



VESPULA QUEEN WASP CONTROL 2023

**WHAKATĀNE RESERVES – ŌHOPE SCENIC RESERVE, KŌHĪ POINT SCENIC RESERVE,
MOKORUA BUSH SCENIC RESERVE AND NGĀTI AWA KĀWENATA.**

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“Ruthless Invader and ingenious predator” (Lester, 2018)

VESPULA QUEEN WASP CONTROL IN WHAKATĀNE RESERVES, 2023

Summary

A trapping programme targeting queen *Vespula* wasps in reserves near Whakatāne continued this season for the fourth consecutive year. Trapping took place within four bush reserves: Kōhī Point Scenic Reserve, Mokorua Bush Scenic Reserve, Ōhope Scenic Reserve (North and South) and the Kāwenata on the Ngāti Awa farm. The methodology was the same as the previous season with 179 No Pests® dome traps set out and lured with No Pests® wasp lure. Traps were placed at approximately 200m spacing along ridges and spurs, avoiding gullies or narrow stream valleys. Most traps were opened in the last week of August and all traps were closed and removed by the end of the third week of December. Traps were checked and captures identified, recorded, and removed, weekly to two-weekly depending on volunteer availability and suitable weather. There were 17 Volunteers who kindly and enthusiastically gifted approximately 440 hours of their time.

There were 770 queen wasps caught, higher than the number caught in 2022 (573) but lower than the number in 2021 (971). The western ridge of the Mokorua Bush SR remains a hot spot for queen captures. The c. 8000 worker wasps caught was lower than the numbers caught in both 2022 and 2021. In anecdotal reports from volunteers and contractors, overall wasp activity was considered low, a positive sign that the wasp control effort has been effective.

Heat mapping is showing a trend of general reduction in queen wasp activity and some shifting of the area of main activity in the Mokorua Bush SR. The worker heat map for the 2023 season has shown a hot spot in the Kāwenata. The area could be considered for extra trapping effort in future.

Bycatch indicated higher numbers of blow/house flies, craneflies, and midge type flies in some areas.

The 2023 queen wasp capture season appeared to follow a more predictable pattern than the 2022 season however the data suggests that initial queen emergence (from hibernation) commenced early therefore it is recommended all trap lines are operational by the beginning of the fourth week of August.

It is also recommended that the annual trapping programme be continued, to better understand the impacts of the trapping against natural population fluctuations. Continued trapping effort would allow trapping effectiveness to be measured by using 'monitor traps' - traps set up and opened each year in the same site whether there was or was not a trap line operating in the same area.

Methods

- The methodology was similar to previous seasons where No Pests® dome traps were set out and lured with No Pests® wasp lure. Traps placed at approximately 200m spacing (depending on suitable location) with a focus on ridges and spurs, avoiding gullies or narrow stream valleys. See Figures 1 and 2 for trap locations. Number of traps put out for the 2023 season was 179, the same number as 2022.
- Most traps were opened in the last week of August by filling them with 250ml of No Pests® wasp lure. Traps were being closed from the second week of December with all traps closed and removed by the end of the third week of December.
- Traps were checked and captures identified as queen or worker and queen by species (*Vespula vulgaris* or *Vespula germanicus*), data recorded, and all captures removed. This was done weekly to two-weekly depending on volunteer availability and suitable weather.
- Recorded data was sent via email or text to the team leader for data inputting, analysis, and ongoing season updates for key participants.



