

EDITED BY
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URBAN RAPTORS

ECOLOGY AND CONSERVATION
OF BIRDS OF PREY IN CITIES

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PART I -

Raptors in Urban Ecosystems

CHAPTER 1

Urban Birds of Prey: A Lengthy History of Human-Raptor Cohabitation

Keith L. Bildstein and Jean-François Therrien

POPULATIONS OF “URBAN” RAPTORS ARE increasing globally. Trained falcons are now being flown in city golf courses to scare off geese in hopes of reducing accumulated droppings along the fairways. In both the Old World and New, tens of thousands of vultures rummage through urban garbage dumps in search of humans’ leftovers. In Spain, lesser kestrels (*Falco naumanni*) raise their young in the center of cities and towns, where they are attracted to and feed on swarms of insects flying above night-lit cathedrals and other historic buildings. Peregrine falcons (*Falco peregrinus*) routinely hunt for birds attracted to the brightly lit Empire State Building in downtown New York City, and red-tailed hawks (*Buteo jamaicensis*) nest in and around Central Park, feeding on pigeons, rats, and squirrels. Many other species serve as additional examples of a growing number of “urban” birds of prey, whose populations are increasing as human attitudes shift from a “shoot-on-sight” mentality to indifference and tolerance. But before exploring this topic further, first we will offer a bit of linguistics to explore the nuances of the phrase “urban raptor.”

The word *urban* is believed to be derived from the Latin word *urbs*, which refers to a “walled city” or, specifically, to ancient Rome. Today it is used

to indicate areas with high-density human settlements and is defined in the fifth edition of the *Oxford English Dictionary* as being “of, pertaining to, or constituting a city or town.”¹ The word first came into use in the English language in the early 17th century, thousands of years after human cities themselves first appeared.

Although raptors, more than most birds, have been heavily persecuted by humans, there is evidence that “urban raptors” began to appear simultaneously with human-created urban landscapes. Indeed, relationships between raptors and humans—some commensal, some mutually beneficial, and others still parasitic or predatory—probably predate modern humanity itself.^{2,3} That said, most studies of urban birds,⁴ including those of raptors,⁵ have been conducted in the past 35 years, and as such, the serious study of urban raptors remains in its infancy, with some researchers suggesting that the phenomenon of “urban raptors” is relatively recent.

Nevertheless, there has been a lengthy buildup to the phenomenon of city birds of prey, highlighted by many kinds of symbiotic relationships between humans and raptors that predate and, in many ways, foreshadow this ongoing phenomenon. Here, we cast this relationship in the light of two well-established and closely related ecological principles: habitat selection and expanded niche breadth coupled with population growth. Specifically, habitat selection results in raptors settling in landscapes that provide them with both safe nesting sites and adequate and accessible feeding sites,⁶ or in less technical terms, a safe “bedroom” and a well-stocked “pantry” or “kitchen” (an ecological connection that then US Secretary of the Interior Cecil Andrus made while proposing the expansion of the Snake River Birds of Prey Conservation Area in Idaho during the 1970s).⁷ We also look at how newfound city landscapes enable growing populations of raptors to broaden their traditional niches by including urban areas and other human-dominated landscapes in their repertoires of “appropriate” habitats.⁸

Pre-urban Symbiotic Associations between Raptors and Humans

To understand the ecological basis of the phenomenon of urban raptors, it helps to outline the history of symbiotic relations between humans and raptors. Today many hunter-gatherers—including, for example, the Hadza of northern Tanzania⁹—routinely monitor the flights of Old World vultures and follow these avian scavengers to large carcasses that the hunter-gatherers then consume, a behavior that many anthropologists suggest originated millions of years ago when early hominins began doing so across the savannas of Africa’s Great Rift

Valley.² More recently, pastoralists and transhumant populations (i.e., seasonally moving populations of pastoralists and their herds) “turned the ecological table” on this symbiotic relationship when they began concentrating large flocks and herds of domesticated ungulates that vultures were attracted to and depended on as predictable sources of carrion.^{10,11,12,13}

Although it is unknown when raptors first began to live in human settlements, in all likelihood it happened early in our history.¹⁴ Primitive encampments that included refuse almost certainly attracted vultures and other scavenging birds of prey. This would have been especially true for smaller raptors, which were more likely than larger species to have been accommodated and not persecuted by humans.¹⁵

