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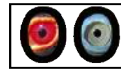
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THE IMPACTS OF THE PIED CROW *CORVUS ALBUS* ON OTHER SPECIES NEED TO BE DETERMINED

John E Fincham^{1*}, Ronelle Visagie², Les G Underhill³, Michael Brooks³ and Miles B Markus⁴

¹SABAP2 Atlaser 11587, retired veterinarian and medical researcher

²Platberg Karoo Raptor Project, Birds of Prey Programme,
Endangered Wildlife Trust

³Animal Demography Unit, Department of Biological Sciences,
University of Cape Town

⁴School of Animal, Plant, and Environmental Sciences,
University of the Witwatersrand

* Corresponding author: fincham04@gmail.com

Madden *et al.* (2015) have reviewed published information on the impact of corvids on the productivity and abundance of other birds in Europe and North America. Their review is based on 42 papers: 10 from North America and 32 from western Europe, of which 23 are from the United Kingdom. No studies from eastern Europe, Africa, Asia, Australasia or South America are included. Moreover, 79% of their corvid impact assessments (257/326 cases) are from one small geographical area, the UK. Given these restrictive limitations, extrapolation of the conclusions reached to other countries or continents would not be valid or acceptable.

It is particularly important that Madden *et al.* (2015) have drawn attention to the lack of publications on African corvids in the context of their review. Profound demographic (human and non-human) and environmental changes have taken place in South Africa and most other African countries during the time span covered by the review. These developments are powerful co-variables that are, overall, almost certainly different in the geographical areas dealt with by

Madden *et al.* (2015) and cannot be ignored. Furthermore, in the light of the results presented below, it is essential to determine the impact of the Pied Crow on other birds and non-avian species, both as a predator and a scavenger, in southern Africa (Simmons and Braine 1994, Simmons and Barnard 2011, Fincham and Lambrechts 2014).

Road counts of crows and raptors

Pied Crows and raptors were counted annually from April 2009 to October 2014 (n = 6 years) during journeys by road from a base situated centrally in South Africa, simultaneously with the ongoing second Southern African Bird Atlas Project (SABAP2). Raptor rehabilitation, checking for collisions with power lines, and conservation-related meetings were the main reasons for travelling long distances in directions that differed widely (Fig 1). Distances varied from 7 353 to 17 098 km/annum, with a mean of 11 413 km and median of 11 485 km. Counts corrected to the mean distance are presented because median correction yielded similar values. The correction factors proportional to the mean distance that were applied to the 6 raw data counts were: 1.0926, 0.8919, 1.5521, 0.6675, 0.9112 and 1.3818. The results shown in Table 1 have been rounded to whole numbers.

The annual number of Pied Crows recorded in Table 1 exceeds the combined total for all of the raptors in each year, and the discrepancy increases progressively. The count trends are in line with the results of SABAP2 for all the species listed in the table (Underhill and Brooks 2014). The populations of medium-sized, non-migratory raptors such as Greater Kestrel, Jackal Buzzard and Southern Pale Chanting Goshawk seem to be more stable.