Equipment for trap check



Trap ready to catch



Volunteers trap checking and replacing lure



Queen wasp and worker wasp

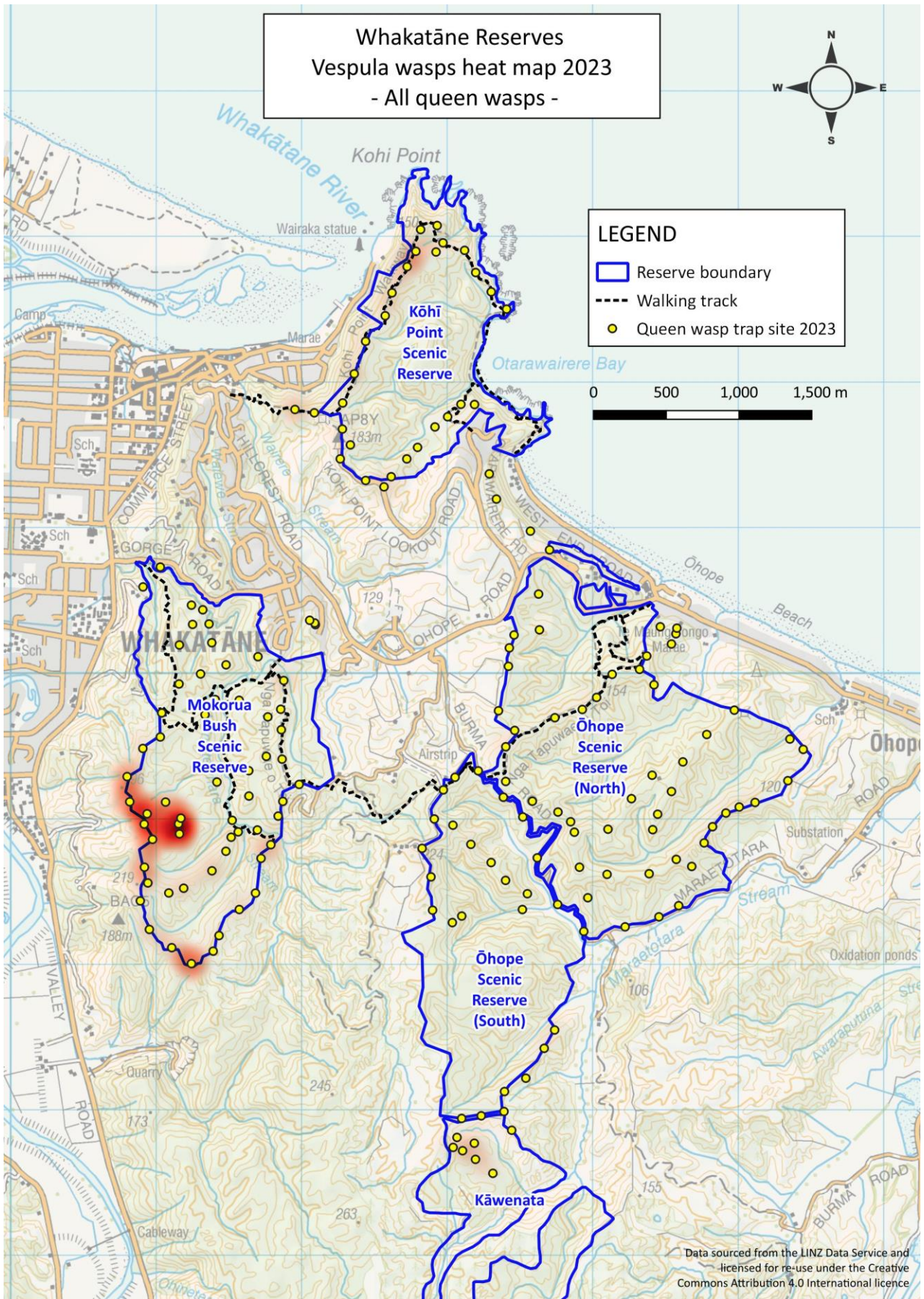
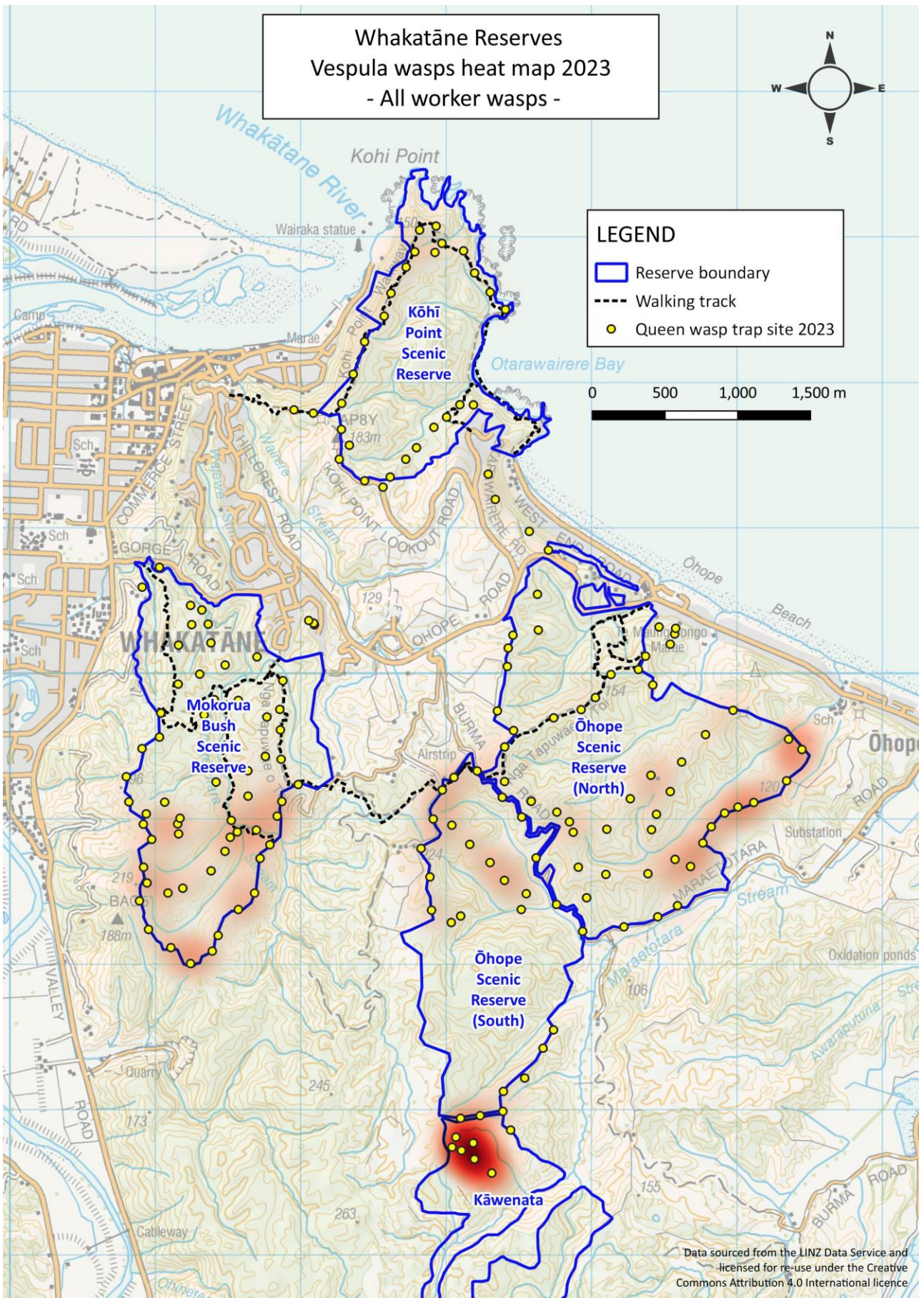


Figure 1: Location of wasp traps and heat map of queen wasp captures in Whakatāne Reserves, 2023



Error! No text of specified style in document. Figure 2: Location of wasp traps and heat map of worker wasp captures in Whakatāne Reserves, 2023

Results

- Total number of queen wasps caught in 2023 was 770 (Table 1) which was higher than the number caught in 2022 (573) but lower than the number in 2021 (971) (Table 2). The total number of worker wasps caught was lower than in both 2022 and 2021.

Table 1: 'Snip' of the *Vespula* wasp trapping dashboard for Whakatāne Reserves, 2023

WKT Wasp Trapping Dashboard 2023 Season					
Data as of: 21/02/2024					
Reserve	Number of traps	Queen wasps	Worker wasps	No. queens per trap	No. workers per trap
Kōhī Point	33	153	817	4.6	24.8
Mokorua	62	435	2257	7.0	36.4
Ōhope North	56	95	2593	1.7	46.3
Ōhope South	14	28	963	2.0	68.8
Kāwenata	14	59	1327	4.2	94.8
Total	179	770	7957	4.3	44.5

- Comparing captures by reserve, the Mokorua SR for the third consecutive season had the highest number of queen wasps caught (435) and Ōhope North SR, also for the third consecutive season, had the highest number of workers (2593) although many fewer than 2022 (+/-20,000) and 2021 (+/-10,650).
- A trap capture rate (average number of queens per trap) has been calculated to compare trapping effort in each individual reserve to account for the different number of traps in each reserve (e.g., Kāwenata = 14 traps; Mokorua SR = 62 traps). With this applied the Mokorua SR remained the site with the highest rate of queen wasps caught per trap followed by the Kohi Point SR. The Kāwenata SR had the highest capture rate for worker wasps followed by Ōhope South SR.
- Queens and workers by species had similar results to previous seasons with the common species dominating.
- Bycatch for the season included high numbers of craneflies and blow/house flies. Some traps had very high occurrence of small black midge type flies. Moths maintained a reasonable presence as well as ants. There were also noted a few hover flies, caddis flies, hunting wasps and cockroaches, a ladybird beetle, weevil, manuka beetle, and a butterfly.

