

Assessing long-term changes in the raptor fauna of the Fertile Crescent by reference to the nineteenth century works of Canon HB Tristram

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Summary: The Reverend Canon HB Tristram was the first serious observer of birds in Palestine, then part of the Ottoman Empire, which he visited six times between 1858 and 1897. We focus on two of his works, published in 1865, 1867 and 1884, which provide summaries of his other works. We compared his observations with more recent ones on the raptor fauna in Palestine in its pre-1948 borders and were struck by the diversity and richness of the raptor fauna he observed. Some species have become regionally extinct in the intervening period (eg Brown Fish Owl *Ketupa zeylonensis*) and others show differences from Tristram's era (eg breeding of the Black Kite *Milvus migrans*). We suggest that further studies of old literature might generate useful indicators of human induced habitat changes and other environmental impacts, including climate change.

INTRODUCTION

The Fertile Crescent is where humans first developed agriculture, domesticating plants and animals some 12 000 years ago. This region was, and still is, rich in floral and faunal diversity because of its geography and geology. Geological changes, especially the collision of the Arabian and the African continental plates, resulted in diverse elevations from the lowest point on Earth to the heights of Mount Hermon (Jabal Alshaikh). The region's geographic location ensures the inclusion of African, Asian and Mediterranean elements in its flora and fauna (Bryce & Birkett-Rees 2016). For the avifauna of the region this also means high diversity, and hundreds of millions of birds migrate through what is essentially a bottleneck between Africa and Eurasia (Shirihai 1996, Shirihai *et al* 2000, Alon *et al* 2004). However, the rich biodiversity that allowed human civilization to flourish also meant that human population impact grew significantly both in the transition to agriculture and in the transition to the industrial age (eg Qumsiyeh *et al* 2014, Sánchez-Marco *et al* 2016).

Raptors are particularly sensitive to habitat destruction because of their position as top predators in an ecosystem (Şekerciöglü 2006, McClure *et al* 2018). However, little information on trends in raptor populations is available in this most ancient area while much more has been done in other countries (Nathan *et al* 1996). Understanding such changes is important in guiding environmental conservation efforts. Due to a long history of religious and cultural development in the Fertile Crescent, many pilgrims came here and together with scientists were able to describe many of the species. While some of their descriptions were "orientalist" in nature (Qumsiyeh & Saeed 2018), many observations made especially by 19th century travellers are directly relevant to understanding the temporal changes in fauna and flora over the past two hundred years (Goupil & Qumsiyeh 2018).

Here, we examine the work of Canon HB Tristram focusing on his seminal works on birds (Tristram 1865, 1867, 1884). We chose to focus on raptors because of their sensitivity to changes in habitats and the fact that many of these species are now on the IUCN red list of endangered or threatened species.

An introduction to HB Tristram

Henry Baker Tristram (Plate 1) was a British biblical scholar, theologian and ornithologist. Tristram was born on 11 May 1822 near Alnwick in Northumberland, England, the eldest son of the Reverend Henry Baker Tristram, vicar of Eglington. He studied in Durham

School for two years and in 1844, at Lincoln College, Oxford, graduated with a BA second class in Classics, adding an MA two years later. Tristram was ordained deacon in 1845. He was a founder member of the British Ornithologists' Union (BOU) and published a valuable series of papers on the ornithology of North Africa and Palestine in its journal *The Ibis* (eg Tristram 1859). He also published papers on other branches of natural history, such as conchology.

Tristram suffered from respiratory illness and was advised to spend time in warmer climates (Baker 1996), perhaps explaining why he traveled where he did. He studied the fauna of territories such as Bermuda (1846-49), Palestine (1858-1897), Tunisia and Algeria (1859-1861).

His name is commemorated in ornithology in the common names of Tristram's Warbler *Sylvia deserticola* (Tristram) and Tristram's Serin *Serinus syriacus* (Bonaparte) and the common and scientific names of Tristram's Grackle *Onychognathus tristrami* (Sclater) and Tristram's Storm-Petrel *Oceanodroma tristrami* (Salvin). Other taxa were also named after him such as Tristram's

Jird *Meriones tristrami* (Thomas) and Tristram's Lizard *Acanthodactylus tristrami* (Günther).

