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An interdisciplinary approach for non-lethal pigeon control

Pigeons have been synonymous with urban environments for centuries. Often perceived as pests, pigeon control is applied without investigating environmental, ecological and anthropogenic factors which affect pigeon populations and their response to control treatments. As the management of wildlife in urban environments interdisciplinary, a two year study was conducted on the University of South Africa's Muckleneuk campus in Pretoria, South Africa (Figure 1).

Quantitative and qualitative research focussed on staff member's perceptions of the pigeons on campus and potential control thereof, the environmental use of the pigeon population and the evaluation of non-lethal control measures recommended by the pest control industry.

Pigeons on all levels of the north and south facing aspects of five of the seven buildings on campus were counted at dawn and dusk, once a week for two years (Figure 2).

The first year provided the baseline study for the second year when various control measures were applied. Optical deterrents (Eagle Eyes^{TM} and Fire flags), physical exclusion (bird spikes), audible (BirdXPeller PRO^{TM}) and actual (birds of prey) predator presence were evaluated for pigeon control efficacy. Members of staff participated in an educational campaign, an online Survey Monkey questionnaire and semi-structured interviews to provide their personal opinions and perceptions relating to pigeons and their activities, the potential impact the pigeons have on the staff members, industry population control options and the perceived pigeon problem on the Muckleneuk campus.

People and pigeons

Pigeons are often considered a nuisance in urban environments, leading to the attempted control or eradication of their populations. Pigeon control and management is however not an isolated discipline. People affected, both positively or negatively by the birds, are often not provided the opportunity to voice their opinions about the birds and potential control methodologies.

The questionnaires and interviews (n = 246) determined that the negative perception of pigeons, which was assumed to be the opinion of staff affected by the pigeons on the Muckleneuk campus, was in fact incorrect. Seventy seven percent of the participants felt that the pigeons allowed a connection to nature in an otherwise

sterile urban environment. Nesting and breeding activities of the pigeons on campus were therefore felt to be encouraged, as participants considered the human–pigeon interaction and viewing of squabs in nests to positively contribute to the work environment. Furthermore when queried as to if the pigeons on campus warranted control, 68% of the participants did not consider the pigeons or their related activities to pose a problem on campus. In addition seventy six percent of the participants felt that should control be imposed, the birds should rather be humanely managed through non-lethal measures such as scare devices and bird spikes rather than eradication to allow the current population to be monitored and to prevent future pigeon problems. The study found that management should not be solely focussed on the pigeon population when implementing control, but should also consider the human association. Unless all interested and affected parties are recognised and heard it is unlikely that actions aimed to reduce or eradicate pigeons from a particular area will be successful and sustainable.

Pigeons use of the urban environment

Similarly ecological and biological aspects influence and direct control strategies applied to pigeon populations. During the baseline year, it was found that the pigeon population on the Muckleneuk campus fluctuated seasonally with population index peaks during the spring ($\bar{x}$ = 365; SE = 4) and summer ($\bar{x}$ = 367; SE = 8) seasons and declines during autumn ($\bar{x}$ = 342; SE = 8) and winter ($\bar{x}$ = 300; SE = 3). While the presence of breeding activity (courting, mating, nesting, squab presence and juvenile presence) was evident throughout the year, the notable peaks and declines was related to physiological and population dynamics.

Pigeons in South Africa have been recorded to roost and or breed in cities but fly to surrounding agricultural areas to feed (van Niekerk, 2009). In order to identify a relationship between surrounding agricultural crop production to the pigeon population fluctuation on campus, a list of agricultural crops ecologically important to pigeons (maize, sorghum and sunflowers) within a 20 kilometre radius of the campus was obtained. The pigeon population index was found to be inversely related to crop availability, as pigeons seemed to make opportunistic use of the crop availability in surrounding farmlands during optimal production periods, while conserving energy when not favourable thus foraging locally.

Pigeons consider energetic implications when choosing sites to roost or nest. This was found to be true of the pigeon population on campus as site selection in relation to building aspect indicated significant differences in all the seasons except for winter. This may be environmentally related as sites were chosen in relation to the direction of preferred feeding sites (Sacchi et al., 2002). Pigeons indicated a significant preference for the southern aspect when seasonal agricultural crop and wild grass seed availability located to the south of the campus was at its highest. The converse applied in spring, when pigeons indicated a northerly site selection preference as preferred foraging sites had limited crop availability. Furthermore pigeons and choice of level indicated an upward trend, with the pigeon index increasing in ledge use the higher the level due to the availability of warmer microclimates, wind updrafts for flight and the essential evasion from predators. However, the opposite was found to be true for pigeons that make use of the roof without the protective structural characteristics found on the other levels. Without the

knowledge and understanding of pigeon biology, ecology and behaviour relating to the use of urban environments, management plans directed at controlling their numbers have been found to be misguided and inappropriately designed (Giunchi et al., 2012).