- Weather for the season was nearer to average in relation to temperature and rainfall however there was high rainfall in September and above average rainfall for January, February, May, and June. It is unknown if this affected the capture result.
- Due to much lower worker numbers the traps were open for longer than in 2022 with an extra three weeks of trapping occurring for some lines.
- Below is a table containing data analysis of trap capture rates over the three seasons 2021 – 2023.

Table 2: *Vespula queen wasp trap captures and trap performance in Whakatāne Reserves, 2021-2023*

Measure	2021	2022	2023
Number of traps	101	179	179
Total number queens caught	977	573	770
Average number queens per trap	9.7	3.2	4.3
Total number workers caught	15747	45741	7957
Average workers per trap	156	256	44
% Traps with zero queen captures	18%	36%	26%
% Traps with one queen capture	9%	19%	18%
% Traps with one or no queen captures	27%	55%	44%
% Traps with four or fewer queen captures	42%	81%	73%
% Traps with 10 or more queen captures	31%	9%	13%
% Traps with 20 or more queen captures	11%	2%	4%

- 1 trap went missing over the season.



Queen wasp captures



Captures plus some bycatch – moth, ants, midges

Data and Other Observations

Comparison using Trap Analysis

- Comparative observations from the trap capture rate analysis (Table 2) have shown the following: The 2023 queen trap capture rate was less than half (4.3) of the 2021 season (9.7). There were also much fewer worker wasps caught per trap (44.5) than in 2021 (156). Comparing the 2023 with the 2022 season the queen wasp capture rate for 2023 (4.3) was higher than the previous 2022 season (3.2). The analysis also shows a huge reduction in worker wasps caught in the 2023 season (44.5) compared to 2022 (255.5). Trap analysis shows a correlation between capture rate and number of traps catching. The higher the capture rate the lower the number of traps with zero captures. Trap capture rate can assist with trap location selection. The number of traps lines and traps in an area can be manipulated according to the success rate of the previous year's trapping effort.

Capture Location

- Total wasp captures by Reserve were similar to previous seasons with the highest number of queens caught in the Mokorua SR and the highest number of workers caught in the Ōhope SR (Table 3 and 4). When incorporating catch effort by Reserve (number of traps in each Reserve) the location with highest capture rate of queens remained the same – Mokorua SR but the location with the highest worker capture rate changed to the Kāwenata SR. This information can be used for deciding on location of future trapping effort.

Timing

- In previous years the bulk of queen captures has occurred in October and November however in the 2023 season the captures were occurring in significant numbers from the second week of September with a peak in early October then continuing a stable trajectory until lowering in December (Figure 3). From this data it is unknown if the queens were emerging early, possibly in mid to late August, as traps were not all filled with lure until late August and regular checks commenced from the second week of September – only two lines were checked in the first week of September versus eight lines in the second week. This may account for the sudden climb in number of captures early in the season but does not show which week the captures may have occurred.
- Workers were appearing in the traps from mid to late November (Figure 4) consistent with data from 2021 and a month later than 2022 however numbers captured in 2023 were much less than in both 2021 and 2022 and peaked later in the season during the second week of December. This may reflect fewer workers overall or greater natural food supply deflecting workers from the traps. On the graphs worker captures reduced late in the season; this could reflect gradual trap closure (not all traps are closed at the same time) occurring from week 14 or an actual drop in numbers captured. Volunteers are encouraged to close traps if the worker wasps are feeding and emptying the traps of lure rather than being caught.

Heat Mapping

- The queen wasp heat maps (Figure 1 and Appendix 3) show changes over time for hot spot location and activity level. The Western ridgeline of Mokorua SR remains a hotspot for queen captures. The hotspot location appears to shift from year to year and be reducing in size. The hotspot at upper Kohi

Point SR last year had far fewer queen wasps this season. Hotspots on the Kohi Point SR public track and Mokorua SR G Line in 2021 continue to have low or lowering queen capture numbers. The combined annual heat map highlights the Mokorua SR hotspot up on the Western Ridge line and spurs. This may be influenced by habitat e.g. sunny ridge faces on both sides, cut over pine area on the western side of the ridge with open sparse vegetation spaces providing a warm and dry environment. There is also no wasp control on this ridge face.

- The worker wasp heat map (Figure 2) shows the Ōhope SR North and South and the mid to southern area of the Mokorua SR have some moderately high worker abundance, however the Kawenata SR had the highest number. These areas can potentially be focused on in future trapping effort. Pleasingly, the previous hotspots along the public track in the Ōhope SR were much reduced in the 2023 season.
- The heat map covering the three-year period 2021 to 2023 (Appendix 3) provides an insight over time of the areas where queens are most concentrated. This can be seen most significantly in the Mokorua SR and Kohi Point SR where the red /pink moves from year to year, where there was a hotspot the previous year it generally results in a lowering of captures the following year or a moving of the hot spot as in the Mokorua SR.

Bycatch

- The season included the usual suite of bycatch however there was noted that the number of blowflies/house flies was much more than has been captured before and crane flies and midge type flies were also caught in quite high numbers. This occurred in some not all traps. It is unknown why there would be such a fluctuation in the capture number of these species. Ants were not as much of a problem compared to other seasons however some traps were moved to a nearby location to prevent them continue to raid/utilise the lure.



