GPP&HFP South Africa
Deliverable September 2014: Final Report on Monitoring Work

Activity: (three original activities apply to this deliverable)

- Adapt and implement a programme for monitoring the status and trends of pollinators in the onion seed and apple STEP site, using a protocol similar to the one outlined in Annex E by end of ~~December 2011.~~ March 2012
- Continue to implement the programme for monitoring the status and trends of pollinators in the sunflower STEP site, using a protocol similar to the one outlined in Annex E by end of ~~December 2011.~~March 2012
- Implement the programme for monitoring the status and trends of pollinators in sunflower and onion STEP sites for a final year, combine with previous year's data and analyze trends by ~~*December 2013*~~ September 2014.

Deliverable: Compilation and analysis of multiple years of data monitoring the status and trends of pollinators in STEP (Study, Training, Evaluation and Promotion) sites.

SUNFLOWERS

Pan traps, as per the GPP protocol, were placed in each of ten study fields (five near (≤ 100m) natural vegetation, and five far away (≥ 1000m) from natural vegetation) during the peak sunflower flowering seasons of 2011, 2012, and 2013 (Fig. 1a,b,c).

Results – Overall, there was high variation between years in the numbers of species and numbers of individual non-*Apis* bees collected. In 2011, 15 non-*Apis* bee species were recorded (three families; ca. 60% Halictidae species), and a total of 204 individuals. Highest abundance for pan trapping was recorded in the flowering sunflower fields away from natural vegetation (168 individuals) (Fig. 1a). Similar species richness was recorded in both site treatments. In 2012, far fewer species (six species; 3 families) and individuals (34) were collected. Similar numbers of species and individuals were collected across the two treatments. In 2013, only three species of non-*Apis* bees were collected (3 families), and only a total of 13 individuals. As in 2012, similar species richness was recorded in both site treatments.

The high variation in capture return across years is most likely due to the high temporal variability in species emergence patterns, thus requiring possible additional long-term sampling, and/or the disjunction between peak sunflower flowering times to that of peak emergence times of bee species in the summer-rainfall Limpopo region. The latter reason most likely of strong influence on monitoring results for our sunflower STEP sites as peak sunflower flowering times can occur up to eight weeks after the putative peak emergence times for non-*Apis* bees in this region.