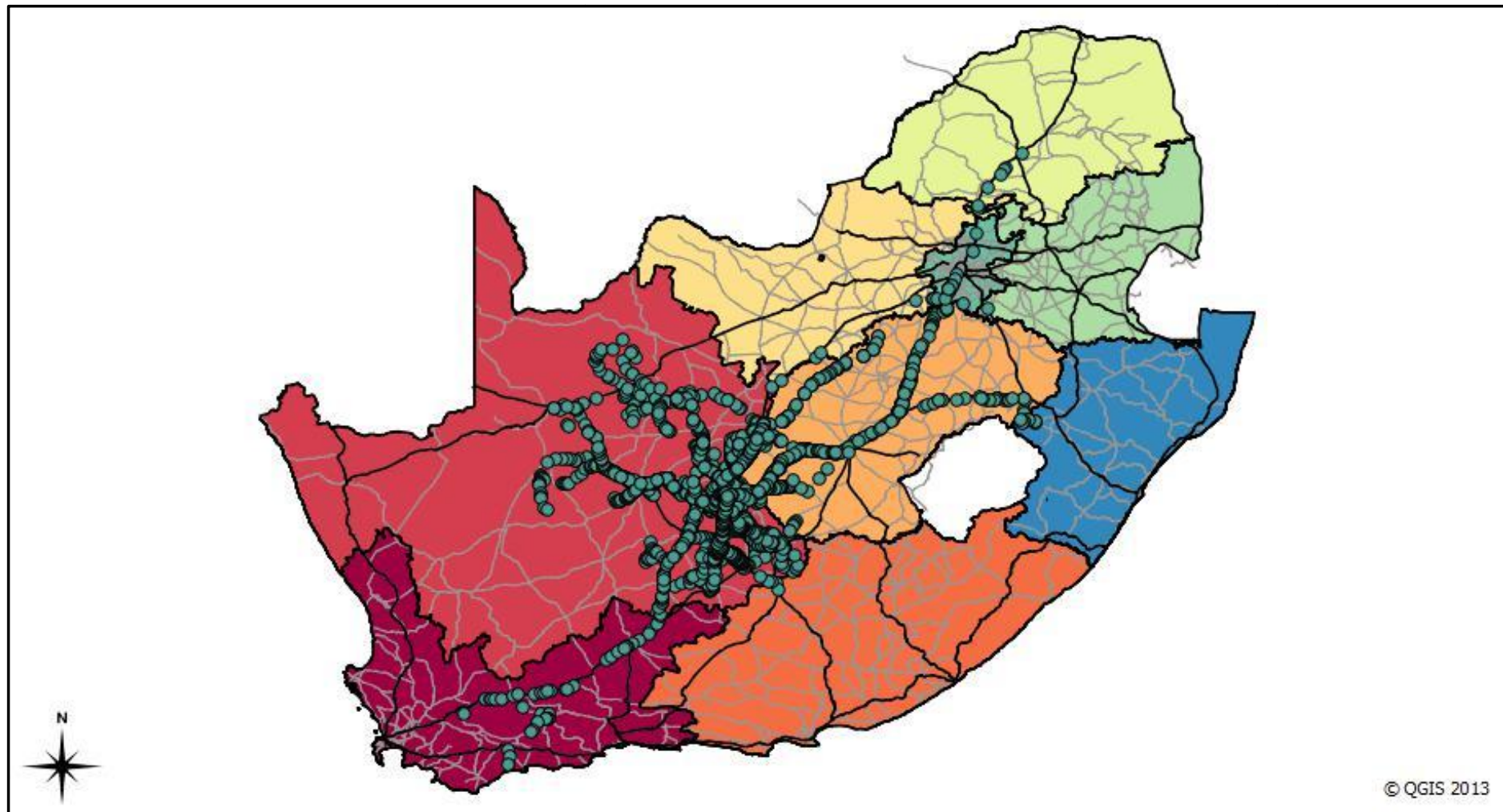


Fig 1 - Crows and raptors were counted between April 2009 and October 2014 along the routes that are indicated schematically by green dots. The counts are mainly (but not only) from areas where SABAP2 has recorded widespread increases in the abundance of Pied Crows.

**Table 1.** Trends in species counts/annum corrected to the mean distance over which counts were made.

	Years					
	2009	2010	2011	2012	2013	2014
	Corrected counts					
Pied Crow <i>Corvus albus</i> ^a	1333	1879	2156	1918	1852	2592
Cape (Black) Crow <i>Corvus capensis</i> ^a	0	5	0	33	4	6
Martial Eagle <i>Polemaetus belicosus</i> ^b	8	13	6	3	4	4
Tawny Eagle <i>Aquila rapax</i> ^b	10	19	8	9	5	4
Verreaux's (Black) Eagle <i>Aquila verreauxii</i> ^b	38	16	16	16	6	3
Secretary Bird <i>Sagittarius serpentarius</i>	32	20	30	15	13	4
Black-shouldered Kite <i>Elanus caeruleus</i> ^c	189	33	39	105	48	57
Rock Kestrel <i>Falco rupicolus</i> ^c	24	20	16	29	6	17
Greater Kestrel <i>Falco rupicoloides</i> ^d	200	160	180	164	113	184
Jackal Buzzard <i>Buteo rufofuscus</i> ^d	104	104	101	73	36	69
S. Pale Chanting Goshawk <i>Melierax canorus</i> ^d	469	350	602	310	286	343