Ants feeding on lure



Bycatch – crane flies, blow flies, ants (note lure has lost its colour but still performing)

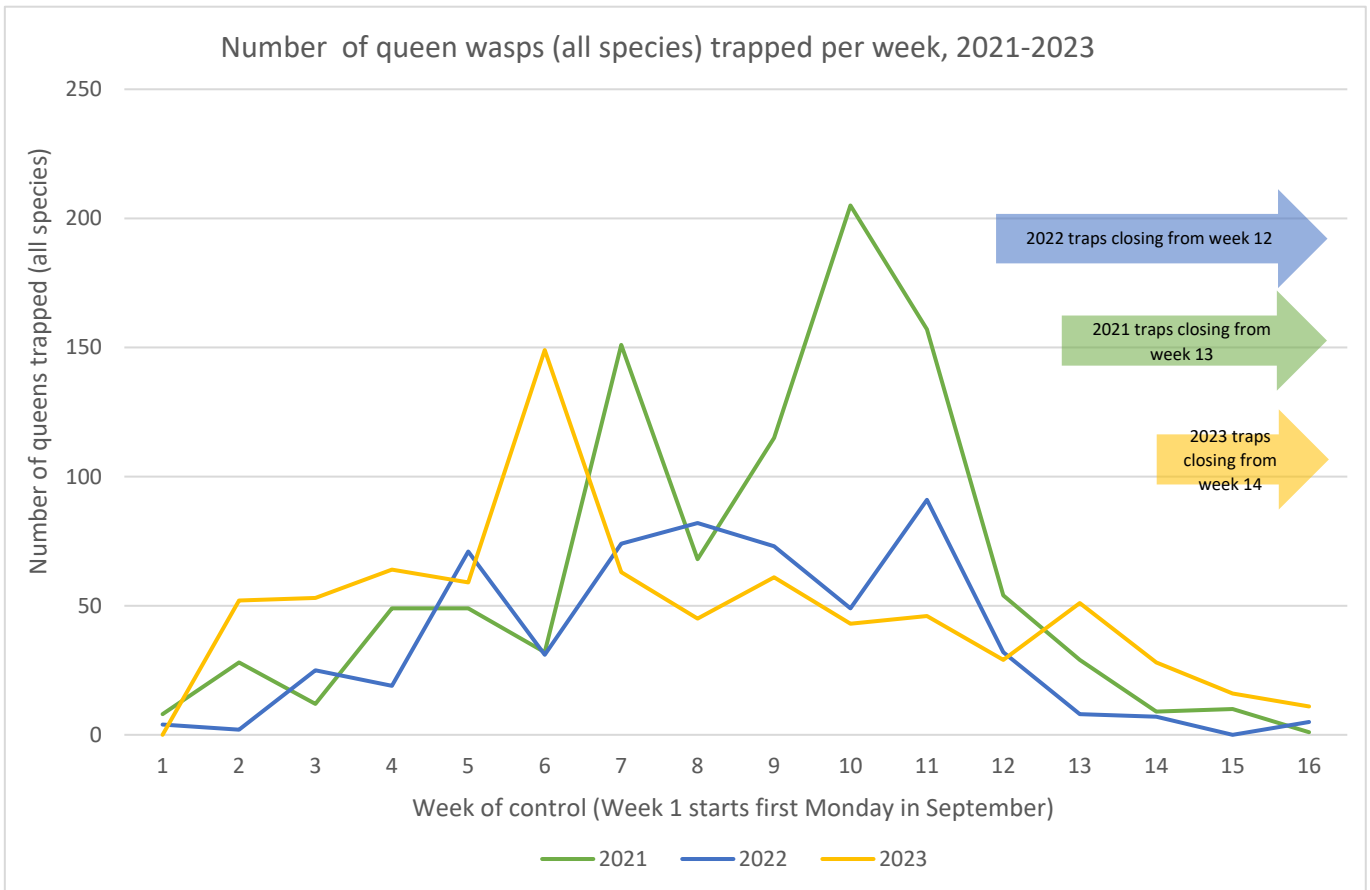


Figure 3: Weekly captures of queen *Vespula* wasps in Whakatāne Reserves, 2021-2023