Figure 1a. Sunflower monitoring - 2011

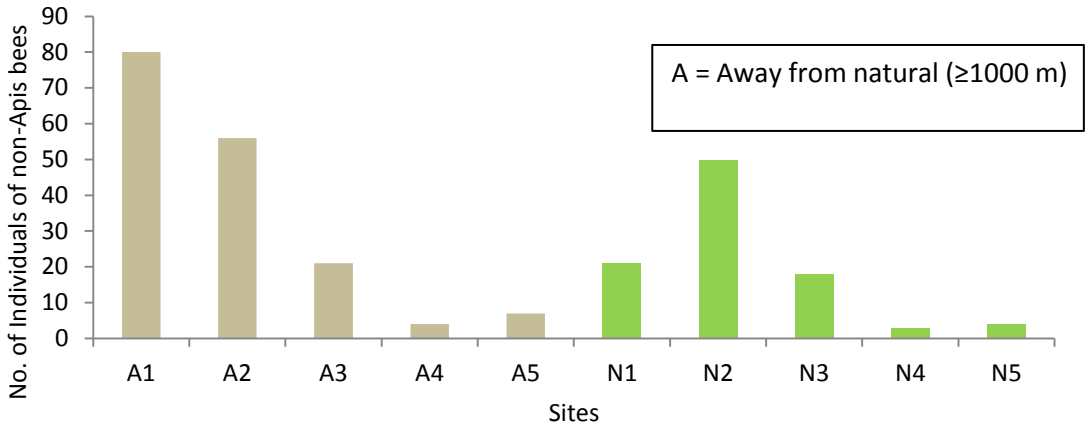


Figure 1b. Sunflower monitoring - 2012

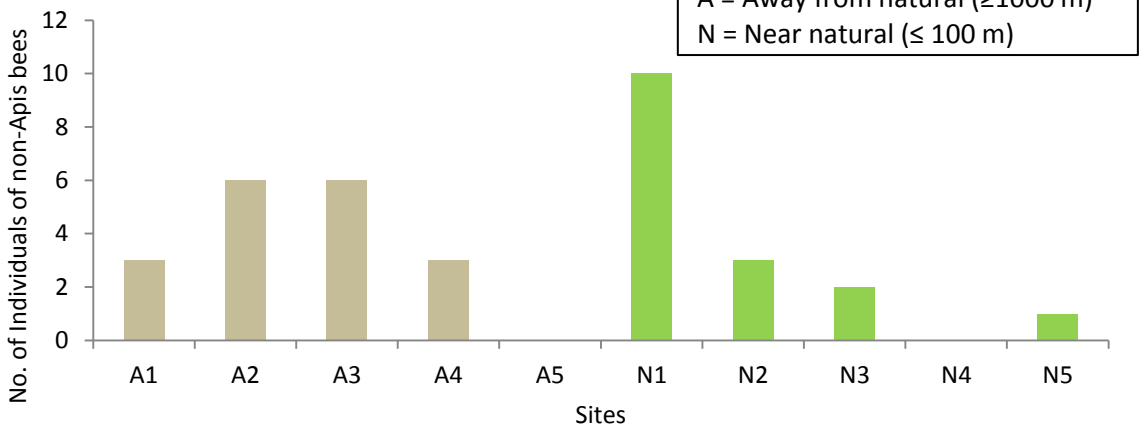
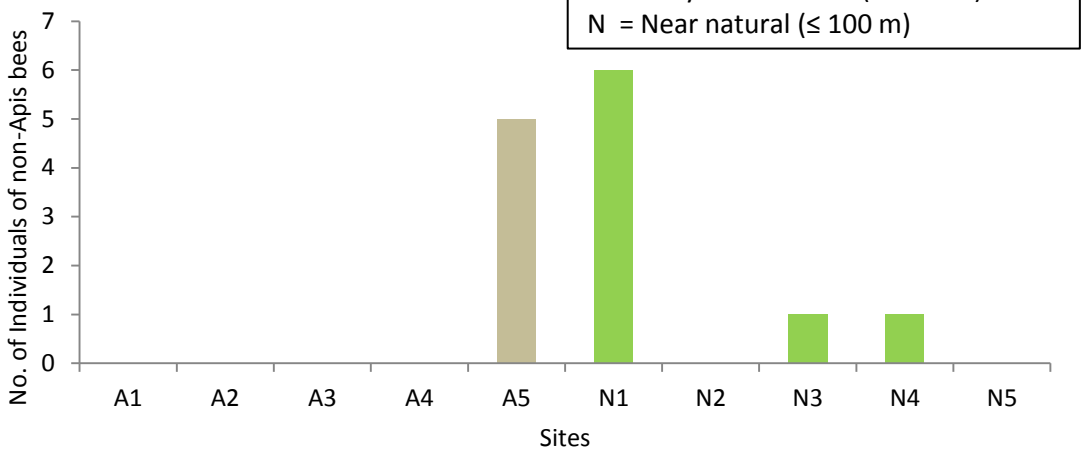


