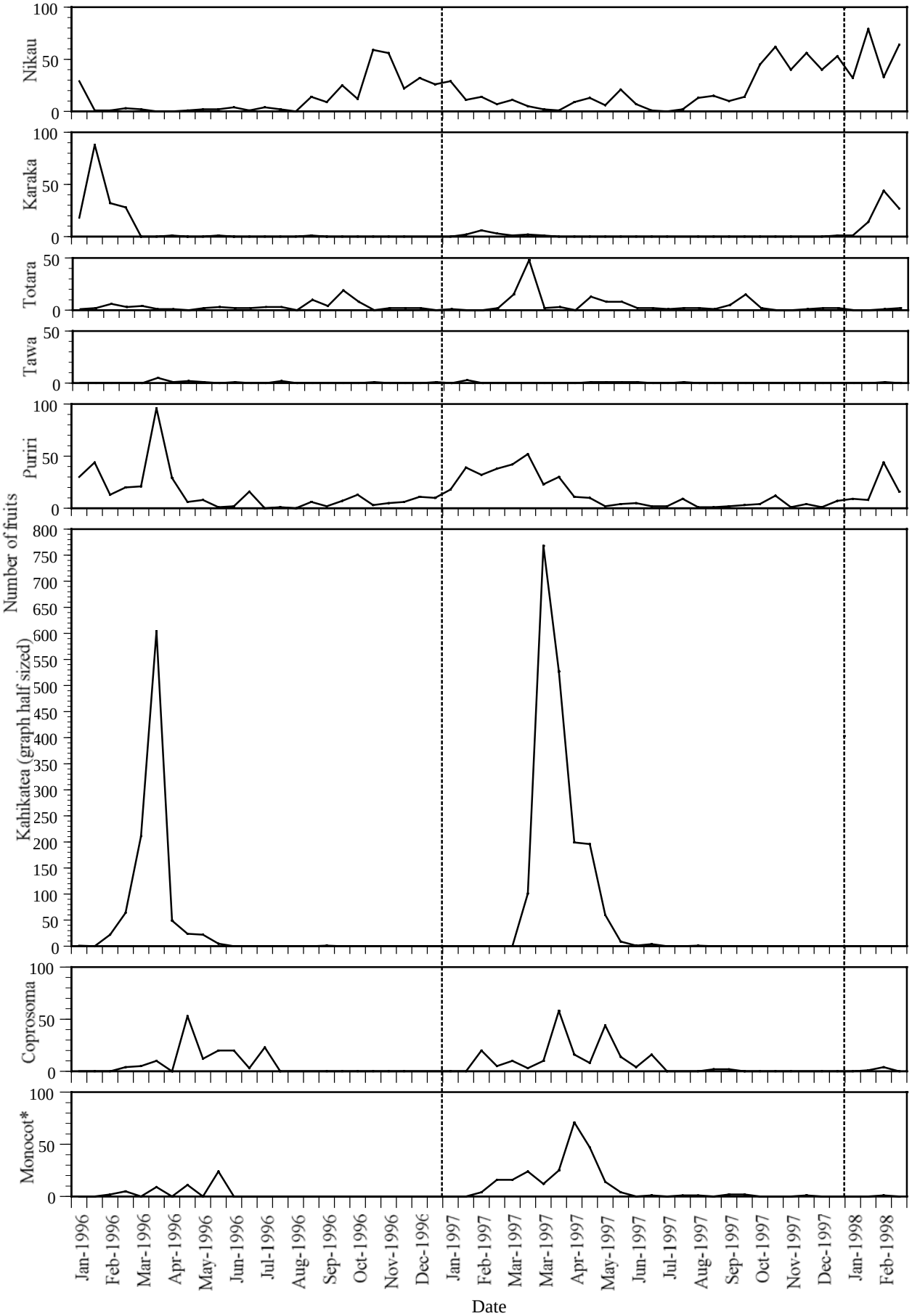


Figure 7.11: Number of mature, undamaged fruits found in seedfall traps at Wenderholm Regional Park, page 1
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



*Monocot = small spiral black seeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.11: Number of mature, undamaged fruits found in seedfall traps at Wenderholm Regional Park, page 2
Mature fruits also include those fruits that were consumed, but excludes those that were predated.

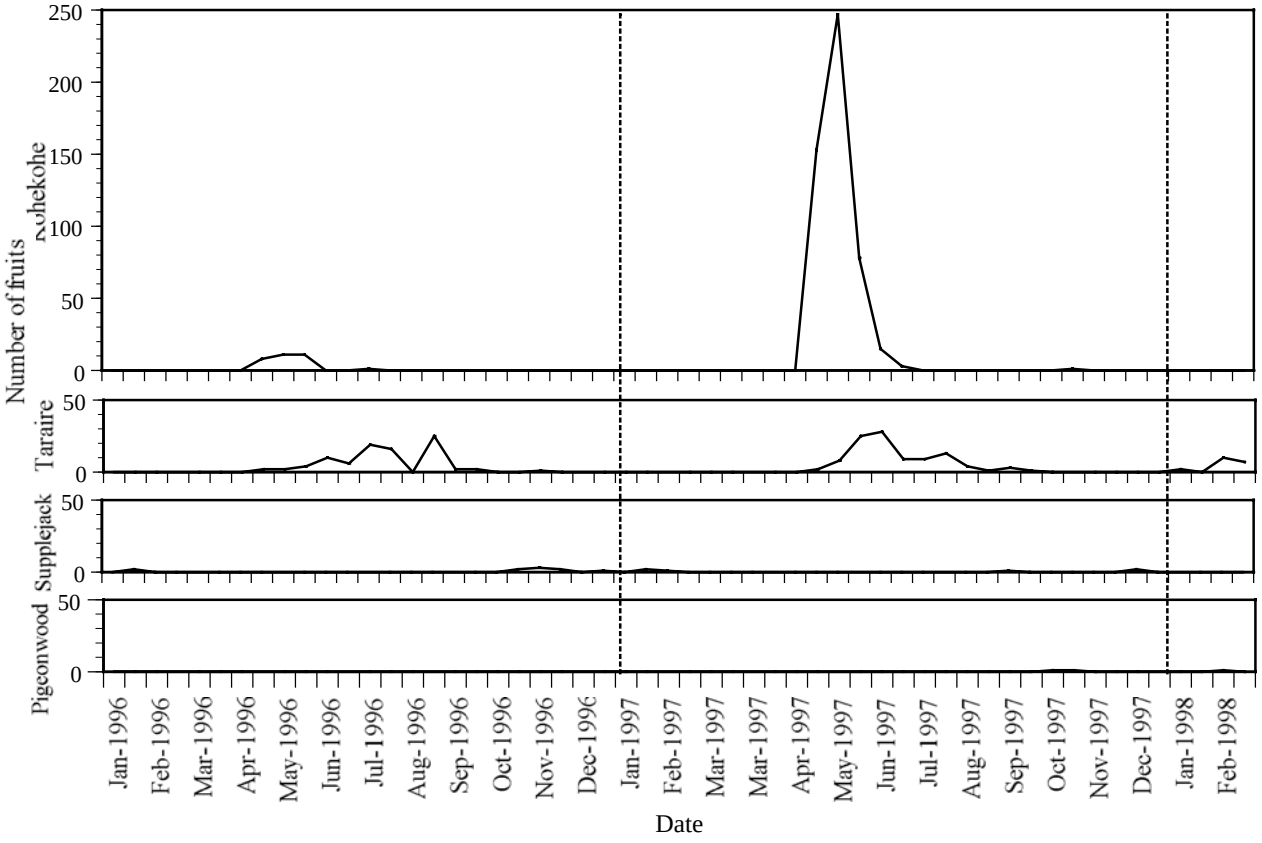
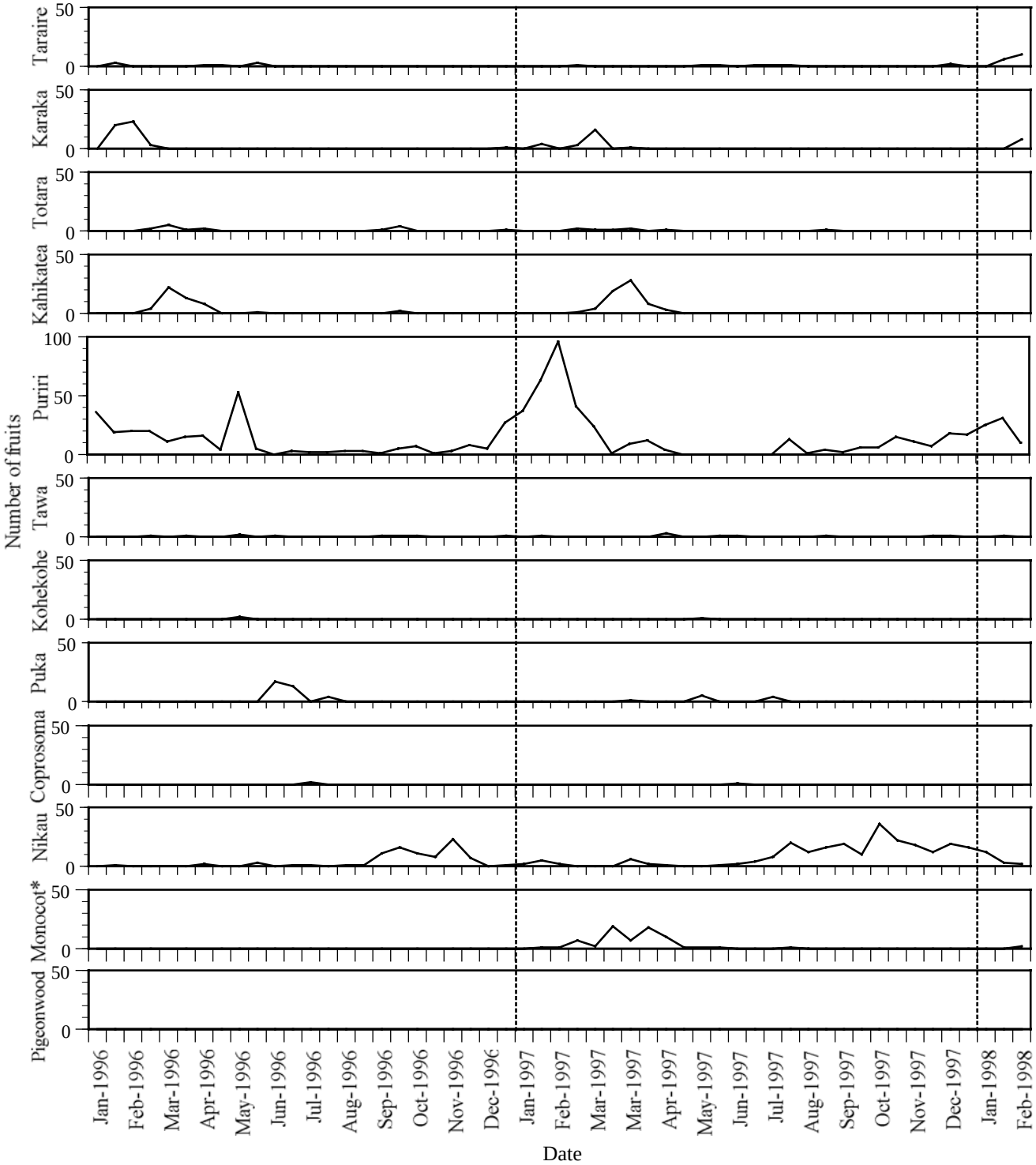
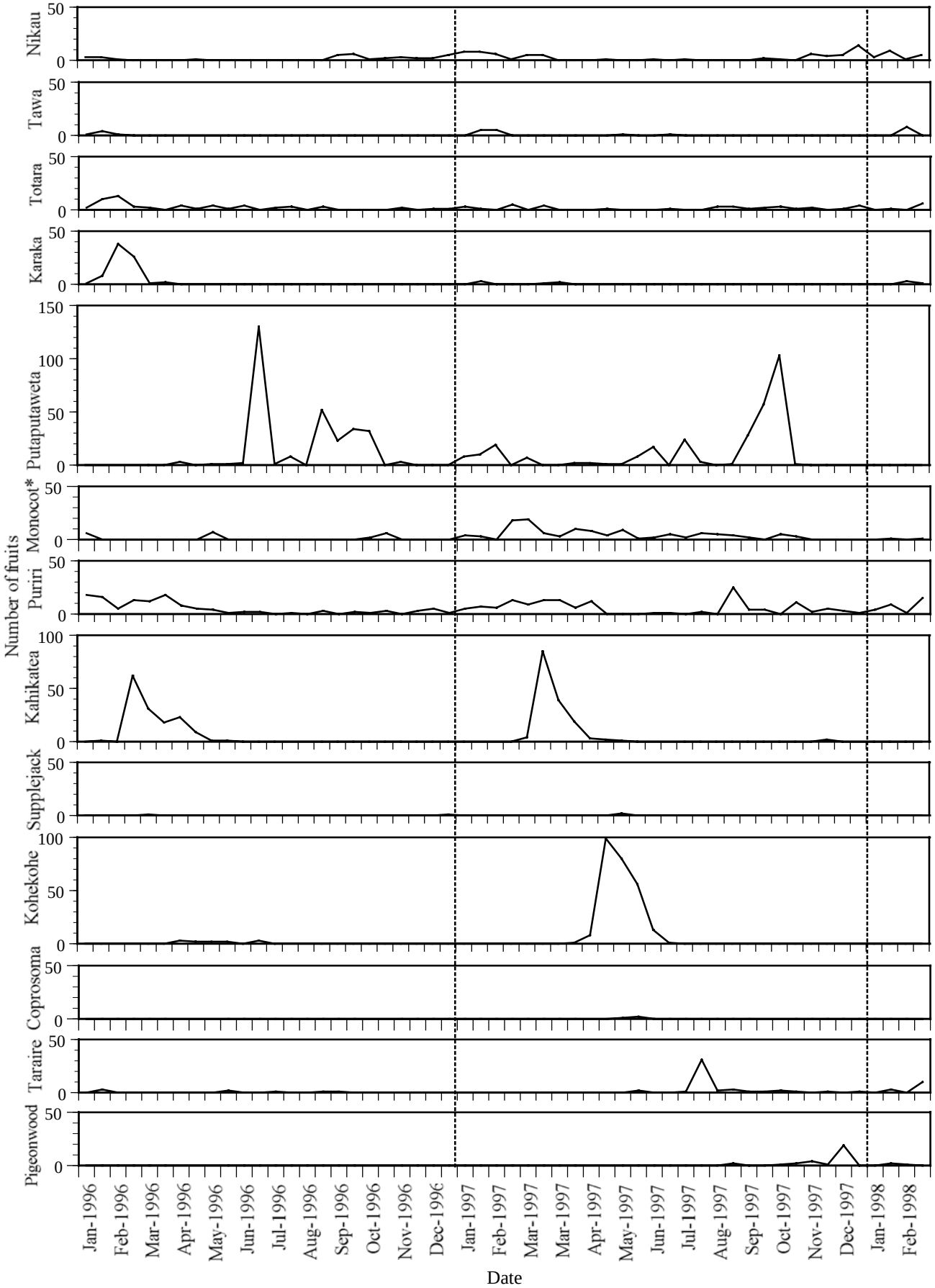