More than most groups of birds, raptors have captured humanity’s imagination for thousands of years.¹⁶ Falconry, an early symbiotic relationship involving raptors and humans, also is associated, albeit indirectly, with the urbanization of raptors. The practice of capturing wild prey using trained raptors dates at least as far back as 4,000 years ago when Asian cultures first began capturing migrating birds of prey and training them to work together with human handlers to capture quarry for the nutritional benefits of both the birds and humans. Although now practiced largely as a sport, falconry flourished as an important hunting technique for humans, particularly in pre-gunpowder days.¹⁶ The art of falconry, by introducing humans to the birds in a positive and nonthreatening way, was an instrumental first step to the more recent urbanization of raptors by making the raptors’ presence in human-dominated habitats more likely to be tolerated. Several techniques associated with falconry, including both captive breeding and “hacking” (a process in which nestlings and fledglings are kept and fed for several weeks at hack boards, where food is left for them as they transition to independent hunting), together have allowed conservationists to “soft release” or “hack” young captive-bred peregrine falcons into cities and other landscapes. The hacked young are imprinted on city environments, which has contributed to the growing urban populations of this near cosmopolitan species.^{17,18} As a result, by the early 1990s, 34 percent of reintroduced peregrine falcons in the eastern United States were nesting in cities, as were 58 percent of midwestern populations.¹⁹

The common thread in the early symbiotic relationships involved increasing food availability for raptors, humans, or both. Once humanity began constructing buildings and growing trees agriculturally, the latter both for fuel and building materials, a second element of symbiosis entered the equation: safe nesting sites.

Although built-up areas can be associated with the destruction of natural nesting sites⁴ and reduced breeding densities of birds, they can also result in the opposite for raptors.⁴ This is particularly the case for smaller and cavity-nesting raptors. Relatively small raptors like bat falcons (*Falco rufigularis*) and Eurasian sparrowhawks (*Accipiter nisus*) pose less of a threat^{20,21,22,23} and are less likely to be considered vermin and persecuted by humans.⁴ Cavity-nesting raptors like kestrels find that the ledges, holes, nooks, and crannies associated with human architecture are suitable structures in and on which to nest.

Medieval and More Recent Associations between Raptors and Humans

KITES

Red kites (*Milvus milvus*) were said to have “thrived” and nested in London during the reign of King Henry VIII (1509–47)²⁴ and reportedly were both numerous and protected in Edinburgh in 1600.²⁵ A foreigner who visited London in the late 15th century would have been “astonished by the enormous number of kites he saw flying round London Bridge.”¹⁴ Given the combination of high human densities in larger cities and poor sanitation at the time, there appears to have been plenty of food for these scavengers. Indeed, in mid-16th-century London and Edinburgh, kites often snatched food out of “children’s hands on city streets”¹⁴ (figure 1.1), much as black kites (*Milvus migrans*) continue to do in parts of Africa and East Asia,^{26,27} where at least until recently, large populations of kites nested in cities.²⁸ In many such instances, writers remarked about the boldness of the birds and that city inhabitants at the time were quite willing to accept the birds’ audacity in light of their value in removing rotting garbage from urban backyards and thoroughfares.^{14,26}

FALCONS

Peregrine falcons have long been attracted to cities by the large numbers of rock pigeons (*Columba livia*) and Eurasian starlings (*Sturnus vulgaris*) that inhabit them.²⁹ In fact, reports suggest that the species has been comfortable in towns and cities since the Middle Ages. Salisbury Cathedral in Wiltshire, England, has hosted nesting peregrine falcons sporadically at least since the mid-1860s.³⁰ Today, peregrines nest in dozens, if not hundreds, of cathedrals in England.³¹ One of the more famous historic North American examples of peregrine falcons



Figure 1.1. Red kites in 16th-century London, from Lea (1909).

nesting on a city skyscraper involves the Sun Life Building in Montreal, Quebec, where from 1936 until 1952, peregrines nested on a ledge that had been “enhanced” with a sandbox that provided a nesting scrape. Along with the phenomenon of nest-site imprinting,³² recent introductions of fledgling peregrines into cities, coupled with a reduction in pesticide impacts, have bolstered the process of “urbanization” for this species.