^aCorvids^bLarge resident eagles^cSmall resident raptors^dMedium-sized resident raptors

Atlasing

Contemporaneously with the counts detailed in Table 1, SABAP2 is ongoing and follows publication of the first atlas in 1997 (Harrison 1992, Harrison *et al.* 1997). When the reporting rate for a resident species in these projects is high across large areas, e.g. as for the Pied Crow, or alternatively low or if there are no reports, e.g. as in the case of the Secretary Bird, this reflects the relative abundance of the species concerned (Harrison and Navarro 1994, Griffioen 2001, Underhill and Brooks 2014).

SABAP2 reporting rates for the Pied Crow can now be compared to rates in the first atlas for 78% (1495/1924) of the quarter degree grid cells (QDGCs) that cover the whole of South Africa, Lesotho and Swaziland. The rates have increased in 63.9% of QDGCs and have decreased in 36.1%. Increases are massive in 33.9%, big in 17.9% and small in 12.1% of cells; whereas decreases are massive in 9.2%, big in 12.4% and small in 14.4% of cells. Changes in reporting rates and abundance are not randomly distributed. Massive and big decreases took place in adjacent areas in the eastern Free State, the eastern North West Province, southern Limpopo Province and



Fig 2 – A Pied Crow scavenging human food litter in a tropical, high-rainfall area not far from the equator. Mongu, north western Zambia. August 2014.
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Mpumalanga Province. These are areas of higher rainfall where crops are a major form of agricultural production. Paradoxically, there have been massive and big increases immediately to the south over all of Gauteng Province (except in three cells), which might be related to widespread urbanisation. Massive and big increases are widespread in the western two thirds of the whole region, other than decreases in a few isolated, scattered cells. This huge area includes all of the Western and Eastern Cape Provinces, much of the Northern Cape, and the western parts of the Free State and North West Provinces. The Karoo biomes with low annual rainfall and



Fig 3 - Pied Crows competing with a Lappet-faced Vulture for carrion near the Namib Desert, where the influence of humans is minimal. September 2012. © Callie Muller.

where land use is pastoral, occupy most of the interior of this large, contiguous area. Rainfall is higher towards the coast, where farming intensifies to include crops, vineyards and orchards, yet crow abundance remains high. In KwaZulu-Natal Province, where rainfall is uniformly high and altitudes range from the Drakensberg escarpment to sea level, cells with increased (46%) and decreased (54%) abundance of crows seem to alternate randomly.

In contrast to the Pied Crow position, the reporting rates for many raptors are declining, indicating that they are becoming less



abundant. The big resident eagles are most affected and no longer occur in large parts of their former ranges (Underhill and Brooks 2014). Vulture populations are in relentless decline throughout Africa (Ogada *et al.* 2015).

Discussion

The Pied Crow is a robust and versatile species that has adapted to wide ranges in climate and habitats across the whole of sub-Saharan Africa (Sinclair and Ryan 2010), from high-rainfall equatorial regions (Fig 2) to dry deserts (Fig 3). They are also present on Madagascar and other Indian Ocean islands. In Namibia, they compete with Lappet-faced Vultures *Aegypius tracheliotos* for carrion in the west of the Kavango Region (Fig 3); and they are predators of eggs and chicks of the Damara Tern *Sterna balaenarum* along the Skeleton Coast (Simmons and Braine 1994).

Since the climatic range utilised by the Pied Crow is so wide, it is not credible that small and erratic variations in temperature and rainfall in limited areas in the south west and north east of South Africa during a short period of time (Madden 2013, Cunningham *et al.* 2015), are causally associated with the changes in abundance and distribution of the species across the whole SABAP2 region. There are powerful non-climatic co-variables, especially food supply and perhaps poisoning, that are more likely in relation to the increases and decreases in abundance that have taken place. In this regard, it should be noted that the results presented in Table 1 are derived from a large area that includes much of the Great Karoo, where extensive livestock farming has become the main form of land use. Mobile populations of wild herbivores and a balanced array of avian and mammalian predators and scavengers have been replaced by a semi-static population of sheep and goats, and an imbalance of predators and scavengers. Food sources for Pied Crows that have

become available include placentas and carcasses of sheep and goats, stillborn or weak lambs and kids, the fruit of the exotic *Opuntia* cactus (prickly pear), road kill, and human-generated litter. Permanent water for livestock and human use has been provided in formerly waterless semi-desert where annual rainfall is low and erratic. Nesting sites have been created because of the presence of telephone poles, electricity pylons, windmills, buildings and alien trees.