Figure 7.12: Number of mature, undamaged fruits found in seedfall traps at Loch Amber Bush.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



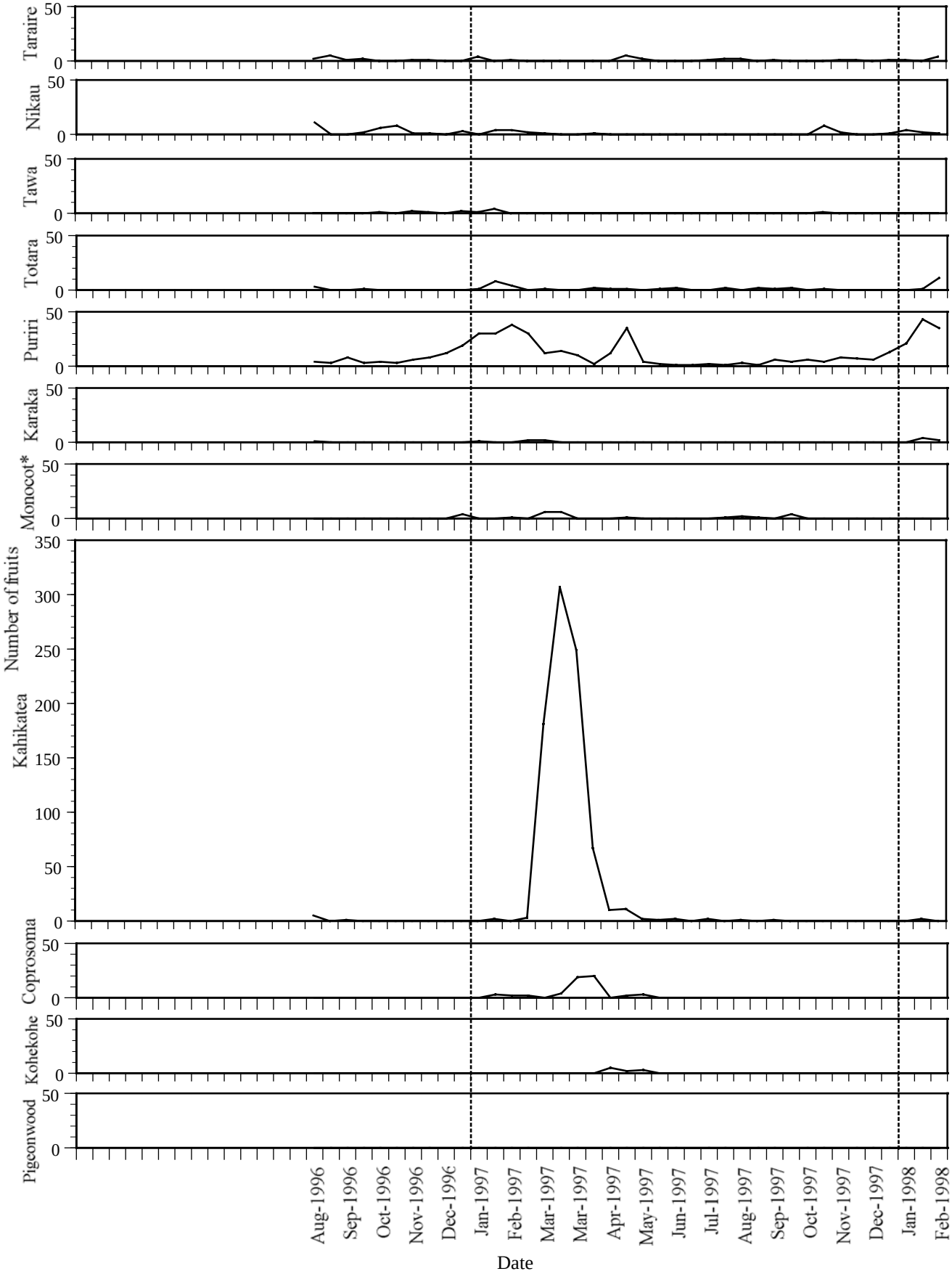
*Monocot = small spiral black seeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.13: Number of mature, undamaged fruits found in seedfall traps at Whitford Bush.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



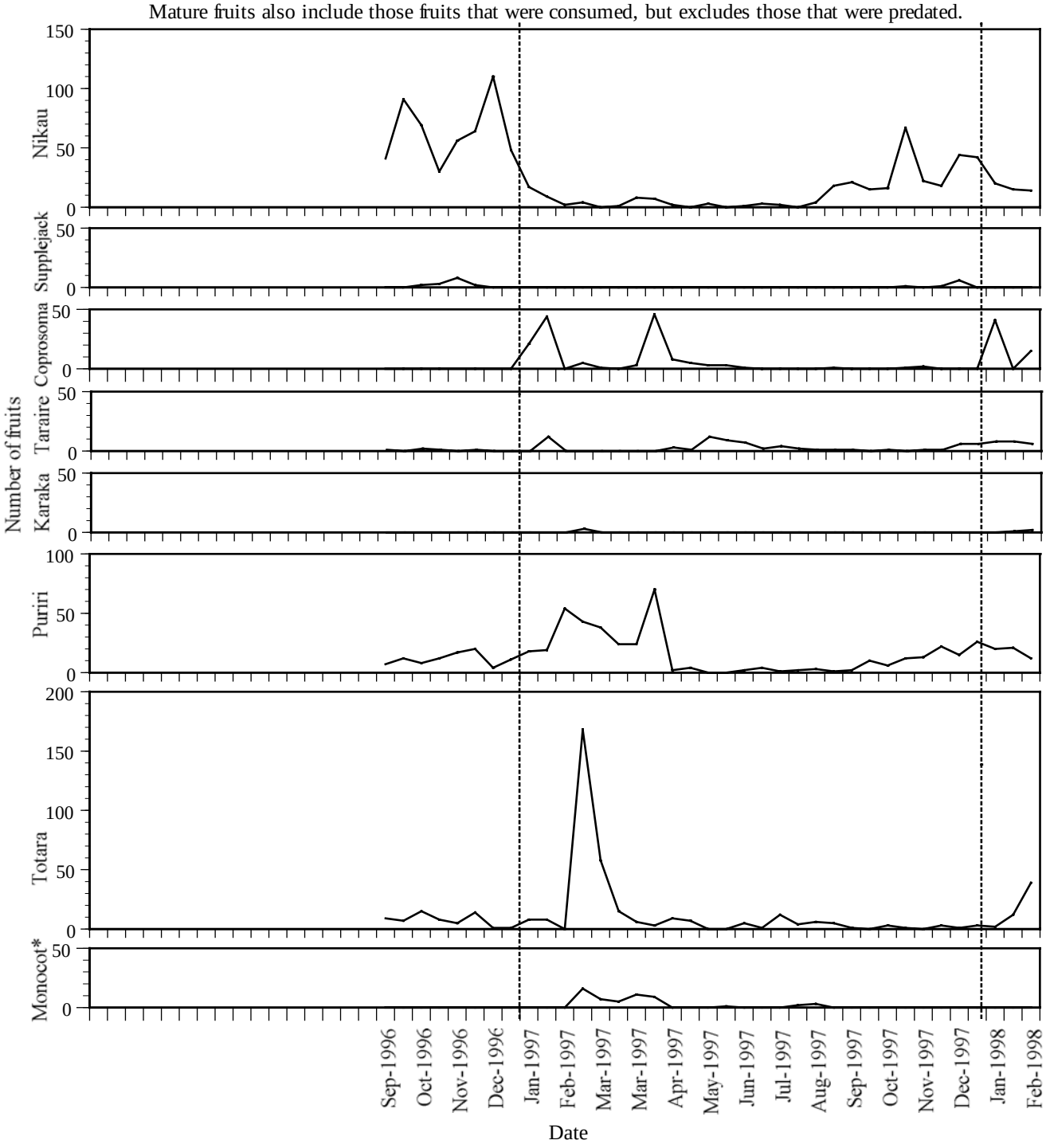
*Monocot = small spiral black seeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.14: Number of mature, undamaged fruits found in seedfall traps at Robertson's Bush.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



*Monocot = small spiral blackseeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.15: Number of mature, undamaged fruits found in seedfall traps at Remiger's Bush, page 1.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



*Monocot = small spiral black seeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.15: Number of mature, undamaged fruits found in seedfall traps at Remiger's Bush, page 2.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.