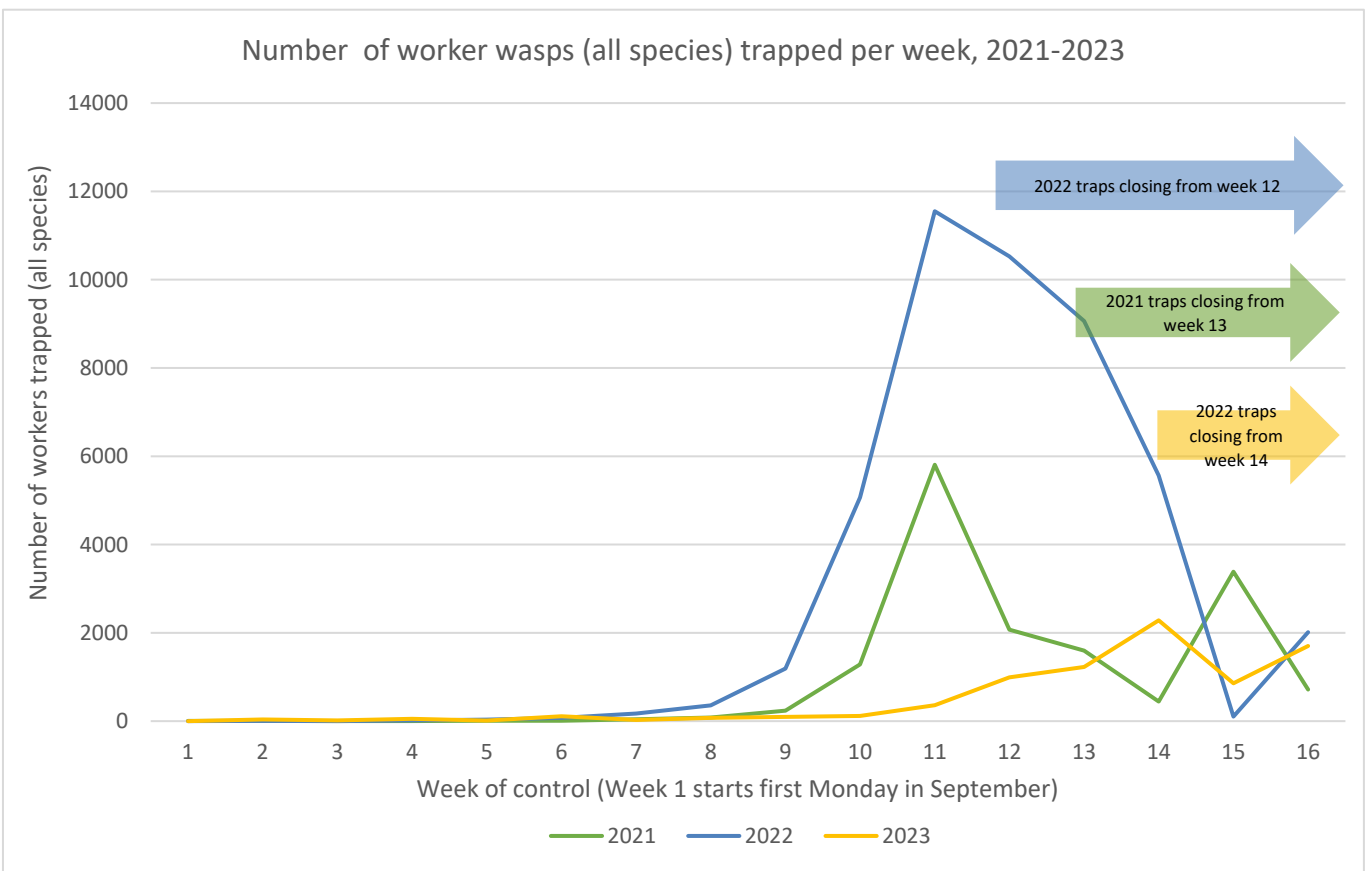


Figure 4: Weekly captures of worker *Vespula* wasps in Whakatāne Reserves, 2021-2023

Table 3: Trap capture rates of queen *Vespula* wasps in Whakatāne Reserves, 2021-2023

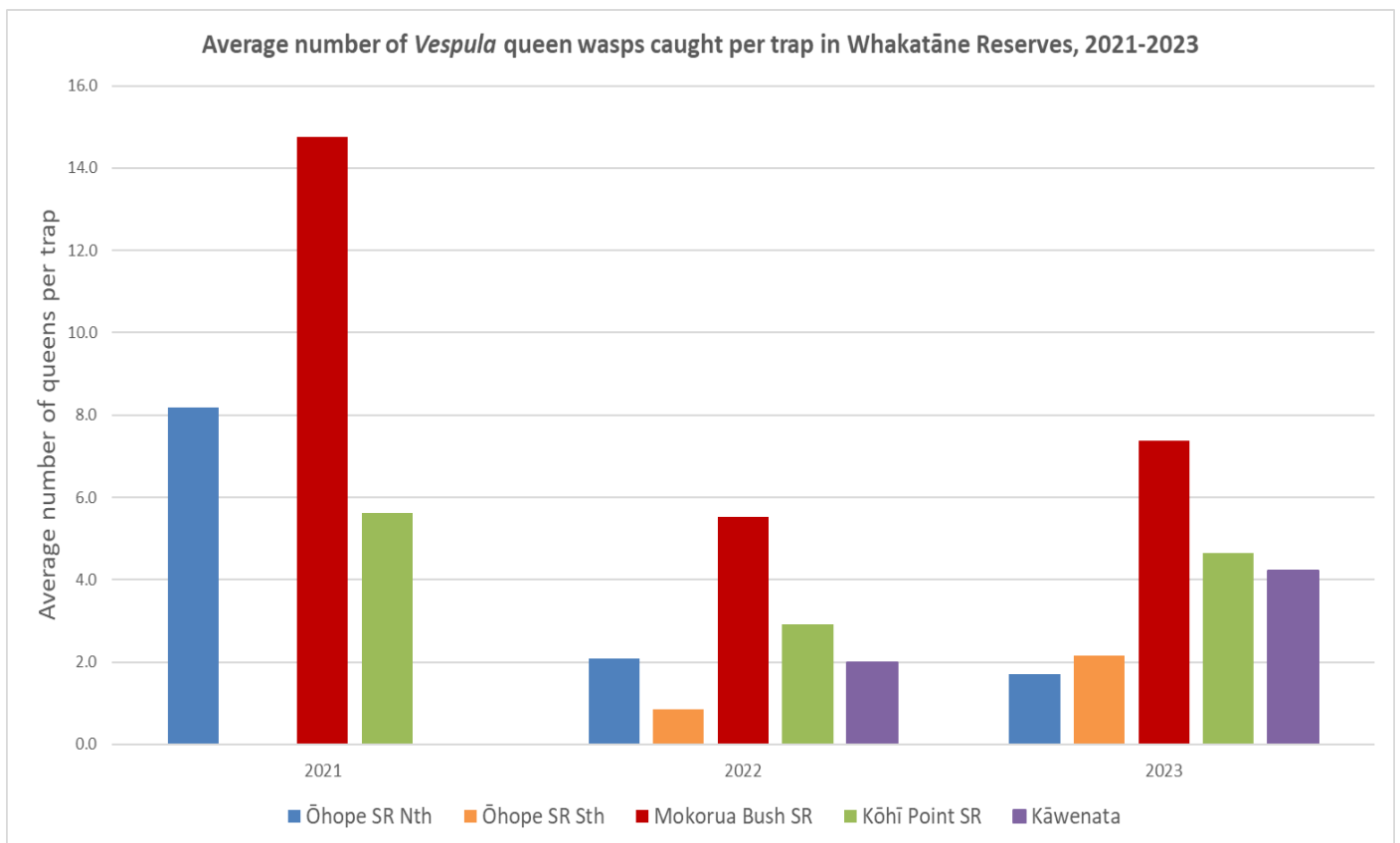
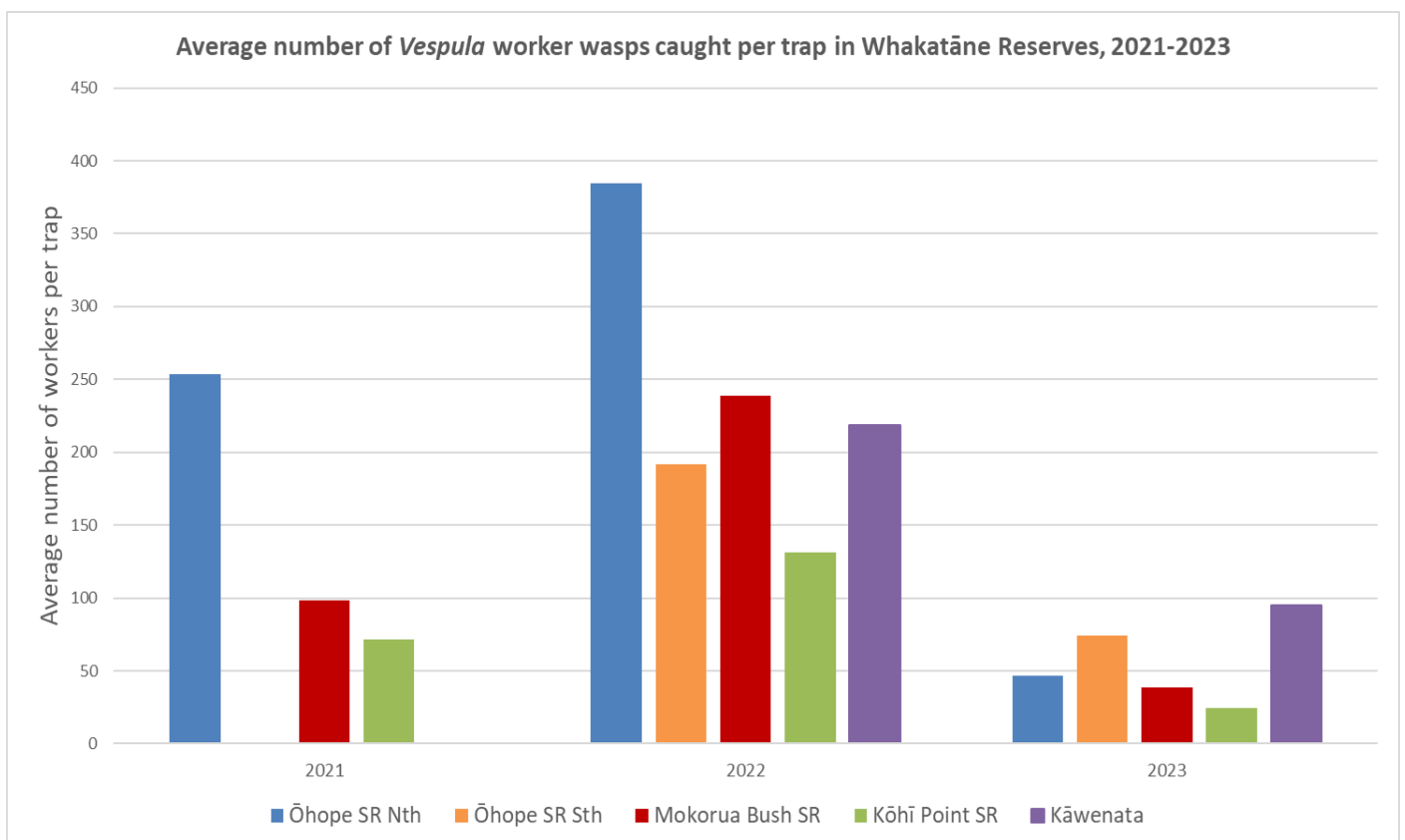