A key aspect of the review by Madden *et al.* (2015) is that it goes beyond assessing the impact of corvids on birds by documenting that the Desert Tortoise *Gopherus agassizii* is being decimated almost to extinction by the Common Raven *Corvus corax* in the Mojave Desert in the USA. The ravens have multiplied much as Pied Crow numbers are increasing in parts of South Africa (Boarman 2003, Underhill and Brooks 2014), where at least 315 small Angulate Tortoises *Chersina angulata* were killed as part of the sustenance needed to rear a brood of four Pied Crow chicks in a semi-desert region (Fincham and Lambrechts 2014). To extract flesh, crows peck into the opening in front between the carapace and plastron, or through the plastron from below. Although collection of carapace remains took place regularly, it is possible that some were removed by scavengers such as jackals. Furthermore, newly hatched tortoises may be eaten entirely and digested to a point where no clearly visible remnants are passed in crow excreta; so more than the recorded 315 tortoises might have been killed by this pair of crows. This high rate of predation on a species with a low reproductive rate, which is moreover rainfall-dependent in semi-desert areas, is unlikely to be sustainable (Branch 2008, M Hofmeyr, in litt.).

Because so many small tortoises were killed during the rearing of one brood of chicks (it is not known to what extent the parents also



fed on tortoises), there is justifiable concern that predation rates on other vulnerable avian, invertebrate, mammalian and reptilian species might likewise be excessive. In this regard, it is notable that the Geometric Tortoise *Psammobates geometricus* is classified as critically endangered and has become locally extinct in most of its original range (Baard 1993, Branch 2008). This is mainly due to loss of habitat coupled with the kinds of environmental changes that lead to proliferation of crows (Marzluff et al. 2001, Underhill and Brooks 2014). In-depth study of specific relationships between the Pied Crow and tortoises, as well as other species it preys upon, is needed urgently, possibly including targeted remedial interventions.

Many farmers regard the Pied Crow as a serious pest and there is online evidence that anti-crow measures by means of shooting have started. These sources can be perused by searching via "pied crow control". The areas where most of the massive and big decreases in abundance have occurred are generally those where summer crop production is the main form of agriculture (e.g. maize and sorghum). Crows and other birds will eat seed grain opportunistically. This might be lethal if the seed has been coated with toxic insecticide. Large-scale poisoning of crows in this way (if it does take place) could be either inadvertent or deliberate.

There is strong evidence that the abundance of Pied Crows is increasing over large areas of southern Africa and decreasing in smaller areas, for reasons that have either not been defined or are speculative (Madden 2013, Cunningham *et al.* 2015). Increases will usually be facilitated by the ability of these crows to rear four or more fledglings/brood (Hockey *et al.* 2005), which enables them to multiply rapidly when sufficient food and nest sites are available (Fig 4). Given that the inexorably increasing human population is continuously influencing the environment in southern Africa and



Fig 4 – Pied Crows can rear 4 or more chicks/brood if food and nest sites are available. This nest was built on a windmill in the Karoo. September 2012. © Nollie Lambrechts.

globally in ways that are harmful to some species and advantageous to others, there is a responsibility to monitor and define the situation comprehensively (Simmons and Barnard 2011, Cunningham *et al.* 2015). Moreover, considering that the distribution and abundance of the Pied Crow in Africa as a whole have not been determined by climatic and topographic variables, other causative relationships need to be sought for the re-distribution of the species that has taken place in southern Africa.

If it is confirmed that Pied Crows are having substantial negative impacts on prey and/or competitor species, as seems to be inevitable where the abundance of crows has increased massively, remedial action to prevent or minimise damage should be taken.

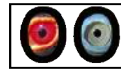


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