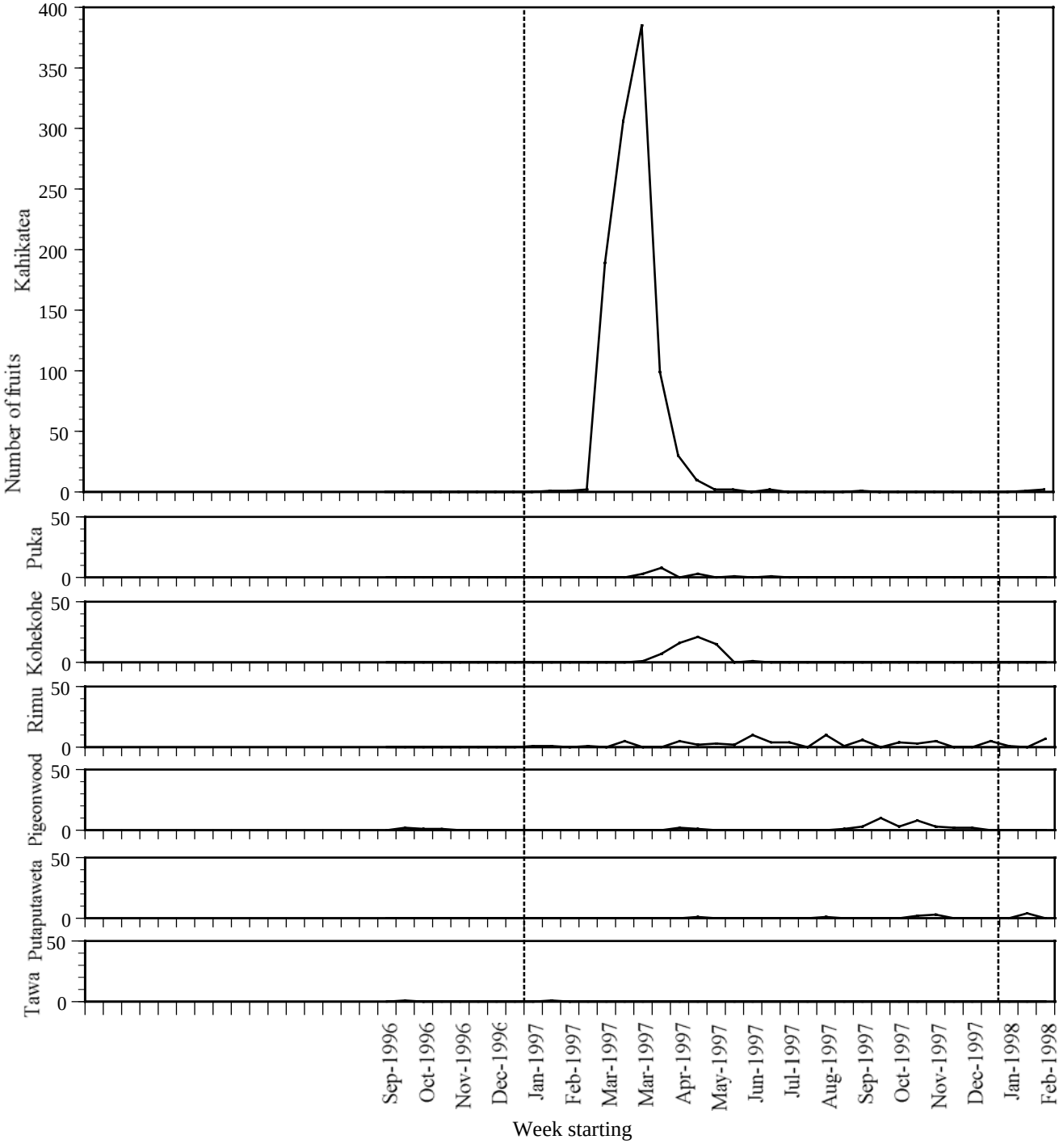
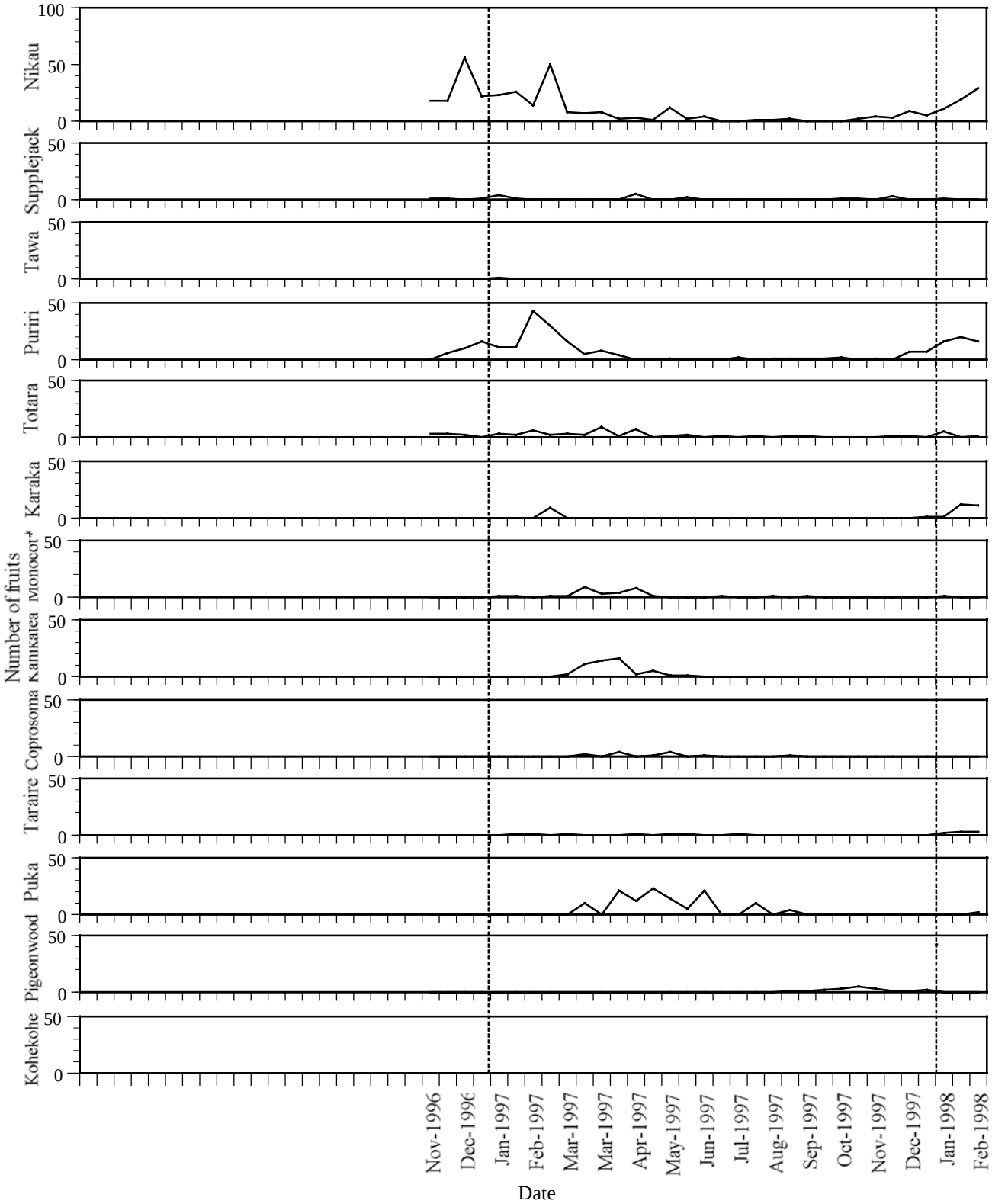


Figure 7.16: Number of mature, undamaged fruits found in seedfall traps at Val's Bush.
Mature fruits also include those fruits that were consumed, but excludes those that were predated.



*Monocot = small spiral black seeds, most likely cabbage tree (*Cordyline*) or *Astelia*

Figure 7.17: Predation and consumption of Kohekohe fruits (note differences in Y axis scale)

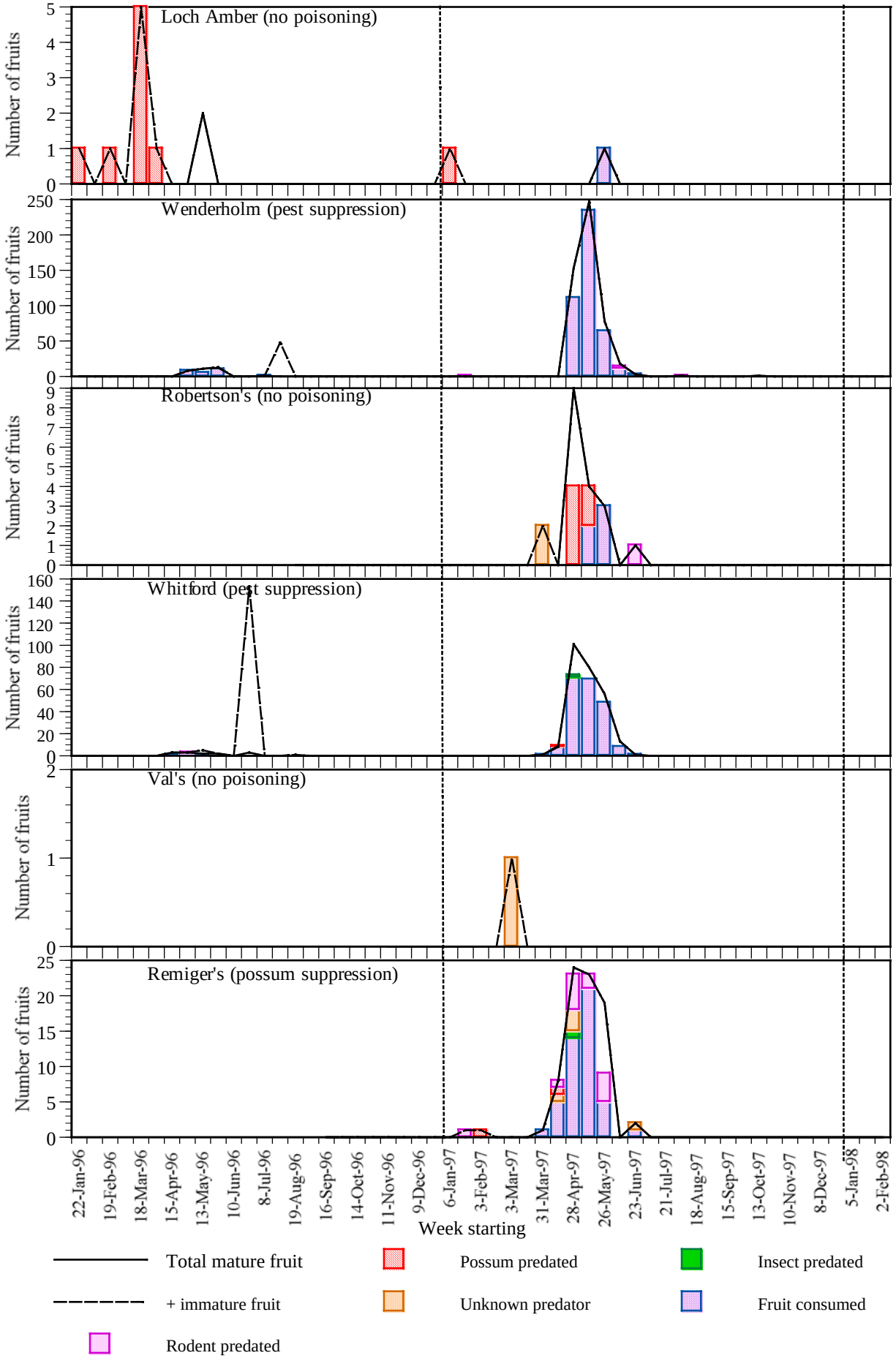


Figure 7.18: Predation and consumption of Taraire fruits (note differences in Y axis scale)

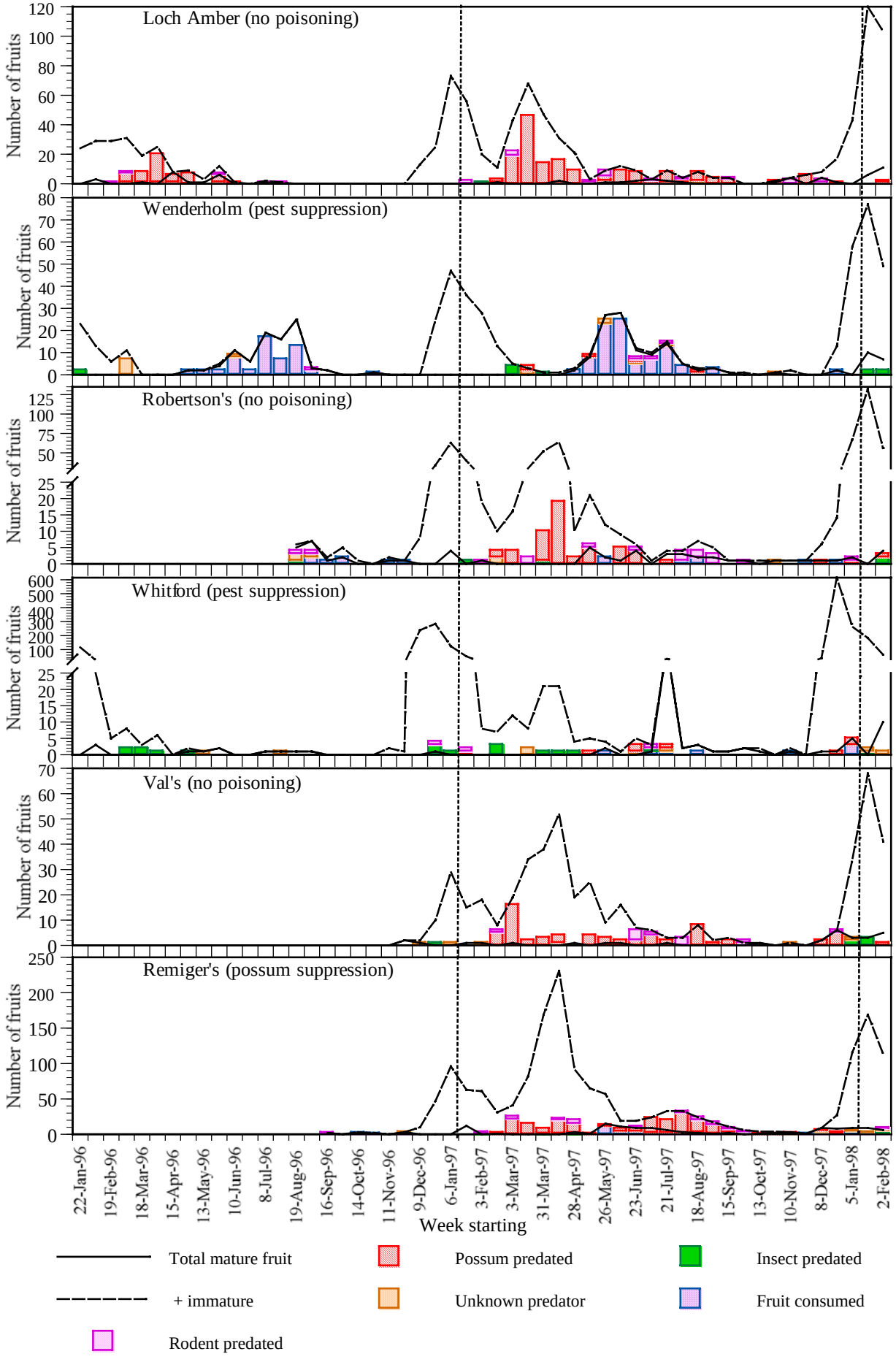


Figure 7.19: Predation and consumption of Karaka fruits (note differences in Y axis scale)