Non-lethal pigeon control

During the second year of the study various control measures, directed by the ecological, biological and social results, were applied to the buildings on campus. A decline of 50% in the pigeon population index was observed. Control structures were found to differ significantly in efficacy from each other. Optical deterrents that were evaluated such as Eagle Eye^{TM} units ,which are designed to interfere with birds' line of flight through sunlight reflection and reflective Fire Flags, which move in the wind thought to create a sense of danger were found to be the least efficient (33% and 39% respectively) at deterring pigeons from campus buildings (Figure 3).

Physical barriers, in the form of bird spikes which prevent pigeons from perching on buildings ledges were found to have the highest efficacy (70%) at deterring pigeons. A combination of Eagle Eyes^{TM}, Fire Flags and bird spikes, the recommendation of the pest control industry for maximum efficiency at reducing pigeon populations, was found to be less efficient at 45% than the building with only bird spikes applied. This was as a result of alternative perching sites made available to the pigeons in the form of open ceiling boards on the tested building, thus limiting the combination's efficacy. Blanket reduction statements issued by pest control companies are therefore not guaranteed as each site and pigeon population interaction is unique.

Seasonality was also found to influence the efficiency of the control structures. Structure efficacy increased during the warmer months corresponding with the natural population index fluctuation. Furthermore pigeons displayed a higher tenacity to tolerate the structures during spring when they were rearing young and agricultural crop availability was limited causing them to forage locally. In doing so, pigeons were more visible on the buildings. On the other hand structures were least efficient in autumn when pigeons were relatively inactive during their moulting season and hidden away due to thermal factors, consequentially also from the observer.

Literature describes how control measures do not influence population size, but simply displaces pigeons away from deterrents to untreated sites (Mooallem, 2006). The study tested this hypothesis by monitoring a campus building without control structures and found that it did not in fact absorb the movement of pigeons moving away from treated buildings.

The use of birds of prey and an audio bird scarer (BirdXPeller PRO^{TM}) which compared actual versus implied predator presence was tested on the pigeon population. The study determined that there was an association between method of scaring and the number of pigeons observed on the different time periods. Pigeons were observed to continue the natural trend of dispersion and return at the dawn and dusk counts during the audio bird scarer trial without being actively discouraged or dislodged from the building. In contrast pigeons reacted positively to the visual raptor

presence of trained birds of prey, which caused them to take flight from the buildings. However the visual effect was temporary as pigeons returned once the threat had been removed. (Figure 4 & 5).

Interdisciplinary approach to pigeon control

Cities need to be recognised as ecosystems with their own set of resources, unique niches and enabling factors which contribute to the successful colonisation of pigeons. Pigeon control therefore needs to be holistic (Hutton & Rostron, 2005) and integrated in its approach with a number of smaller control actions being more effective than one large operation (Murton, Thearle & Thompson, 1972). Control cannot simply be biologically orientated, as social acceptability and support are crucial to its success as people and pigeons are interconnected whether it is formally recognised or not, each plays a role in the other's lives. Through the prioritisation of interdisciplinary non-lethal pigeon control living and working conditions can be ensured, structural integrity of the infrastructure can be upheld and pigeon populations in urban environments can be sustainably maintained at healthy acceptable levels.

References

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Further reading

This study has five research journal manuscripts available for further reading.

Harris, E., de Crom, E.P., & Wilson, A. (2016) Pigeons and people: mortal enemies or lifelong companions? A case study on staff perceptions of the pigeons on the University of South Africa, Muckleneuk campus. *Journal of Public Affairs*, doi: 10.1002/pa.1593.

Harris, E., de Crom, E.P., & Wilson, A. (*under review*) Pigeon control and people: staff perceptions on University of South Africa's Muckleneuk campus.

Harris, E., de Crom, E.P., Labuschagne, J. & Wilson, A. (*under review)* The use of an urban environment by speckled pigeons (*Columba guinea*) and feral pigeons (*Columba livia*) with special reference to the University of South Africa's Muckleneuk campus.