Table 4: Trap capture rates of worker *Vespula* wasps in Whakatāne Reserves, 2021-2023



Weather

- Weather for the season was nearer to average in relation to temperature and rainfall however there was high rainfall in September and there had been above average rainfall for January, February as well as May and June (Appendix 1). It is unknown if this affected the capture result however the September rain may have reduced the number of queens emerging and/or successfully establishing a nest although the data shows a higher than previous seasons capture rate for September.

Monitoring Trapping Effectiveness

- There remains the question of queen wasp trapping effectiveness – does it reflect natural population fluctuation or trapping effectiveness? There has been a suggestion of using ‘monitor traps’ to assess for this. These traps would be in sites used annually for comparison purposes whether a trap line was operating in the area or not. A review of past trap captures can be used to identify approximately 20 successful trap sites e.g. sites that have annually captured several queen wasps, within the four reserves.

Research

- Observations over the last few years of wasp captures has identified a small but ongoing problem with identifying queen versus worker wasps. Size is generally used to differentiate between them but may not always be the best/easiest indicator. Some of the wasps captured could either be small queens or large workers. A queen is generally described as 20mm or more in total length, however some captures are close at 17 plus mm - is it a large worker or a small queen? Some research during the 2023 season has provided a possible tool to assist in identifying these wasps. A publication from the University of Guelph, Canada has identified a common colouration difference between worker and queen *Vespula* wasps. This may provide a tool to assist in identification of these ‘intermediate’ sized wasps. The publication states “Propodeum with a pair of yellow spots in the worker and rarely in the queen, absent in the male”. (Matthius et al,2008). Analysis during the 2023 season has shown positive results and this method could be used in future trapping.

General Observation

- Anecdotally, wasp numbers and wasp nests appear to be lower in the reserves making the reserves much more pleasant and safer to work and spend time in. There appears to be many more bees seen foraging and feeding indicating that the wasp control is having a positive impact.

Volunteers

- 17 volunteers assisted with putting traps out, trap checks and maintenance, data collection and retrieving traps: Phil and Peta Barker, Chris van Beek, Mike and Di Collins, Jude and Pete Ferguson, Dave Hall, Dave Howard, Erica Hurren, Allan McDougall, Ian Treloar, Chris Ward, Gaye Payze, Vanessa Searcy, Ingrid Pak, Ed Reid.
- Approximately 440 hours were gifted by volunteers for wasp control.
- Greg Moorcroft (Terra Whenua Conservation Services Ltd) assisted with data analysis.

Recommendations for next queen wasp capture season

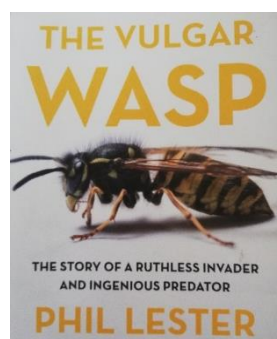
- Have traps open by the beginning of the fourth week of August.
- Focus trap sites on ridges and spurs especially near worker and queen wasp hot spots.
- Purchase and use lure that has been produced in the current year.
- Use 'monitor traps' in all reserves to observe for trapping effectiveness.
- Continue to collect more data to provide more pattern/trend information for greater clarity of any conclusions formed.