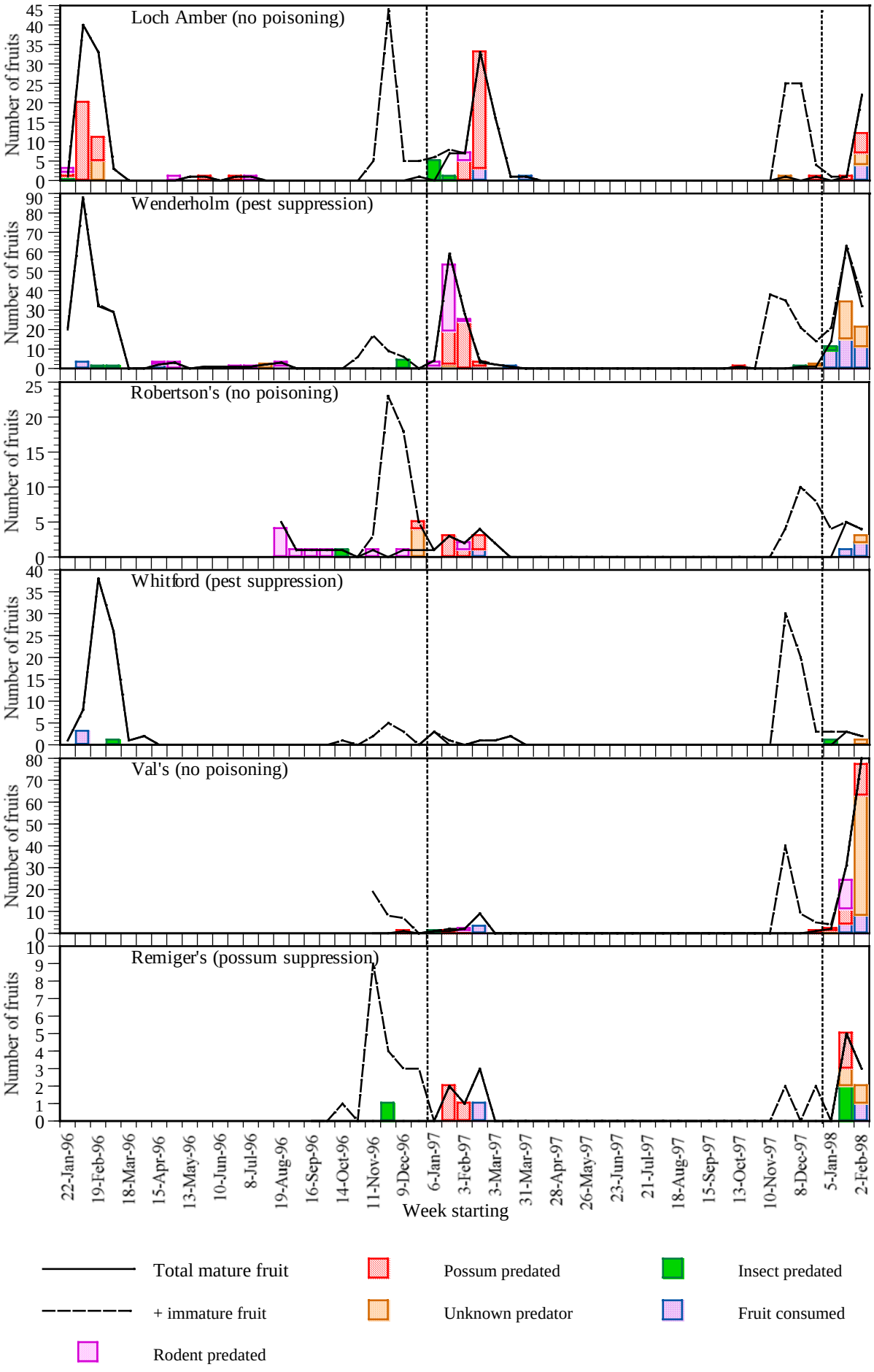


Figure 7.20: Predation and consumption of Puriri fruits (note differences in Y axis scale)

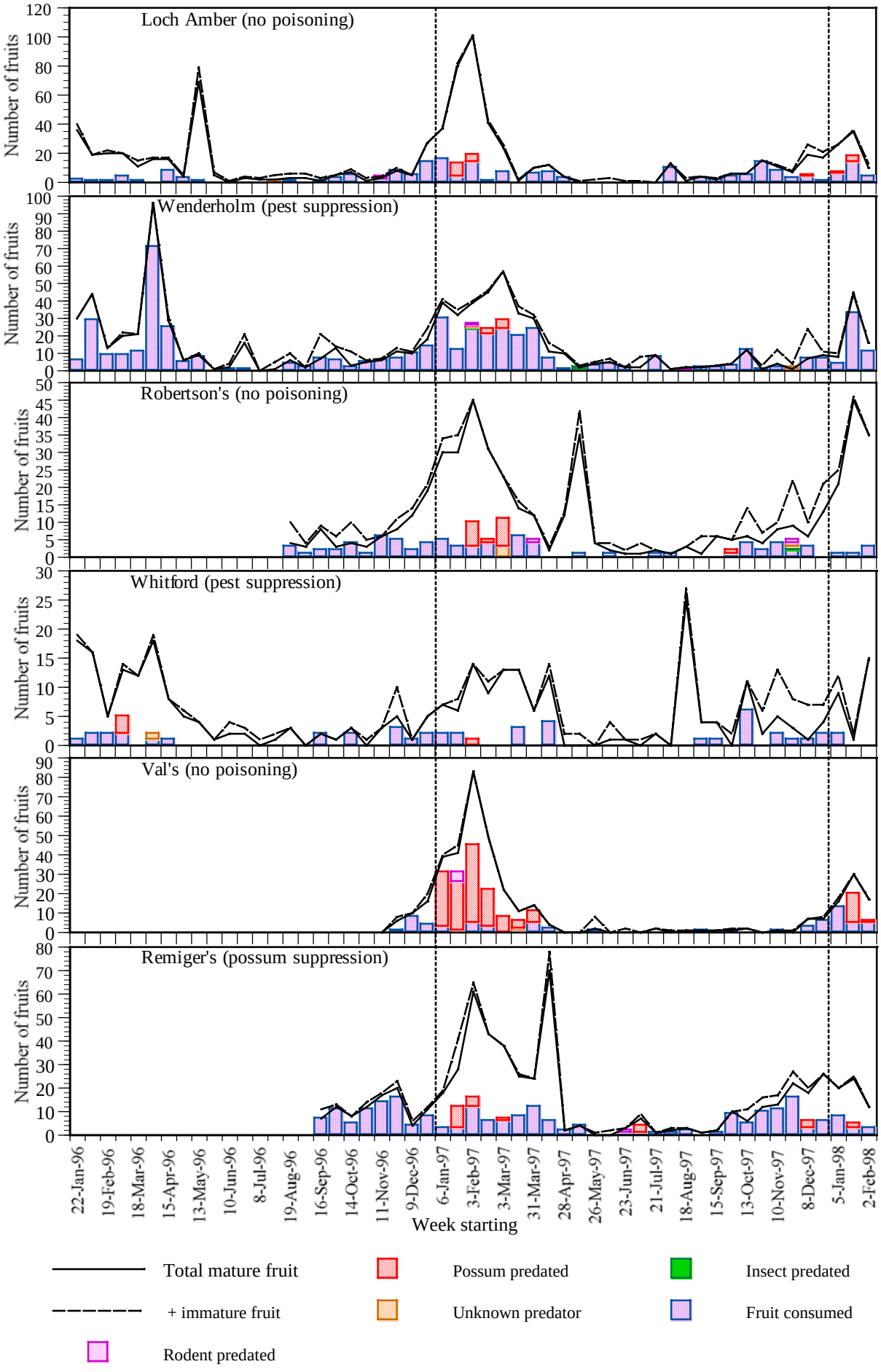


Figure 7.21: Predation and consumption of Tawa fruits (note differences in Y axis scale)

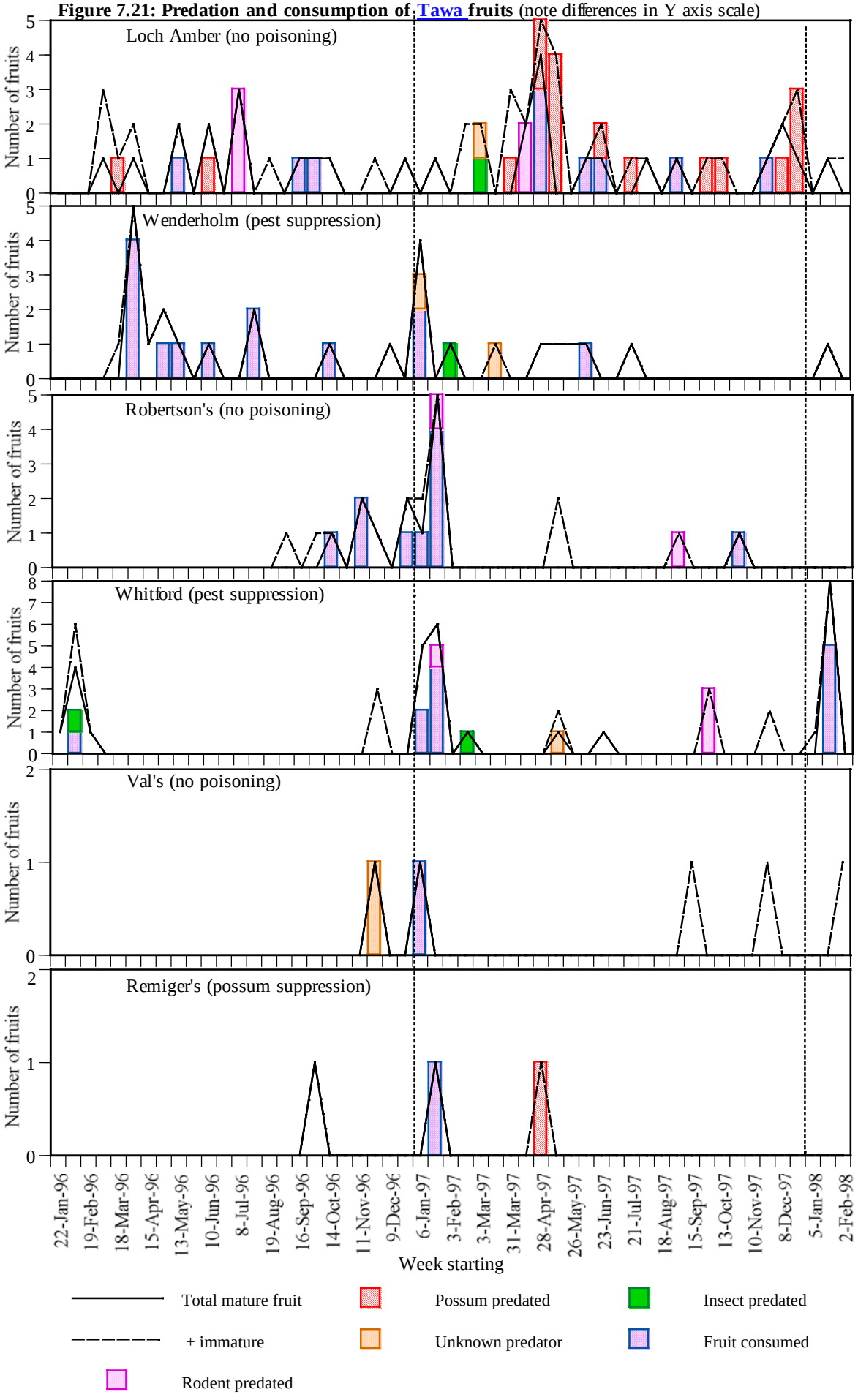


Figure 7.22: Predation and consumption of Pigeonwood fruits (note differences in Y axis scale)