In the early part of the 20th century, the Richardson’s merlin (*Falco columbarius richardsonii*), one of the three North American subspecies of the merlin (*F. columbarius*), began to expand the northern limits of its wintering range from Colorado and Wyoming into southwestern Canada. Reports of the expansion document overwintering merlins in Saskatchewan, Canada, in 1922, and in Alberta, Canada, in 1948. The expansion, continuing well into the second half of the 20th century, was especially apparent in urban areas, with Christmas Bird Counts suggesting substantial increases in several of Canada’s prairie cities from the late 1950s into the early 1980s. By 1970, Richardson’s merlins were not only overwintering in cities but beginning to breed there as well.³³ Since then, nonmigratory populations of “city” merlins have appeared in numerous urban areas throughout southern Canada and the northern United States.

Several factors seem to have played a role in this shift from migratory to nonmigratory behavior. The initial northward expansion of winter areas coincided with the regional expansion of the species’ predominant urban prey, the house sparrow (*Passer domesticus*), an Old World species introduced into North America in the 1850s that spread into the American West in the early part of the 20th century.³⁴ It seems likely that increased prey availability, including both house sparrows and Bohemian waxwings (*Bombycilla garrulus*)—the latter being attracted to urban areas by fruit-bearing ornamental trees—contributed substantially to the merlin’s wintering farther north. A second factor was likely the availability of corvid nests in urban areas; merlins, like other falcons, do not construct their own nests but readily use those of other similar-sized birds. Finally, declining human persecution throughout the period may also have played a role by allowing the species to take advantage of this new opportunity.

The lesser kestrel (*Falco naumanni*) also routinely nests in cities and, apparently, has done so for some time, most likely in part because of lower predation on their nestlings.²³ An Old World species that breeds colonially in the architectural nooks and crannies of chapels, churches, and cathedrals, lesser kestrels are aerial insectivores that routinely feed on insects attracted to artificial nighttime lighting at such sites. Detailed observations at well-lit buildings in Seville, Spain, including the city’s main cathedral, reveal substantial nighttime hunting by lesser

kestrels and nocturnal provisioning of their nestlings during the breeding season. Several of the city's historic buildings are currently illuminated at night for tourists, and the lighting attracts enormous numbers of flying insects, which in turn attract large numbers of aerial insectivores, including both bats and lesser kestrels.³⁵ The extent to which nocturnal hunting improves the nesting success of these and other kestrels breeding in urban areas has not been studied in detail, but it may be substantial as urban sprawl increases the time it takes parental kestrels to ferry insect prey back to the city from agricultural areas surrounding the city center.^{23,36} Peregrines are also attracted to urban lighting by concentrations of disoriented songbirds upon which they feed.³⁷

SCAVENGING RAPTORS

In the 1960s, black kites and white-rumped vultures (*Gyps bengalensis*) were nesting at densities of 16 and 2.7 pairs per km², respectively, in Delhi, India. This, together with a smaller population of Egyptian vultures (*Neophron percnopterus*), resulted in an overall urban population estimated at 2,900–3,000 raptors, which were mainly concentrated in “Old Delhi” in mango gardens.²⁸ The abundance of raptors in Delhi was attributed to three things: (1) food abundance in rubbish heaps, (2) trees for roosting in gardens and along streets, and (3) the “traditional good-will of Indians to all living things” (considered the most important).²⁸ In Africa, but only north of the equator, the continent's two smallest vultures, the Egyptian vulture and the hooded vulture (*Necrosyrtes monachus*), routinely forage in the immediate vicinity of humans and frequently nest nearby.^{10,38,39}

Overwintering adult and nonbreeding juvenile and subadult Egyptian vultures occur in large numbers in refuse dumps associated with the capital of Addis Ababa, a city of more than three million humans in Ethiopia, as well as on migration in southern Israel.⁴⁰ The same appears to be true in the Arabian Peninsula around a municipal landfill on the outskirts of Muscat, Oman, a city of 1.5 million.⁴¹ Counts at the Muscat landfill between autumn 2013 and spring 2015 indicate wintertime peaks of between 350 and 450 birds, approximately two-thirds of which were adults, many of which were presumed to be migrants from European breeding populations.⁴¹