Acknowledgements

I would like to acknowledge the continued support of Key Industries Ltd who produce the No Pests® wasp products used in the Queen wasp control program, in particular Warren Wright. He has followed with great interest our annual control program and catches up with the program team leads regularly for an update. Also, the wonderful team of volunteers, as mentioned above, without them it wouldn't happen – they are human wonders 😊.

References cited

- Lester, P. 2018. The Vulgar Wasp. The story of a ruthless invader and ingenious predator. Victoria University Press, Wellington, New Zealand
- Matthias Buck, Stephen A. Marshall, David K.B Cheung. 92. *Vespula germanica* (Fabricus,1793) – German Yellowjacket. Identification Atlas of the Vespidae (Hymenoptera, Aculeata) of the northeastern Nearctic region. Department of Environmental Biology, University of Guelph, Ontario, Canada

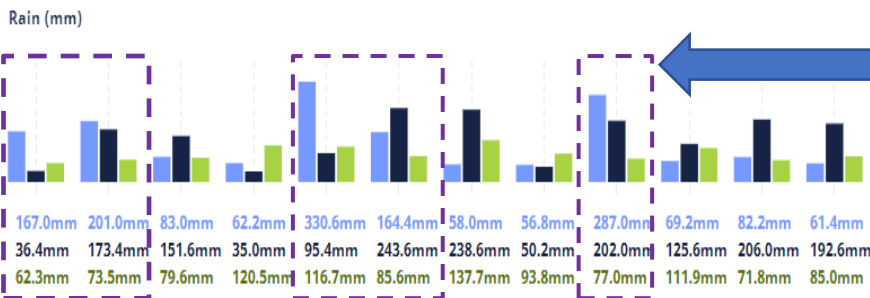
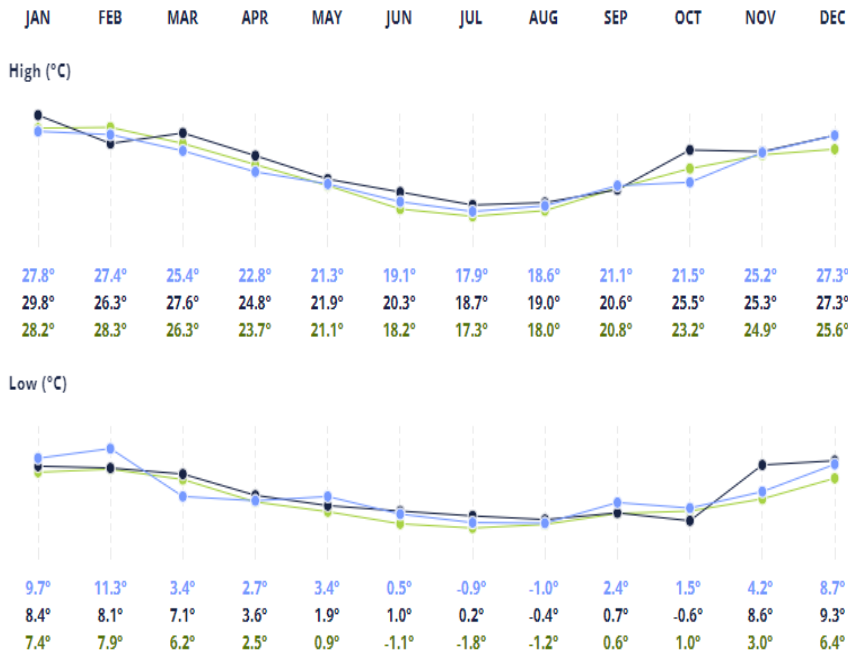


Reference Material Used

- Queen wasp trapping reports prepared for the Whakatane Kiwi Trust for Queen Wasp Control in years 2020, 2021, 2022.
- Met Service weather data.

Appendix 1: Weather data for Whakatāne 2023 (source: MetService)

● Jan 2023 - Dec 2023 ● Jan 2022 - Dec 2022 ● Historical average



Higher than average rainfall as indicated by the blue bars.

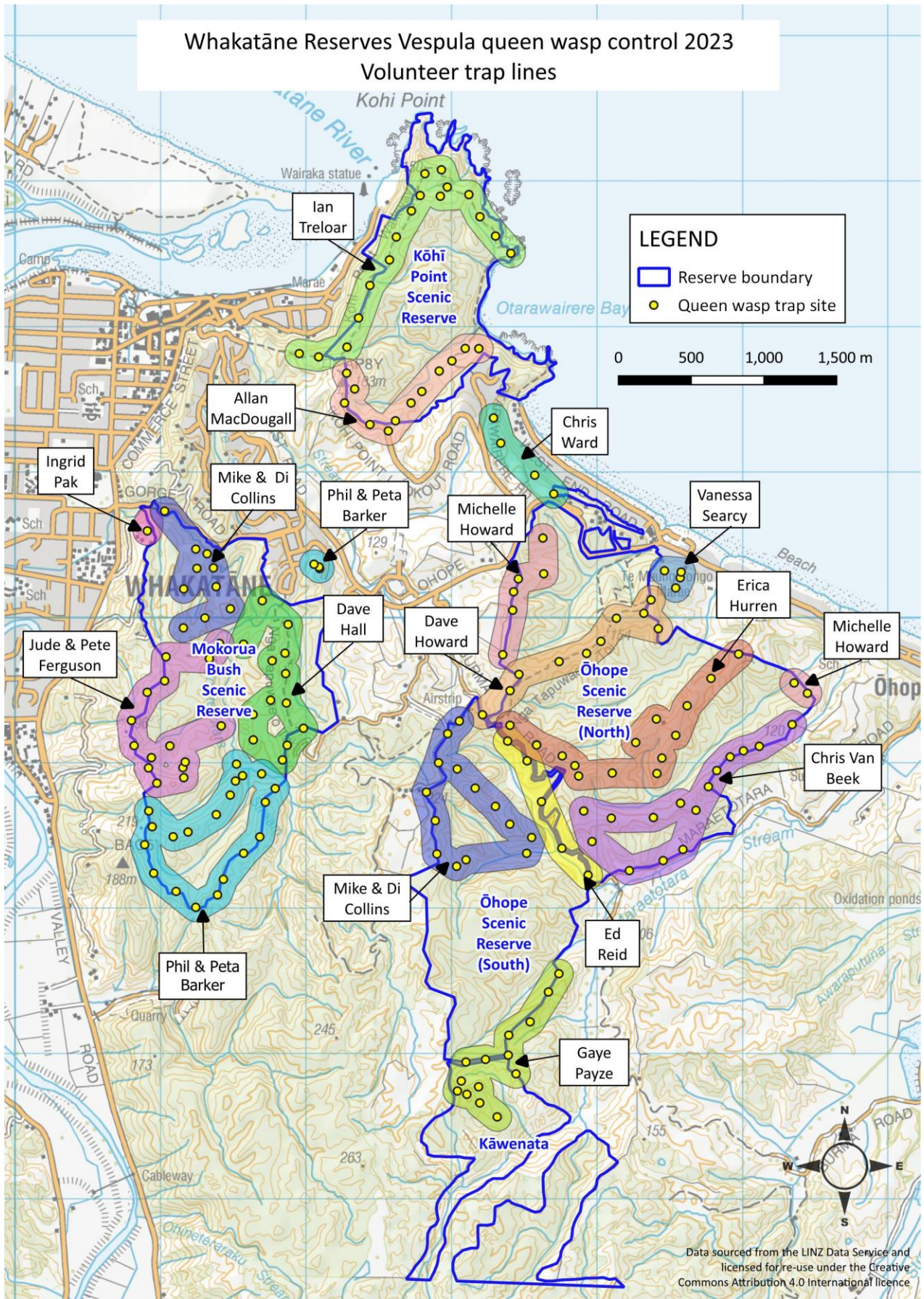
The shade of the bar indicates the year or historical average.