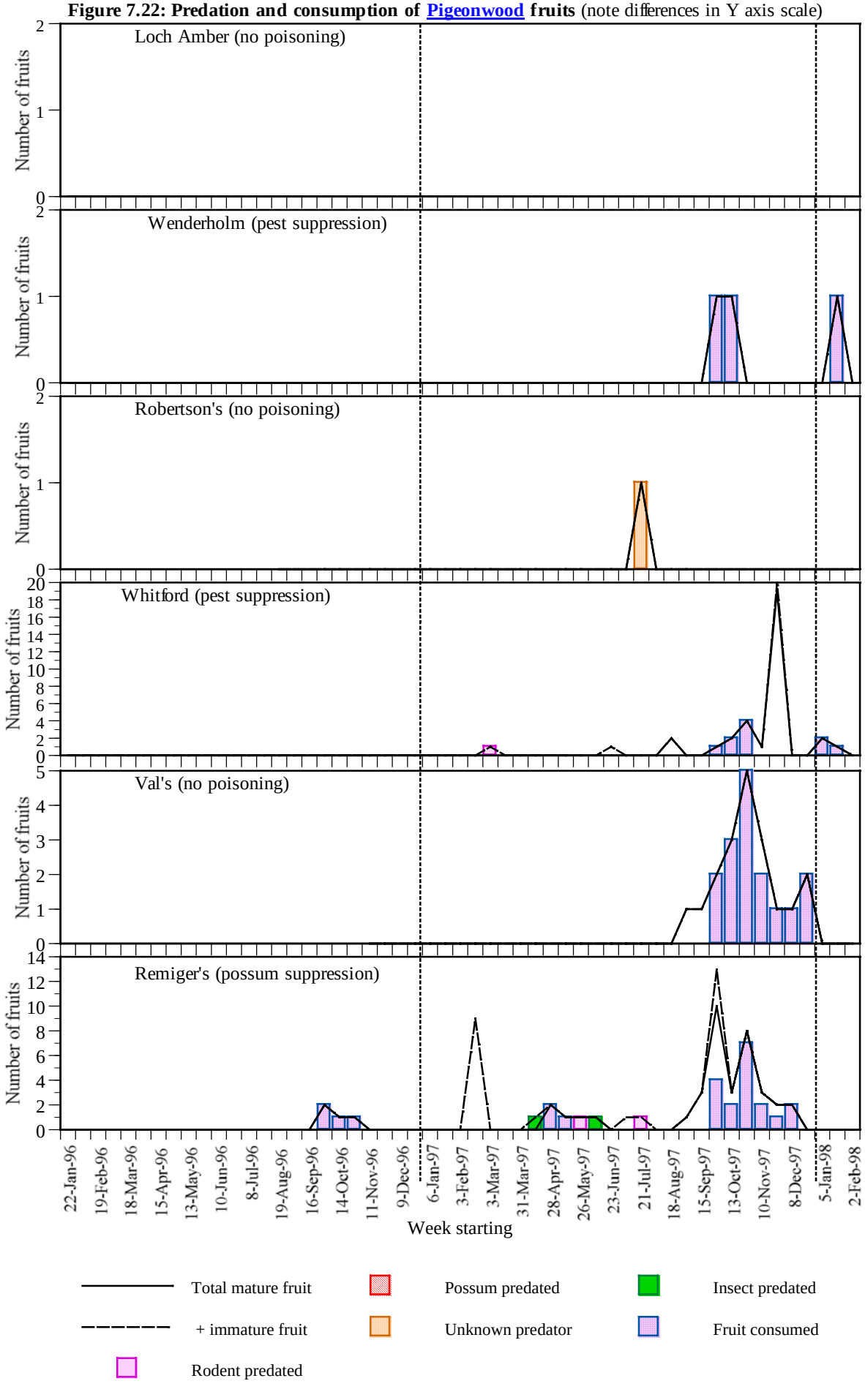


Figure 7.23: Predation and consumption of Nikau fruits (note differences in Y axis scale)

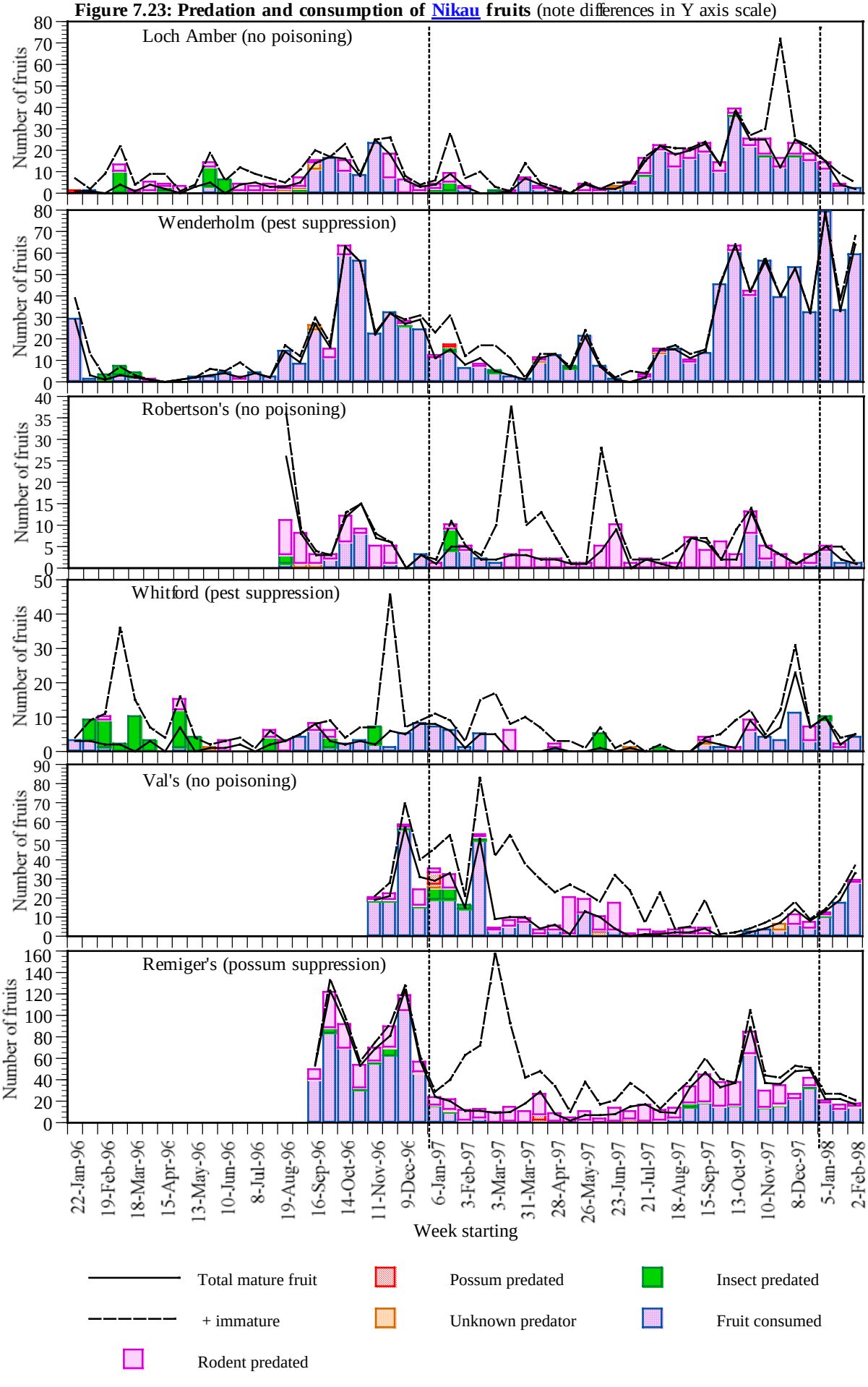


Figure 7.24: Predation and consumption of Kahikatea fruits (note differences in Y axis scale)

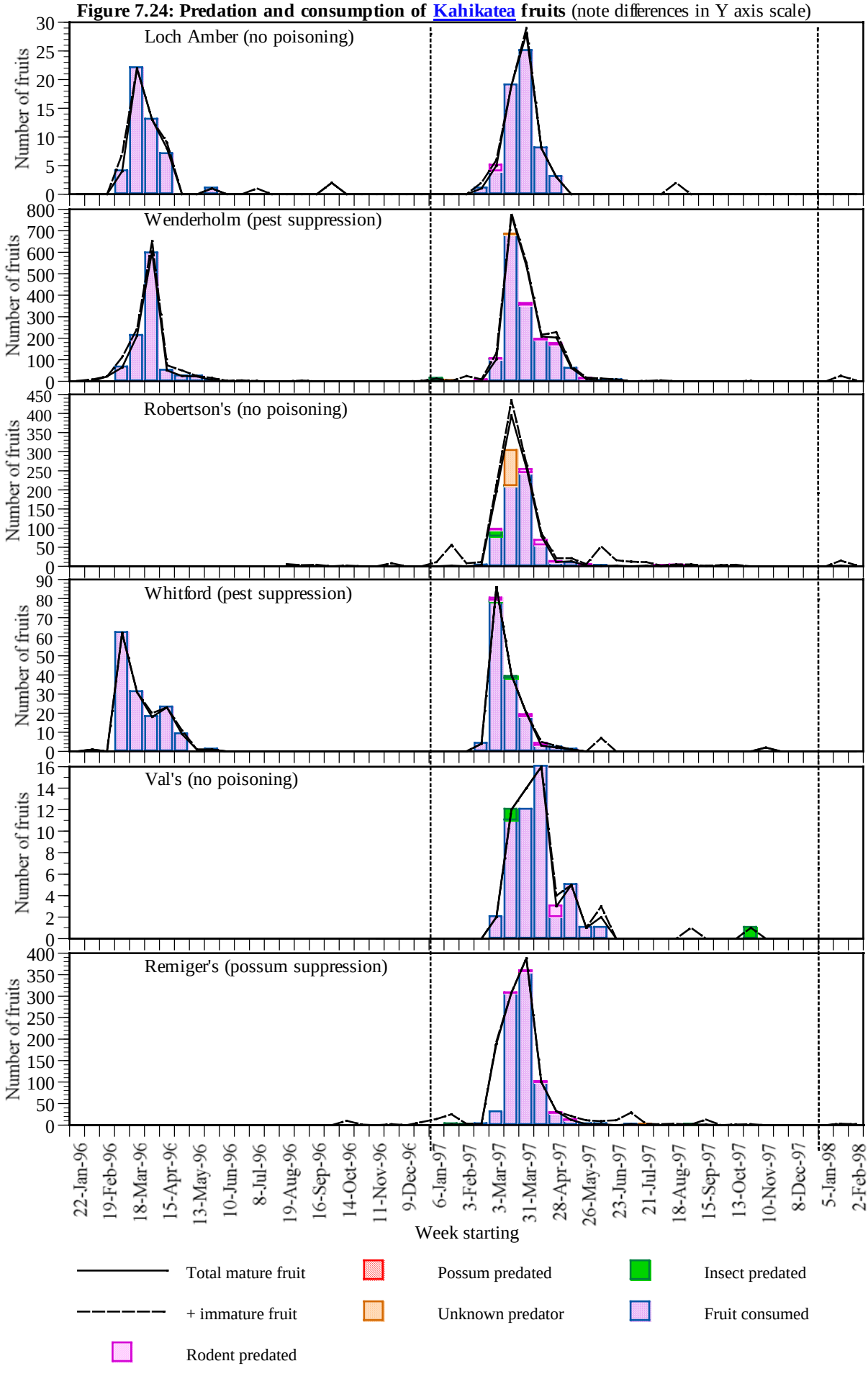


Figure 7.25: Predation and consumption of Rewarewa seed capsules (note differences in Y axis scale)

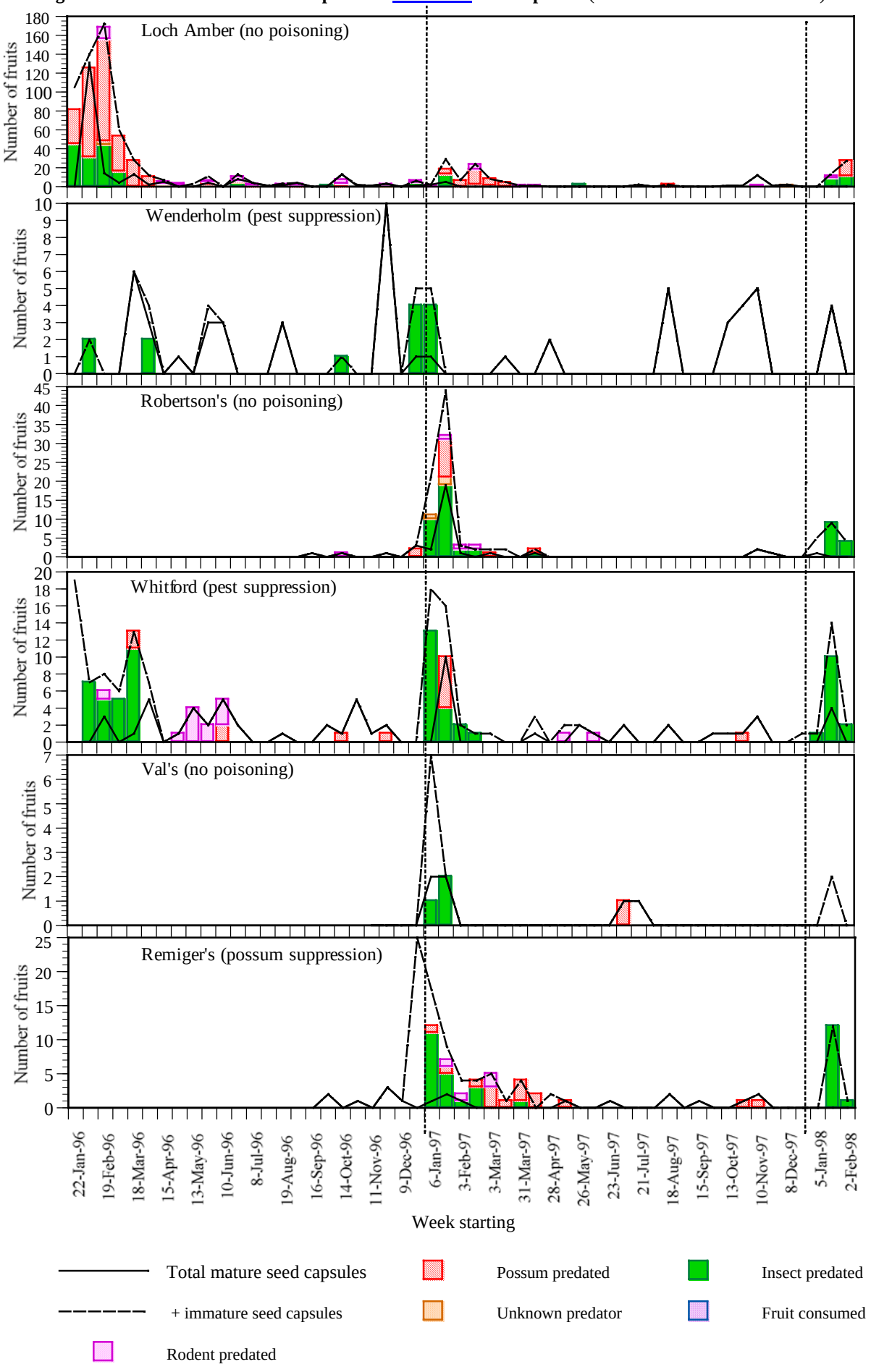


Figure 7.26: Comparison between levels of predation, bird consumption and fruit production for Wenderholm and Loch Amber.