Harris, E., de Crom, E.P., Labuschagne, J. & Wilson, A. (*under review*) Humane non-lethal pigeon control, with particular focus on visual deterrents and physical barriers on the University of South Africa's Muckleneuk campus.

Harris, E., de Crom, E.P., Labuschagne, J. & Wilson, A. (*under review*) Evaluation of audible and visible predator presence, for pigeon control purposes on the University of South Africa's Muckleneuk campus.

FIGURES AND CAPTIONS

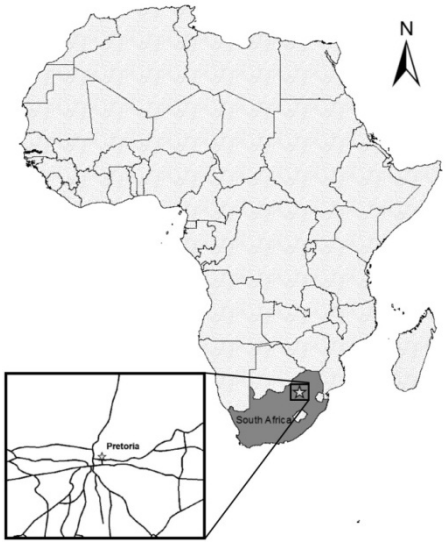

Figure 1: The University of South Africa's Muckleneuk campus is located in Pretoria, South Africa

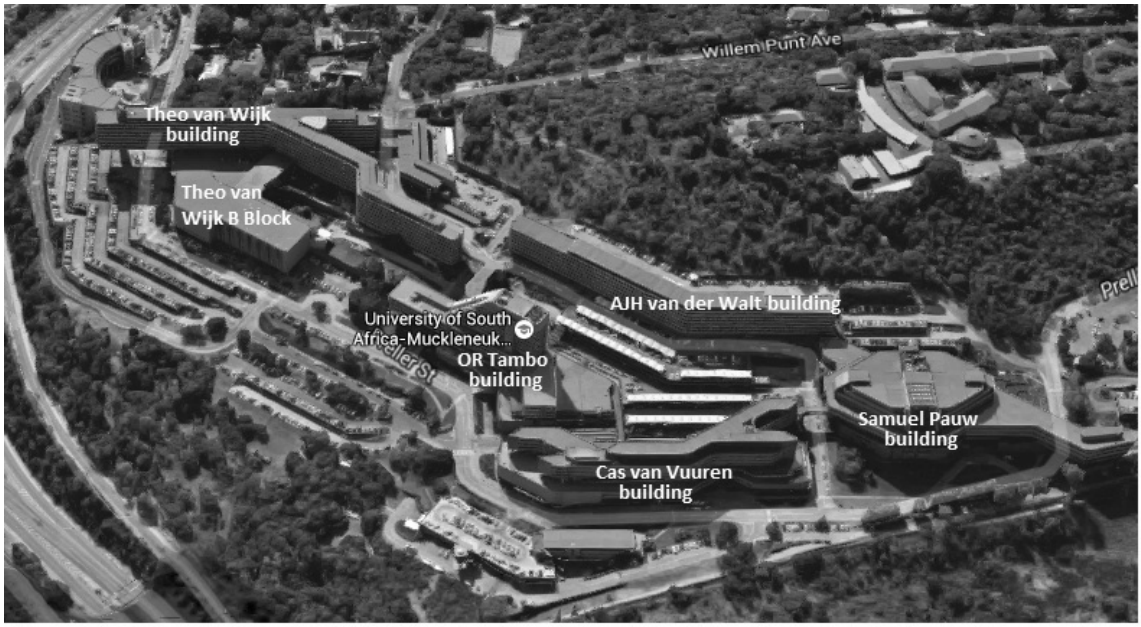

Figure 2: Detailed view of the University of South Africa's Muckleneuk campus indicating the buildings where the pigeon census took place during year one and year two of the research (Google Maps, 2015)

Figure 3: Fire Flags on OR Tambo building of the University of South Africa's Muckleneuk campus (E Harris, 2015)

Figure 4: BirdXPeller PRO™ unit used during the implied predator presence audio trial at University of South Africa's Muckleneuk campus (E Harris, 2015)

Figure 5: Rock kestrel (*Falco rupicolus*) flown during the actual predator presence visual trial at University of South Africa's Muckleneuk campus (E Harris, 2015)