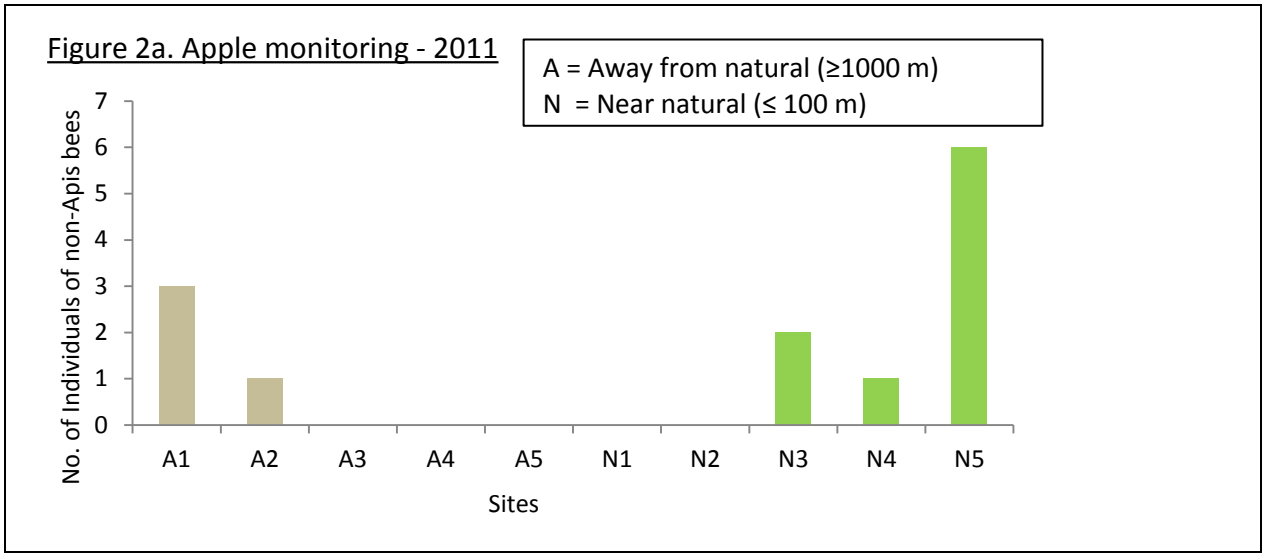
Figure 1c. Sunflower monitoring - 2013



APPLES

Pan traps, as per the GPP protocol, were placed in each of ten study fields (five near (≤ 100m) natural vegetation, and five far away (≥ 1000m) from natural vegetation) during the peak apple flowering seasons of 2011(Fig. 2a). All orchards sampled were Royal Gala and made use of managed honeybees.

Results – Pan trap catches were extremely low with nine individuals (two species; one family) from near natural vegetation, and four individuals (four species; two families) from away from natural vegetation. The fynbos region is a known hotspot of bee species (> 300 species; Kuhlmann 2009) and one would have expected higher returns.



ONION HYBRID SEED

In October/November 2009 and 2010 pan traps were placed in ten onion fields away from natural vegetation, and eight fields close to natural vegetation (Fig. 3a). This study formed part of a PhD thesis (Brand unpublished). Non-standard GPP pan traps were used, differing in shape and in the type of paint used. Additionally, three extra colours (red, orange and pink) were used. Pan traps were raised to umbel height with stick platforms. In 2013, pan traps, as per the GPP protocol, were placed in each of five fields (all positioned near (≤ 100m) natural vegetation) on the ground between rows of onion plants, during the peak onion flowering seasons (Fig. 3b). No fields away from natural vegetation were located, and this treatment was therefore not used. There is high variation between years in terms of the location of onion fields, and therefore it is not always possible to locate equal numbers of treatment sites. Additionally, in 2013, flooding caused the destruction of many onion fields.

Results – In 2009 and 2010, the non-standard GPP pan traps collected mostly honeybees (80% of all bee specimens collected). The non-*Apis* component was relatively diverse with over 50 non-*Apis* species (over 600 individuals; six families; majority being Halictidae) being collected in the pan traps across 18 field study sites across two years of sampling. Similar numbers of species and individuals were collected across the two treatments (but see below). Considering that the region boasts well over 200 species of non-*Apis* bees (Kuhlmann 2009), two seasons of monitoring has thus far been able to capture a third of possible representatives of the non-*Apis* species community. This capture return is most likely due to several reasons - unattractiveness of the pan traps to the broader non-*Apis* bee community, particularly when the natural vegetation is in peak flowering (as seen in 2013), high temporal variability in species emergence patterns, thus requiring possible additional long-term sampling, and/or the disjunction between peak onion flowering times to that of peak emergence times of bee species in the Little Karoo region. A distinct compositional difference between species found in 2009 compared to those collected in 2010 was noted. Moreover, there was low species

compositional similarity (ca. 35%) between sites and within treatments. In 2013, GPP pan traps collected eight species of non-*Apis* bees (41 individuals; three families). The region had experienced high winter and summer-rainfall and the natural vegetation was still in flower, possible acting as an effective completion for the pan traps, hence explaining the low capture returns in numbers of species. The fields selected for monitoring work were surrounded by high quality, undisturbed vegetation, and it was expected that the pan traps would collect high numbers of non-*Apis* bees. Scan sampling of onion flower heads, did record several non-*Apis* bee species visiting. The numbers of honeybees on onion flower heads was extremely high despite the lack of managed hives having been brought in by farmers.