Columns connected by horizontal lines are not significantly different

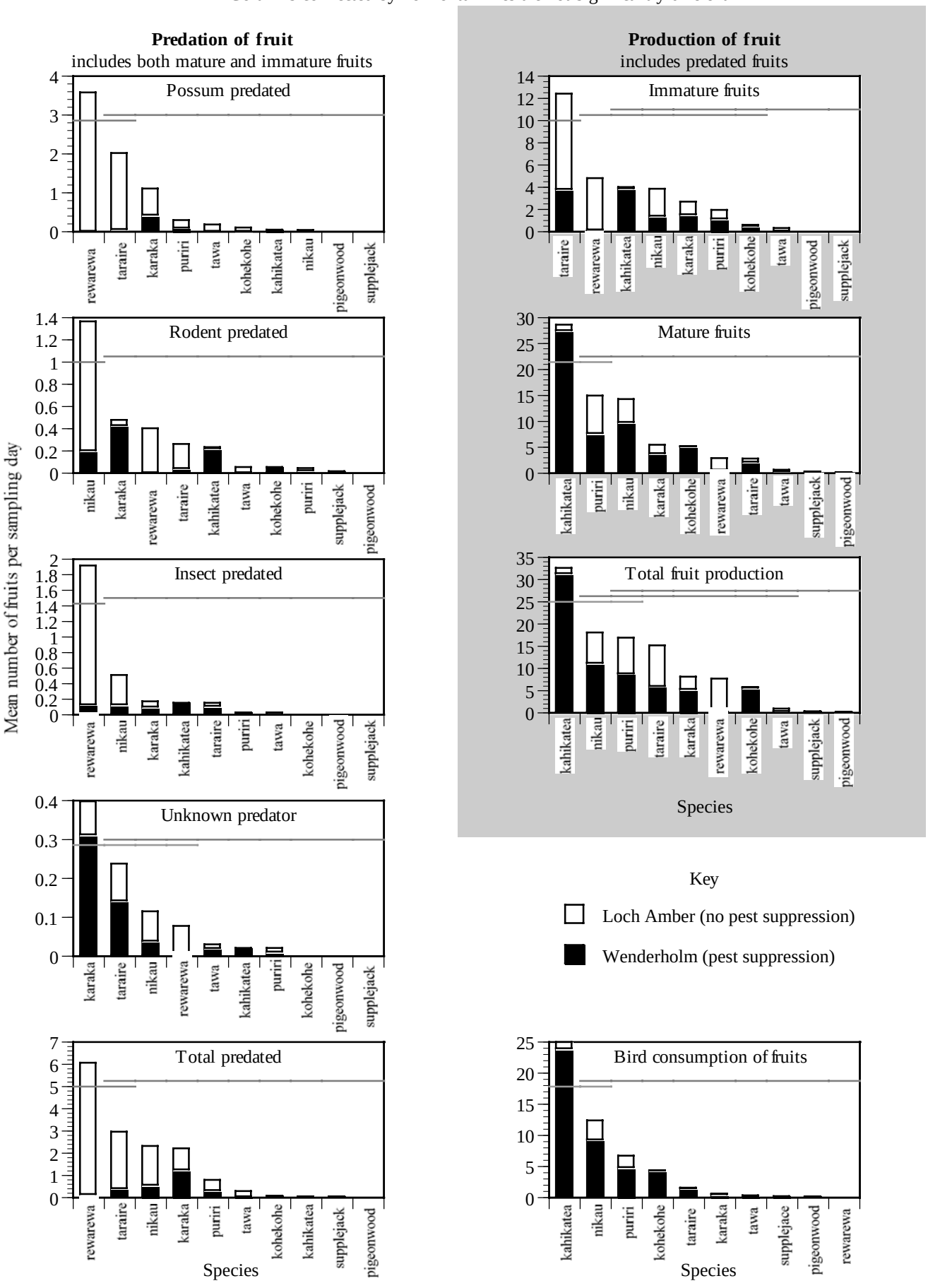


Figure 7.27: Comparison between levels of predation, bird consumption and fruit production for Whitford and Robertson's.

Columns connected by horizontal lines are not significantly different

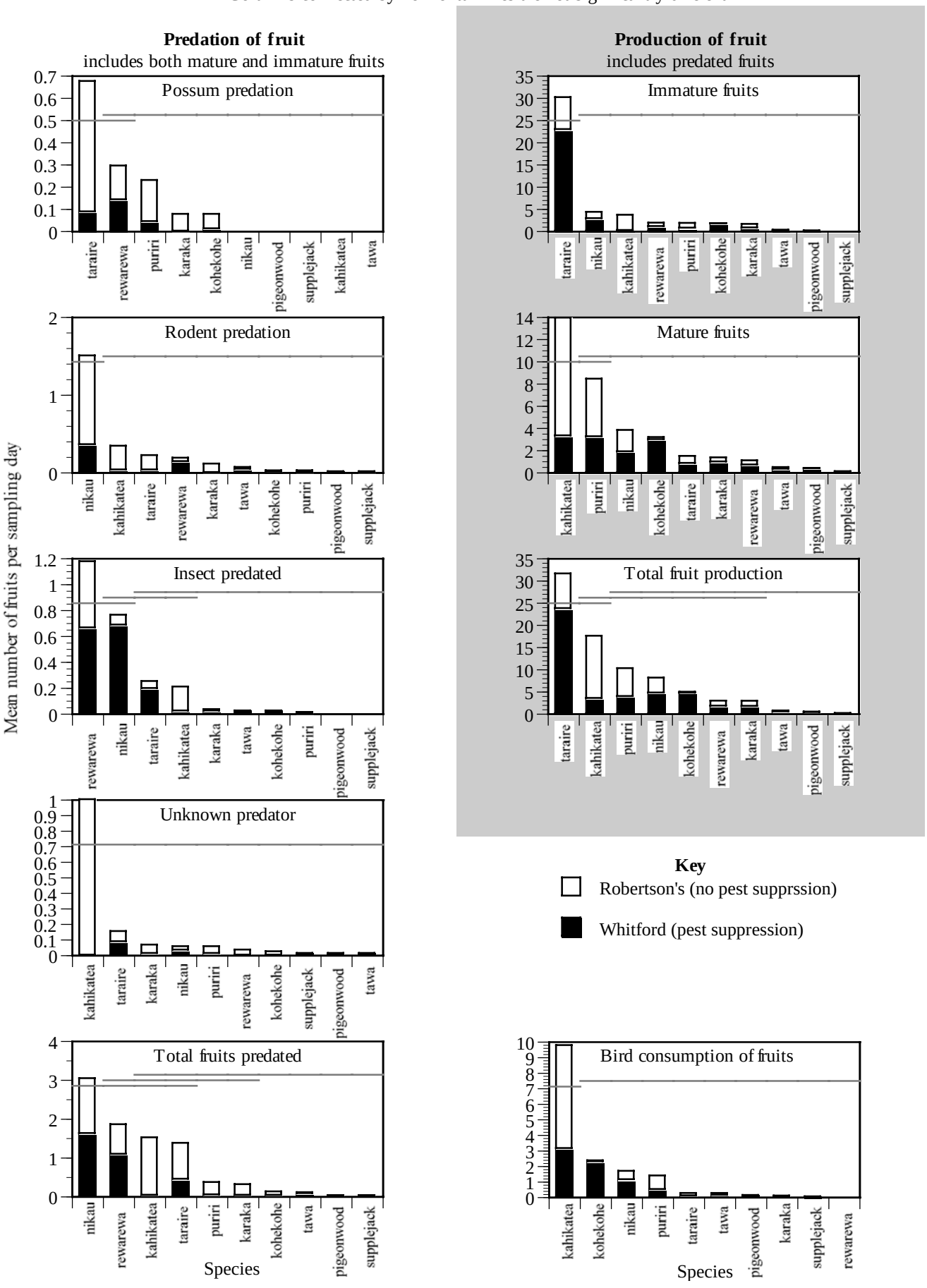


Figure 7.28: Comparison between levels of predation, bird consumption and fruit production for Remiger's and Val's.

Columns connected by horizontal lines are not significantly different

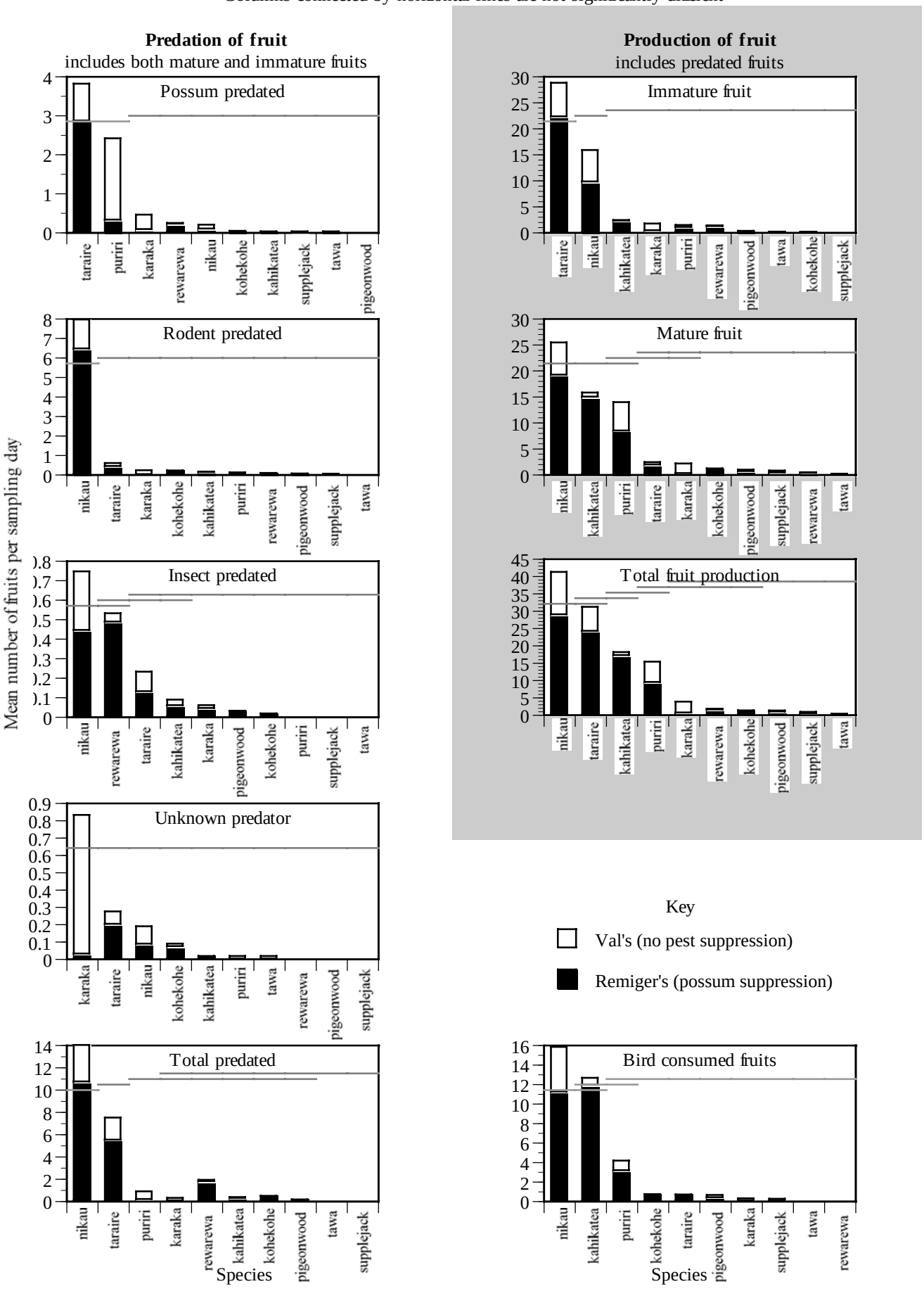


Figure 7.29 a to c: Number of seedfall traps at each site containing one or more insect dropping

