Suppl. material 1. Appendix

Bee flight observations: *Pharohylaeus lactiferus* is ~11 mm long; smaller than the *Hyleoides* Smith, 1853 (~15 mm) and generally larger than the *Meroglossa* Smith, 1853 or *Hylaeus* Fabricius, 1793 (<7 mm) species that were also commonly found foraging on *B. acerifolius*. All of these hylaeines are relatively robust and darkly coloured bees but, *Hyleoides* species could be often identified on the wing by their colour (orange and black warning colouration), and when alighted by their wasp-like stance. The flight pattern of all three bee groups was similar – quick and controlled (can be distinguish from the less-common bee visitors such as *Apis mellifera* Linnaeus, 1758, *Lasioglossum* sp. Curtis, 1833, *Megachile* sp. Latreille, 1802 and *Tetragonula* sp. Moure, 1961 species), with males of at least *P. lactiferus* quickly patrolling flowers and rarely alighting.

Collection bias analysis: To examine potential collection biases, I examined geographical data in several ways. Firstly, all collection buffers were overlaid with the National Vegetation Information System major vegetation subgroups in Queensland and New South Wales. For each site, the sum of bees collected and sampling time were counted towards each major vegetation subgroup in the 500 m buffer (Suppl. material 2, Table S4). These data were used to examine the cumulative number of bees, cumulative sampling time and total area for each major vegetation subgroup. The number of bees, sample time and number of *P. lactiferus* were summed in bins of 10 km distances from TSTRs. Because most data occurred in the first bin, this was repeated with bin widths of 200 m and a maximum distance from TSTRs of 10 km (i.e. the first 10 km bin). For each of these distances, the sum number of *P. lactiferus* was plotted against the sum of sampling time in those bins. A two-sided Spearman's rank correlation was implemented using the *R* package *stats* to analyse the correlation between each of these variables.

For analyses using both the full dataset and the 10 km dataset there were significant and negative correlations between the sum of bees caught (full: $p = 1x10^{-15}$, rho = -0.69; 10 km: $p = 0.001$, rho = 0.47; Suppl. material 6, Fig. S4A, E), sum of sample time (full: $p = 7x10^{-11}$, rho = -0.59; 10 km: $p = 2x10^{-4}$, rho = 0.51; Suppl. material 6, Fig. S4B, F) and, for at least the 10 km dataset, sum of *P. lactiferus* (full: $p = 0.09$, rho = -0.17; 10 km: $p = 0.02$, rho = 0.34; Fig. Suppl. material 6, Fig. S4C, G). In contrast, there were no significant correlations between the sum of *P. lactiferus* and sampling time (full: $p = 0.16$, rho = 0.23; 10 km: $p = 0.31$, rho = -0.17) (Suppl. material 6, Fig. S4D, H). Larger absolute values of rho indicate a stronger correlation and the sign indicates direction (i.e. negative values of rho indicate a negative relationship). The cumulative number of bees and sampling time as well as the area sampled in each major vegetation subgroup from this study generally do not match the total proportions from NSW and QLD (Suppl. material 7, Fig. S5). This reflects a lack of *a priori* site choice in the study design.

My sampling was biased, with significantly fewer bees caught and less time spent sampling moving further away from TSTRs (Suppl. material 6, Fig. S4). There were significantly more *P. lactiferus* caught near TSTRs (Suppl. material 6, Fig. S4). Additionally, the number of bees that I caught, time that I spent sampling and area that I sampled did not match the relative areas of each major vegetation subgroup in New South Wales and Queensland (Suppl. material 7, Fig. S5). However, sampling time and the number of *P. lactiferus* caught were not significantly correlated (Suppl. material 6, Fig. S4). Additionally, the aim of this research was to rediscover and provide the first biological information on *P. lactiferus* and to suggest the further research that needs to be completed to assess and ensure its protection.

Geographical information systems: I sourced National vegetation information system major vegetation subgroup maps from Geoscience Australia (NMD 2003a; b) and Australian bioregion data from DEE (2017). I obtained Queensland burn scar data from 1988 to 2016 from the DSITI (2017) and 2019-20 bushfire data from the DAWE (2020). I undertook GIS analyses using QGIS version 3.8 (QGIS Development Team 2020). I calculated fragmentation indices using LecoS version 3.0.0 (Jung 2016). I analysed Bushfire data using a two-sided Spearman's rank correlation as implemented in the *R stats* package to examine correlation between year and area burnt. I defined collection and observation sites by discrete, non-contiguous 500 m buffers around collection points: where buffers overlapped I counted them as a single site (Suppl. material 2, Table S3).

The furthest from TSTR that I collected *P. lactiferus* was 213 m. However, I made this collection in a contiguous wooded and urban habitat and so that distance might be an over-estimate. I made most other successful collections within 65 m of TSTRs (Suppl. material 2, Table S1). For this reason, I analysed the changes in this habitat type for the *Wet Tropics* and *Central Mackay Coast* between 1788 and 2018. It is possible that *P. lactiferus* also inhabits other vegetation types that I did not analysed. The most likely additional habitat types are warm temperate rainforest and dry rainforest or vine thickets; both of which are found in the region.