Temperature The historical data is the extreme maximum air temperature for the month averaged over a historical period (e.g. 10 years) and the extreme minimum air temperature for the month averaged over a historical period. The data for the previous two years is the highest maximum and lowest minimum recorded for the month.

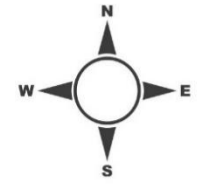
Rainfall The total rainfall that fell during the month

Observations recorded at Whakatāne Airport (AWS-93191)

Appendix 2: Location of volunteer trap lines

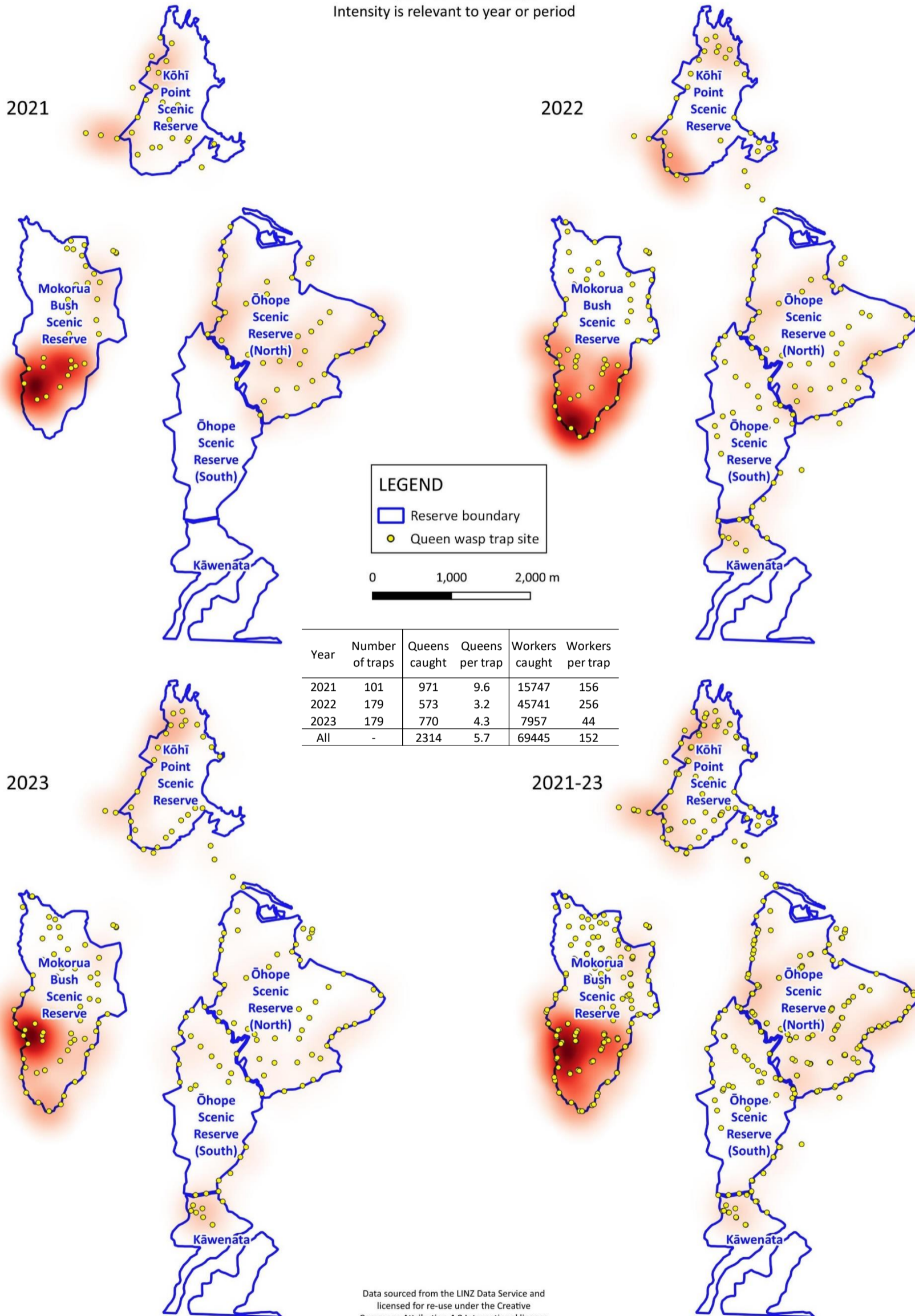


Appendix 3: Heat maps of *Vespula* queen wasp captures in Whakatāne Reserves, 2021-2023



Whakatāne Reserves *Vespula* queen wasp heat maps 2021-2023

Deeper red = more wasps
Intensity is relevant to year or period



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