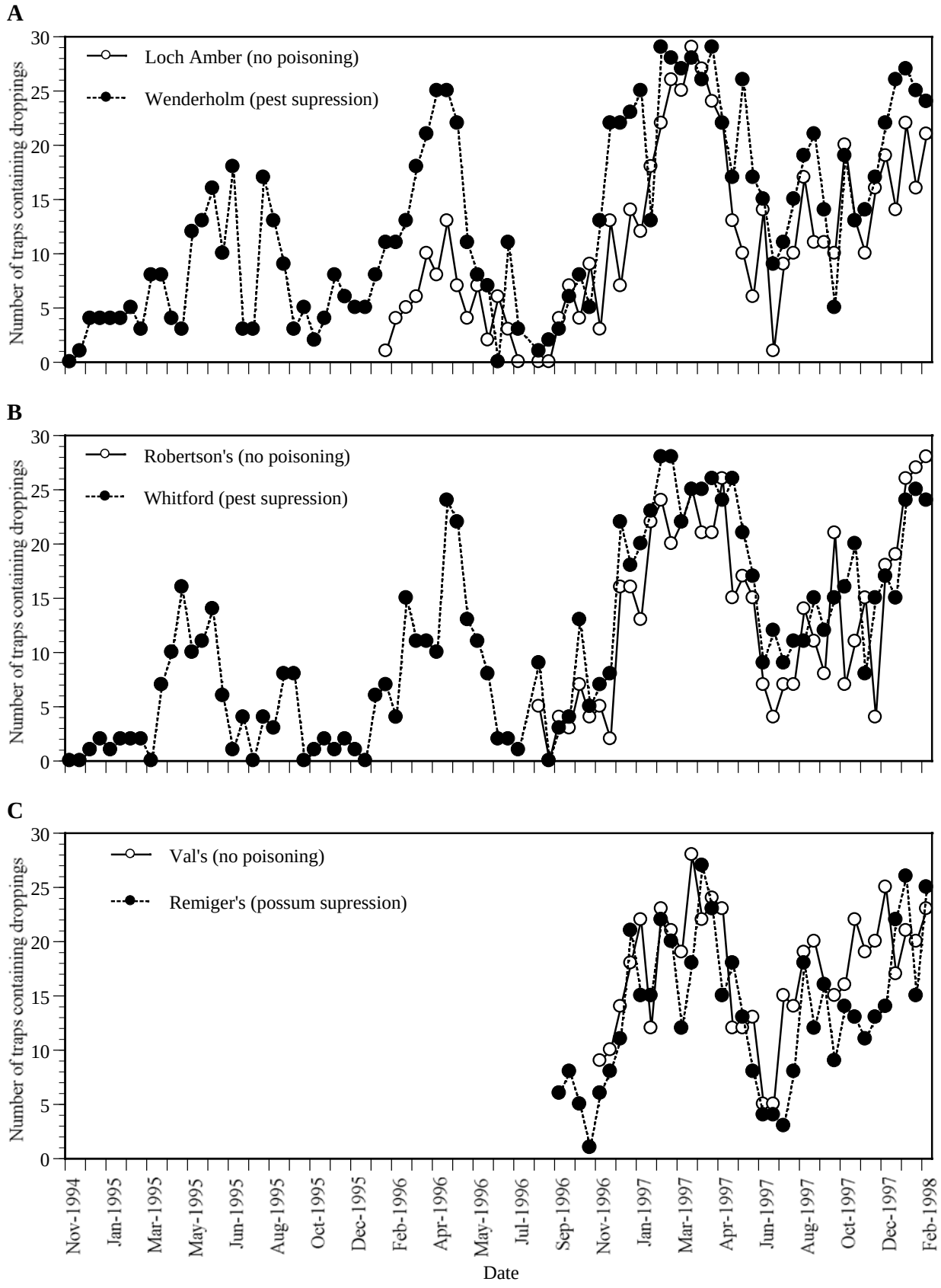


Figure 7.30 a to c: Number of seedfall traps at each site containing one or more weta dropping

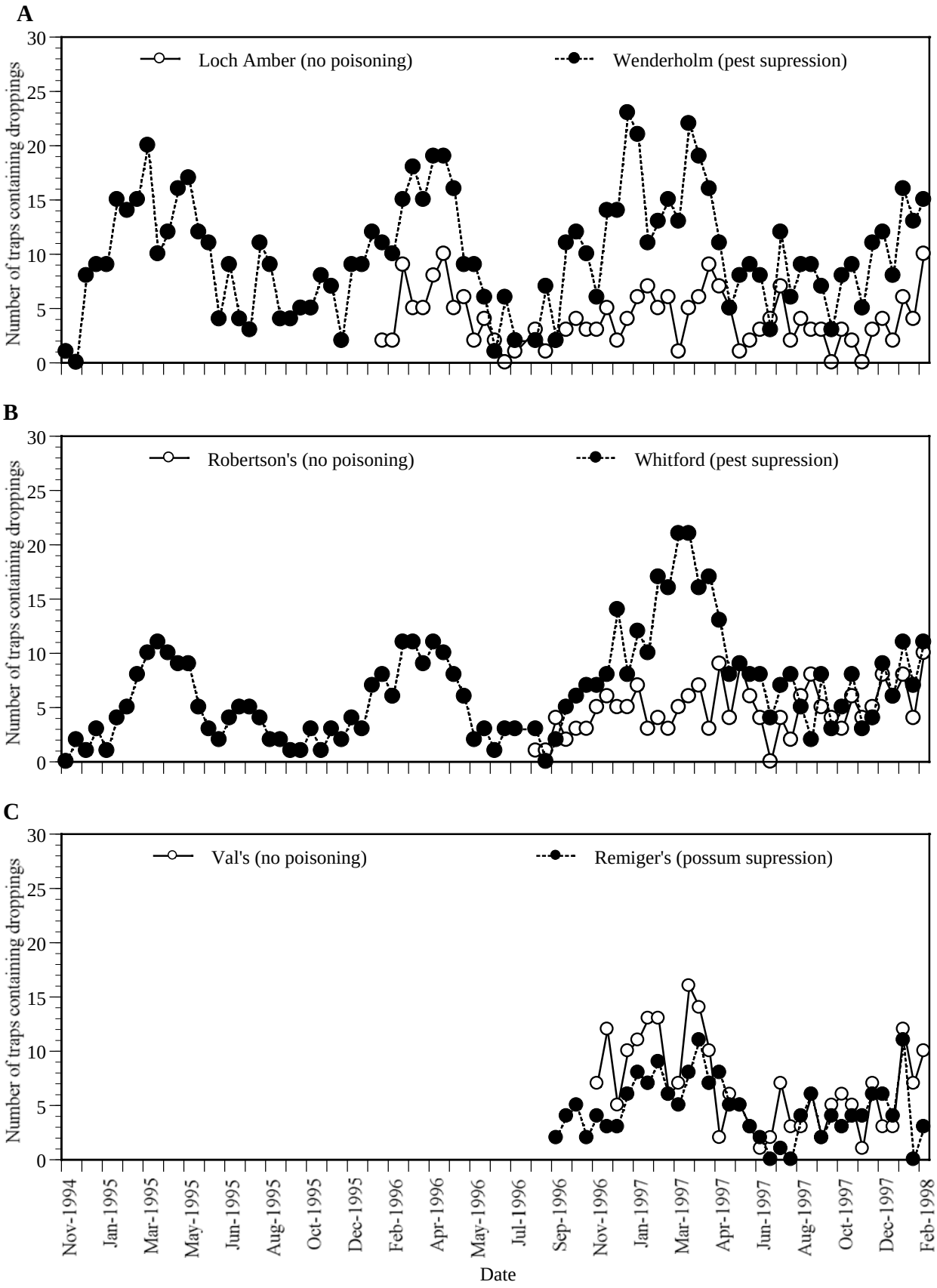


Figure 7.31 a to c: Number of sedfall traps at each site containing one or more pigeon dropping

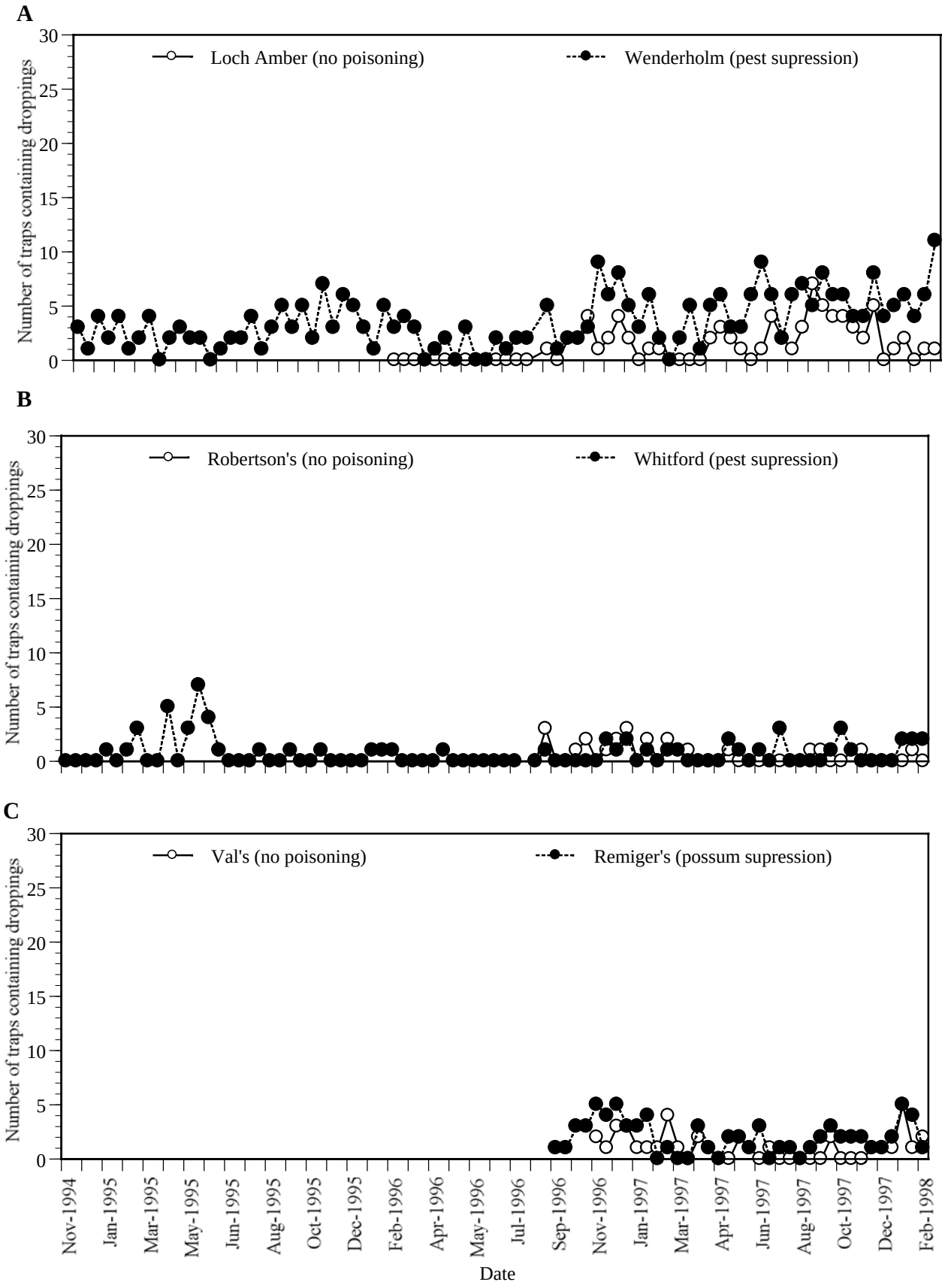


Figure 7.33: Average number of observations (seen or heard) of frugivorous bird species per site visit (error bars are 95% standard error)

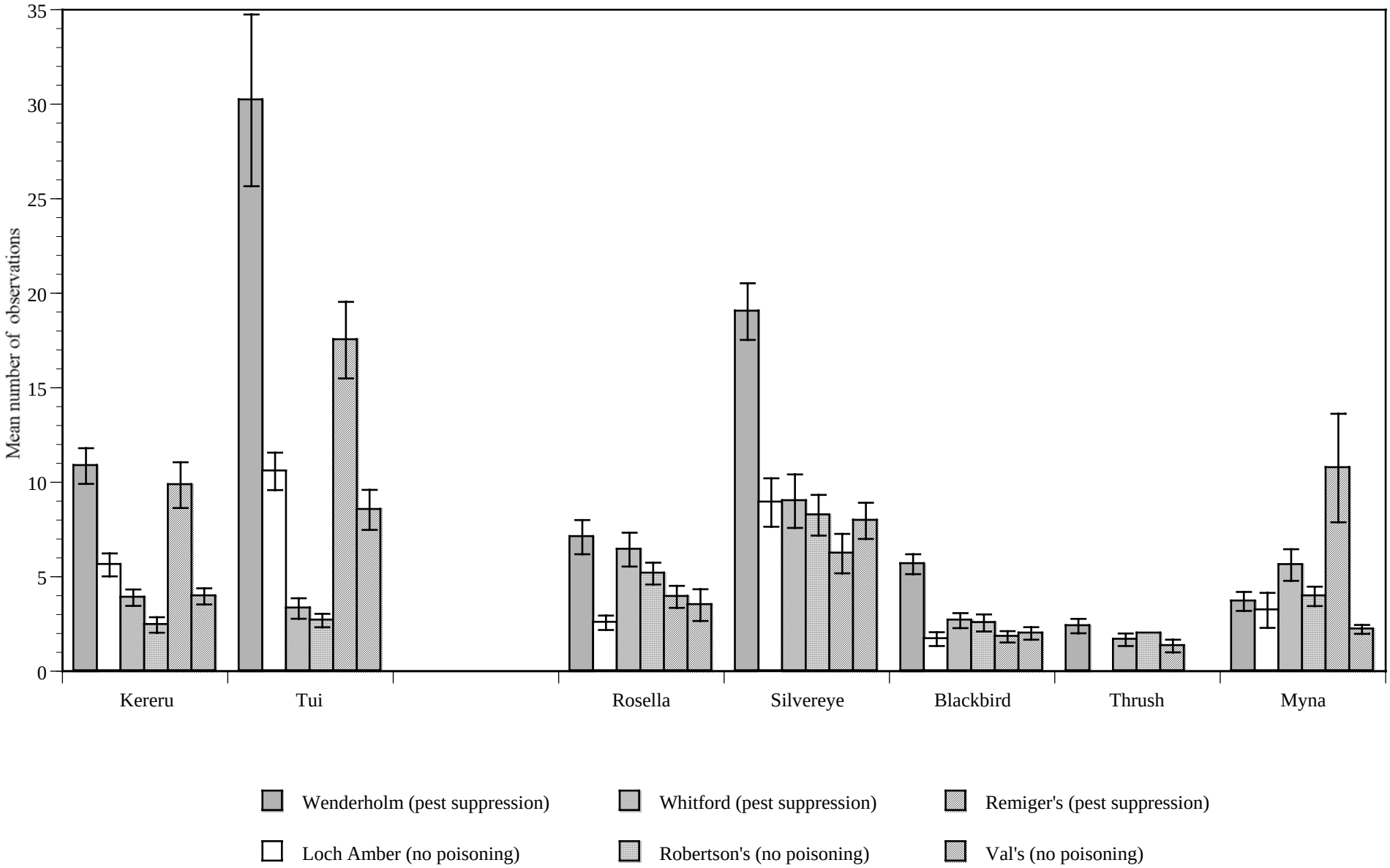


Figure 7.34: Average number of observations (seen or heard) of non-frugivorous bird species per site visit (error bars are 95% standard error)