Tropical or Sub-Tropical Rainforest decreased in overall area by 33% in the Wet Tropics tropical. Tropical or Sub-Tropical Rainforest decreased in overall area by 11% in the Central Mackay Coast tropical (Suppl. material 2, Table S5). The number of patches increased and mean patch area decreased for both the Wet Tropics (14% increase in number of patches, and 39% decrease in area) and the Central Mackay Coast (9% increase in number of patches, and 17% decrease in area) (Suppl. material 2, Table S5). The smallest patch that I collected *P. lactiferus* near was Hallorans Hill Conservation Park, which was just 0.09 km^2 in area.

To determine the amount of rainforest that has burned, I overlaid Queensland burn scar data from 1988 to 2016 and the 2019-20 bushfire season with national vegetation information system 5.1 data (NMD 2003a; DNRME 2019). Two-sided Spearman's rank correlation regressions found no significant change in area burned by year for any rainforest type (major vegetation subgroups one, two, six and 62). However, I found that all vegetation types, except for major vegetation subgroup one (cool temperate rainforest) have burned every year for which records exist (Suppl. material 8, Fig. S6). Additionally, all rainforests types burned more in the 2019/20 fire season than any previous year; however, these data include fires from July 2019 to May 2020, while the Queensland burn scar dataset runs from January to December (DSITI 2017; DAWE 2020). On average, 2.2% (μ = 226 km^2, standard deviation = 124 km^2) of TSTR (major vegetation subgroup 2) burned each year between 1988 and 2020 in Queensland (Suppl. material 8, Fig. S6).

Tropical or Sub-Tropical Rainforest in Queensland have experienced habitat destruction and fragmentation since European arrival (Fig. 1). For both the Wet Tropics and Central Mackay Coast, the overall area and mean patch areas were reduced and the number of patches have increased (Suppl. material 2, Table S5). The Wet Tropics had the largest decrease in overall area, with 33% of area lost compared to 11% in the Central Mackay Coast. The number of patches increased by 14% and 9% for the Wet Tropics and Central Mackay Coast, respectively. While the decrease in mean patch area was greater at 39% and 17% for Wet Tropics and Central Mackay Coast, respectively. Mean patch area for each (1.71 km^2 and

1.82 km^2, respectively) was still much larger than the area of Hallorans Hill Conservation Park (0.09 km^2). Hence, habitat destruction and fragmentation alone are unlikely to cause the rarity of *P. latiferus*. Regardless, habitat fragmentation and destruction, however small, decreases the ability of populations to colonize new fragments (Ewers and Didham 2006). For example, bushfires burnt an average of 226 km^2 of TSTR every year between 1988 and 2020 (Suppl. material 8, Fig. S6). The 2019-20 fire season burnt more rainforest in each major vegetation subgroup than any year before (Suppl. material 8, Fig. S6). Additionally, Eungella National Park experienced severe fires in late 2018 (burning close to the Eungella *P. lactiferus* collection site (Forbes and Tatham 2018); however, no data have been made available for the 2017 or 2018 fire seasons). Hence, *P. lactiferus* habitat patches are at risk of destruction by fire, and fires might also increase with changing climates (CSIRO and BOM 2015).

Historic associated plant records: Because the two known associated plant species, *B. acerifolius* (2,396 individuals total) and *S. sinuatus* (1,456 individuals total), are easily identifiable, I used all records on the Atlas of Living Australia for New South Wales and Queensland (their natural range (Guymer 1988)). Additionally, because these species are commonly cultivated, I focus on records in natural major vegetation subgroups, however total values are reported in Suppl. material 2, Table S2 and shown in Suppl. material 3, Fig. S1 and Suppl. material 4, Fig. S2. I obtained plant occurrence data from the Atlas of Living Australia (ALA 2020a; b) and overlaid them with New South Wales and Queensland National Vegetation Information System data using *QGIS*.

Over 50% of New South Wales and Queensland records that were found in natural regions occurred in rainforests (Suppl. material 2, Table S2). In New South Wales 28% and 4% of *B. acerifolius* and *S. sinuatus* records occurred in TSTR (Major Vegetation Subgroup 2), respectively (Suppl. material 2, Table S2). In Queensland, 38% and 39% of *B. acerifolius* and *S. sinuatus* records occurred in TSTR, respectively (Suppl. material 2, Table S2). Warm temperate rainforest (major vegetation subgroup 6) accounted for 28% and 78% of all natural *B. acerifolius* and *S. sinuatus* records, respectively (Suppl. material 3, Fig. S1; Suppl. material 2, Table S2). Older records of *B. acerifolius* and *S. sinuatus* tended to occur in natural areas, and most recent records occurred in cleared or non-native habitats (Suppl. material 4, Fig. S2). Compared to New South Wales plant records, Queensland records (where *P. lactiferus* has been found) that occurred in cleared or non-native habitats tended to be older (Suppl. material 4, Fig. S2). These older records could represent natural habitats that have been subsequently cleared.