In Uganda, the relationship between humans and hooded vultures, a critically endangered species, has been studied in detail.³⁹ In the city of Kampala, which in the early 1970s had a human population estimated at 330,000, hooded vultures routinely fed on human rubbish in two large refuse dumps as well as at

an abattoir (i.e., slaughterhouse), areas they shared with other avian scavengers, including marabou (*Leptoptilos crumenifer*), black kites, and pied crows (*Corvus albus*). Hooded vultures were particularly common at the abattoir, where their numbers were estimated at more than 100 individuals daily. Numbers there exhibited no consistent seasonal trends, suggesting that the birds using the dump consisted either of nonbreeders or breeders that were nesting nearby. The considerably larger marabous behaviorally dominated the vultures, which in turn behaviorally dominated the smaller pied crows. Black kites sometimes secured food that vultures had consumed by chasing them in the air and forcing them to regurgitate. Although the vultures often perched on buildings in the city, they were not seen nesting on them. It was suspected that the vultures had become numerous in the city because they were “rarely molested unless they became a blatant nuisance,” a statement that appears to be true of urban populations of vultures elsewhere in Africa.³⁹

Hooded vultures also are human commensals in many urban sites in West Africa, including, at least until recently, Accra, Ghana, a city of more than two million, and Kumasi, Ghana, a city of about two million, where they are not molested.⁴² Similarly, both in Banjul, the Gambian capital city of about 35,000, and in exurban areas within 25 km of it, the densities of hooded vultures climbed from 2.9 birds per linear km of road surveyed in 2005 to 12 birds per km in 2013 and to 17.5 birds per km in 2015.^{43,44} In western Gambia, hooded vultures are relatively fearless of humans, most of whom value their services in cleaning up humans’ rubbish, including moribund fish bycatch, roadkill, butchery scraps at small open-air butcher shops and larger abattoirs, and blood and ruminant stomach contents dumped purposefully for the birds in population centers. Assuming that recent survey results accurately reflect their density,⁴⁴ westernmost Gambia hosts a population of 7,000–10,000 individuals, or 4–5 percent of the currently estimated global population of hooded vultures,⁴⁵ in an area that represents less than 0.0001 percent of the species range.^{44,45}

There is some disagreement among researchers about how long humans and hooded vultures have had a mutually beneficial relationship—some think it is a relatively recent phenomenon, whereas others believe that the “relationship goes back thousands of years.”³⁸ For both hooded and Egyptian vultures, urban commensalism based on food provisioning at refuse dumps and abattoirs is almost certainly enhanced by the absence of larger and competitively superior vultures.^{41,42,44} The conservation significance of the sometimes urban nature of the two species may be considerable, as global populations of both vultures are in decline, resulting in their International Union for Conservation

of Nature (IUCN) listings as critically endangered (hooded vulture)⁴⁶ and endangered (Egyptian vulture).^{45,47} Although it has yet to be studied in detail, the commensal nature of the two species will likely play an important role in their survival, at least in the short term.

In southwestern Europe, the Iberian population of griffon vultures (*Gyps fulvus*) has recently begun to grow and increasingly uses urban rubbish dumps, including the one associated with the city of Algeciras.⁴⁸ Hundreds of mainly juvenile and subadult griffon vultures feed at the site while waiting for appropriate weather conditions to migrate across the Strait of Gibraltar.^{49,50}

In the New World, populations of both black vultures (*Coragyps atratus*) and, to a lesser extent, turkey vultures (*Cathartes aura*) also have been urbanized, particularly in the neotropics. In 1839, Charles Darwin reported that although black vultures were not found near Montevideo, Uruguay, “at the time of the [Spanish] conquest,” they had subsequently followed people there.⁵¹ In 1839, John Audubon also mentioned the species’ “half domesticated” nature and the ease at which it found food in villages and towns.⁵² More recently, black vultures were abundant at a settlement on the Rio Negro in Patagonian Argentina, where they “crowded together in the thousands on trees” at a roost near “cattle slaughtering establishments.”⁵³ In addition, the black vulture extended its range in Brazil considerably “as it accompanie[d] human occupation,” and the species routinely breeds on the rooftops of tall buildings in São Paulo and other urban areas.^{54,55} Turkey vultures too are sometimes attracted in large numbers to urban areas in southern Central America and northern South America, including Panama City, Panama, particularly in boreal winter when larger migrants arriving from North America successfully compete with relatively smaller tropical black vultures at rubbish tips,⁵⁶ inducing “reciprocal migration” of the latter there.⁵⁷ Farther south in the Americas, where black vultures currently do not live, nonmigratory subspecies of turkey vultures frequent urban and suburban trash tips in both Tierra del Fuego and the Falkland Islands.⁵⁸