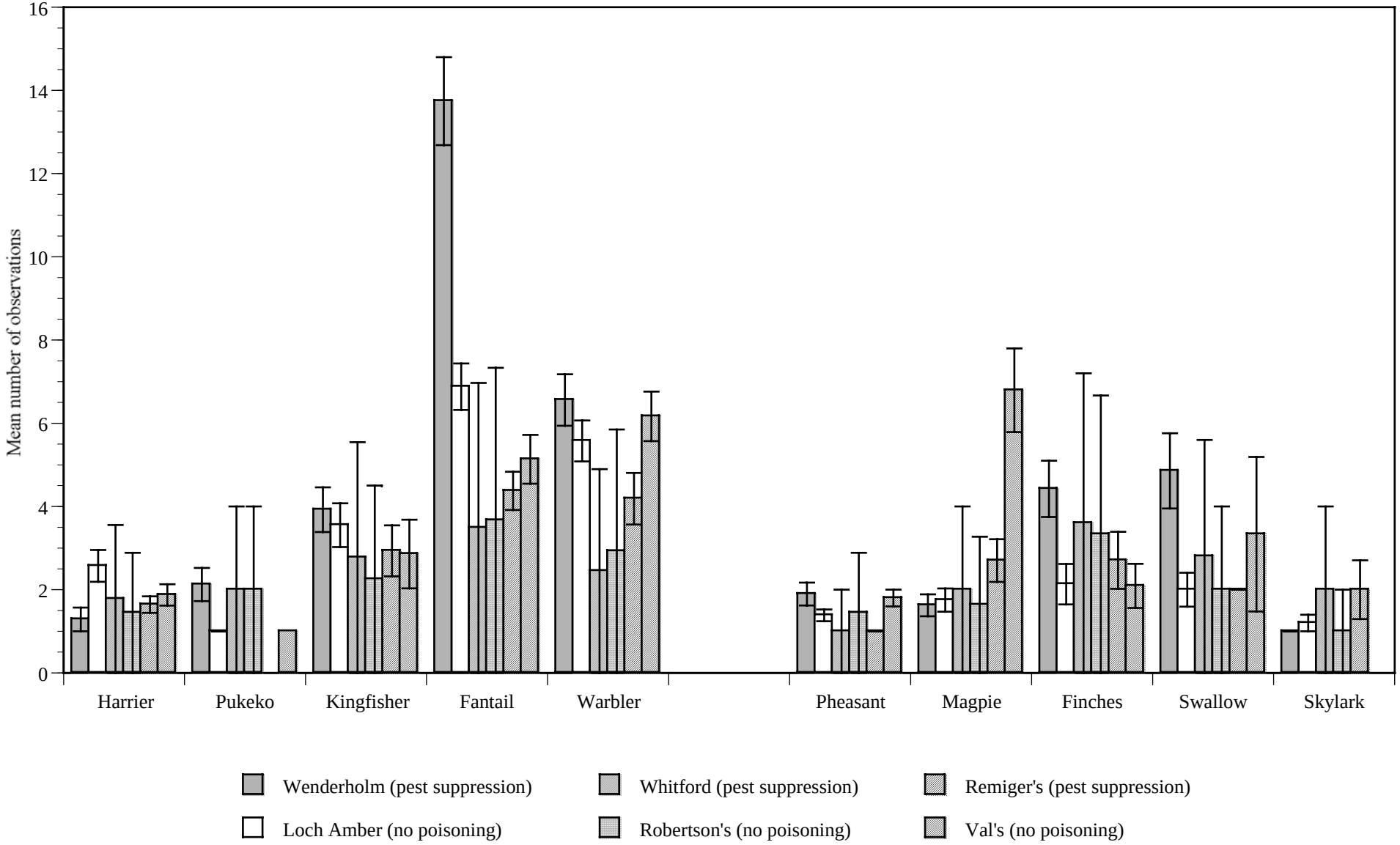


Figure 7.35: Number of frugivorous birds at Wenderholm and Loch Amber, grouped by flock size

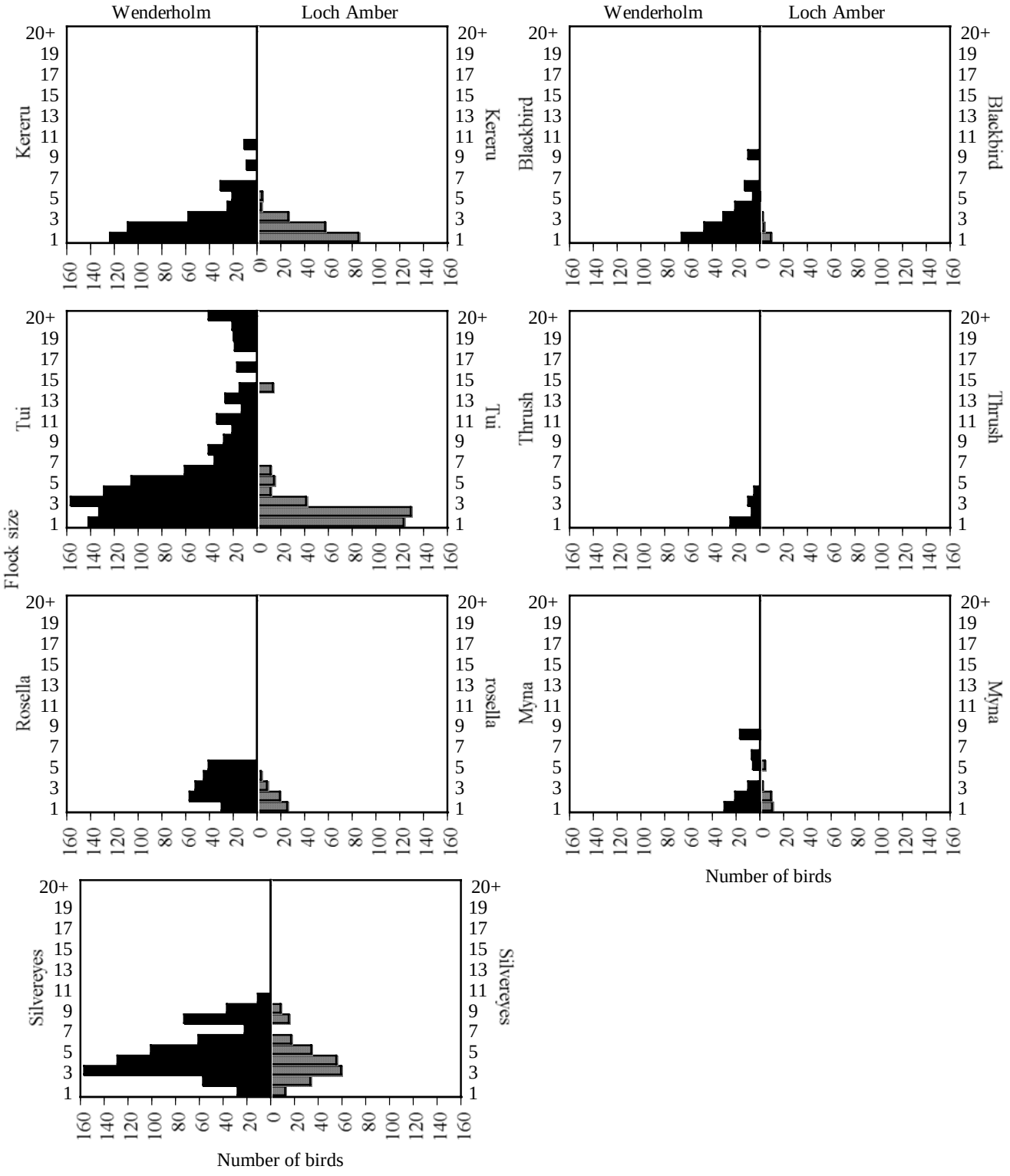


Figure 7.36: Number of frugivorous birds at Whitford and Robertson's, grouped by flock size

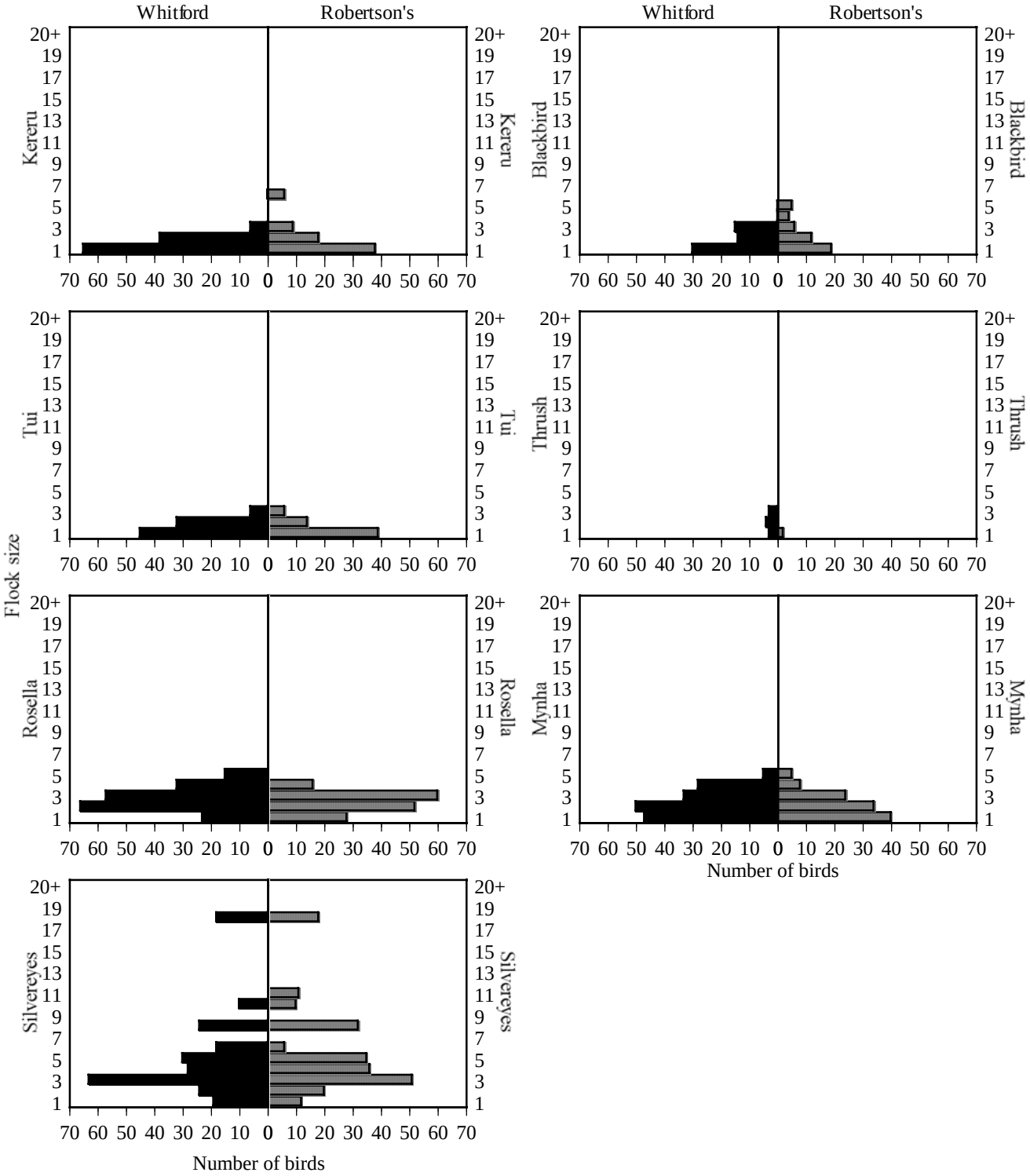


Figure 7.37: Number of frugivorous birds at Remiger's and Val's, grouped by flock size