Figure 3a. Onion monitoring - 2009/2010

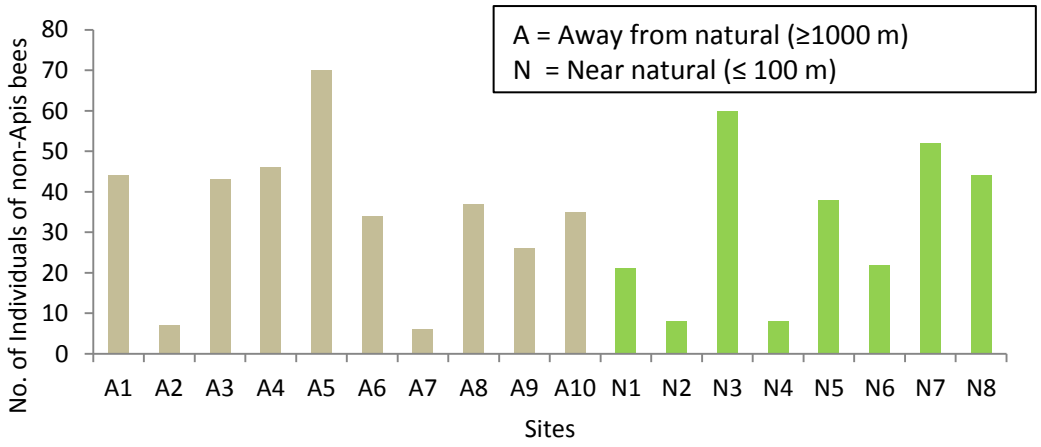
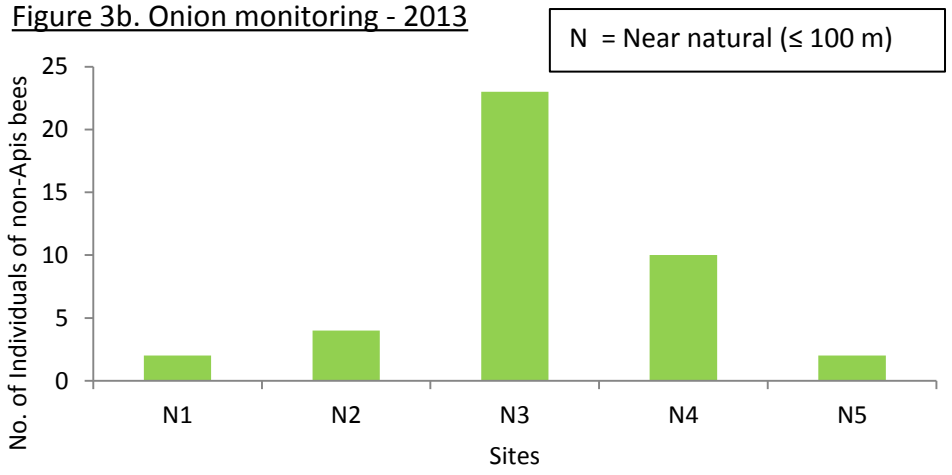


Figure 3b. Onion monitoring - 2013



References

KUHLMANN, M. 2009. Patterns of diversity, endemism and distribution of bees (Insecta: Hymenoptera: Anthophila) in southern Africa. *South African Journal of Botany*, 75**,** 726-738.

BRAND, M. R. 2013. Pollination ecosystem services to onion hybrid seed crops in South Africa. *PhD Unpublished Thesis*. Department of Conservation Ecology and Entomology, Stellenbosch University.