Summary

Continued growth of urban areas occurring around the world^{59,60} will have important consequences for diurnal birds of prey, all of which are firmly rooted in fundamental ecological principles. Below we highlight five of them.

1. *As long as urban areas provide “safe bedrooms” for nesting and overlapping or adjacent “well-stocked kitchens” for feeding, breeding populations of at*

least some species of raptors will be attracted to them. This may sometimes occur in large numbers, which may in turn make them less acceptable to people. The latter may be especially true for species with a long history of urbanization. The New World black vulture, a species that has been associated with urban areas for hundreds of years, is a case in point.^{51,52} As North American populations of black vultures continue to grow substantially,^{61,62} concerns associated with increasing urban populations of the species—including property damage, so-called nuisance roosts, and collisions—continue to arise.^{63,64} Aircraft collisions with this species alone are estimated to have cost the US Air Force in excess of \$25 million over a 25-year period.⁶⁵ In South America, concerns regarding geographically expanding and growing populations of black vultures focus on their apparent effect on Andean condors (*Vultur gryphus*), a globally near-threatened species with a moderately small global population.⁴⁵ In some circumstances, Andean condors are outcompeted by black vultures at carcasses.⁵⁵ Similar concerns are likely to occur wherever and whenever urban raptors move from being “boutique” members of urban environments to more fully functional, common species in cities.

2. *The likelihood that a raptor will be successful in urban areas will depend on its perceived threat to humans living there.* As a result, relatively small species of raptors are more likely to thrive in urban areas than larger species, particularly if they are asocial or are only moderately social, and do not feed on animals that are viewed as valuable to people. Turkey vultures (but perhaps not black vultures) in the New World are a case in point, as are Egyptian and hooded vultures in the Old World. All of these species are relatively small vultures that, at least historically, appear to have been accepted and even protected by local people.^{44,66} Lesser kestrels and peregrine falcons also appear to be notable examples of this principle, in part because of their diets—largely insects in the case of lesser kestrels³⁵ and feral rock doves in the case of peregrine falcons.¹⁹

3. *Urban areas that allow an increase in reproductive success, a reduction in mortality, or both can affect regional and even global populations of raptors.* Cases in point include griffon vultures in Spain,^{48,49} hooded vultures in parts, though not all, of West Africa,⁴⁴ and Egyptian vultures overwintering in North Africa and the Arabian Peninsula.

4. *Abundant, widespread generalist species are more likely to colonize and thrive in urban landscapes than uncommon, limited-range specialist species.*⁶⁷ The overwhelming preponderance of examples offered above suggests that relatively widespread species known for their generalist food habits are most likely to be urbanized.

5. *Migratory populations of raptors may be urbanized during certain portions of their annual cycles more than others.* This is especially likely during migration and on the wintering grounds when territoriality is less common. In the New World, both sharp-shinned hawks (*Accipiter striatus*) and Cooper's hawks (*Accipiter cooperii*) are now regular visitors to backyard bird feeders where they prey on "bird feeder" birds.⁶⁸ And the migration of at least the former species has changed via migration short-stopping in response to this newfound food source.⁶⁹ In the Old World, Egyptian vultures and griffon vultures certainly typify this, given their appearance in large numbers at trash dumps during migration.^{41,49} In the New World, turkey vultures do the same in winter,⁵⁶ although it should be noted that this species also routinely nests in abandoned and underused buildings in both suburban and urban areas.

Finally, the extent to which the urbanization of wildlife affects evolutionary processes is only now being studied by ecologists and conservation biologists.^{67,70} In the long term, we believe that such evolutionary effects may outpace ecological consequences in their overall effect on raptor populations, as well as on raptor diversity and conservation.

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