He first arrived in Palestine in the spring of 1858 and, as a clergyman, was keen to explore it from a scriptural point of view. His daughter wrote "My father set his foot for the first time on the land which he has made his own in the course of six visits of investigation [and] saw, that as far as an exploration and investigation for biblical illustration went, the land had only been scratched" (Baker 1996, p 329). He studied the fauna from 1858 onward but also helped survey the flora with his colleague, Benjamin Thompson Lowne (funded by the Royal Society). He published a number of papers culminating in some books such as *The Land of Israel: A Journal of Travels in Palestine* (1865), *The Natural History of the Bible* (1867), *The Topography of the Holy Land* (1871), and *The Survey of Western Palestine: The Fauna and Flora of Palestine* (1884). Tristram's collections of shells, plants, fish, birds and geological specimens located in London became objects of inquiry that supplemented his work.

Tristram's collection of terrestrial molluscs gathered from 1858-1897 was given to the Backhouse collection at Sunderland Museum and his collection of shells was donated to the Montrose Museum in Scotland (Baker 1996). His collections were sold to many places. Part of his collection of plants is at the herbarium at Cambridge and some of his collection of birds, which contained 265 specimens, was housed in the Natural History Museum in 1864 where one year later part of his collection of mammals was added. Many researchers working with groups like Palestine Exploration Fund (founded 1865; <https://www.pef.org.uk/>) utilized his work, although PEF later changed its focus to archaeology.

Tristram continued to travel to Palestine in 1880/81 and again in 1894 and his last visit was in 1897 at the age of 75. Over this period, his time was divided between exploring locations mentioned in the Bible and studying and collecting specimens of fauna, flora, geology and archaeology. But he was always fascinated mostly by birds (Baker 1996). He received many honours and honorary degrees: Legum Doctor (LLD) from Edinburgh (1868), Doctor of Divinity (DD) from Durham (1882) and St Andrews (1896), and fellowship of the Royal Society and President of the Tyneside Naturalists' Field Club in 1859-60 and in 1896-1897. He died in 1906.

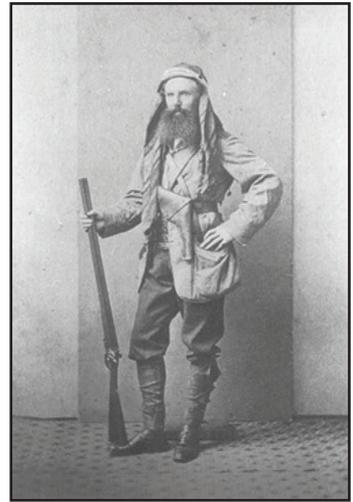


Plate I. Photograph of HB Tristram, taken in Durham, in travelling outfit worn in Palestine c1850s (from Baker 1996). Anon

Recent status of raptors compared with Tristram's time

We compared raptor records reported by Tristram in the 19th century with the known status of birds from more recent studies (Table 1). For selected species we expand the discussion because of the importance of the species or its regional extinction since the time of Tristram.

Table 1. Raptor Fauna in Historic Palestine in the 19th century from Tristram and current status after Nathan *et al* (1996) and Shirihai (1996): AV- accidental visitor, EX - extinct, PM - passage migrant; RB - resident breeder; SB - spring breeder; SV - summer visitor; WV - winter visitor. In italics is the regional Red List status from Dolev & Perevolotsky (2004): RE - Regional Extinct, VU - Vulnerable, LC - Least Concern, EN - Endangered, NT - Near Threatened, DD - Data Deficient. Tristram's notes are given after the table for selected taxa. Not all species occurring in the region are listed.

| Species | Status | Tristram's notes |
|--|------------------------------------|---|
| ACCIPITRIDAE | | |
| Eurasian Sparrowhawk <i>Accipiter nisus</i> | RB, LC | Very common (1867) |
| Cinereous Vulture <i>Aegypius monachus</i> | PM, WV, SB, RE (as breeder) | See species accounts below |
| Golden Eagle <i>Aquila chrysaetos</i> | RB, EN | See species accounts below |
| Greater Spotted Eagle <i>Aquila clanga</i> | EX, PM, WV, SV, RE (as breeder) | See species accounts below |
| Eastern Imperial Eagle <i>Aquila heliaca</i> | PM, WV, VU | Throughout the country, common "as common as the Golden Eagle" (1865) "especially Dead Sea and Araba Valley areas" (1867). More numerous than Golden Eagle, throughout country, not in summer (1884). |
| Tawny Eagle <i>Aquila rapax</i> | RB, VU | Found breeding in Mt Carmel (1865). "young nestling was brought to me in April at Jericho, and another at Jerusalem" (1867, p 252). |
| Long-legged Buzzard <i>Buteo rufinus</i> | RB, PM, WV, NT | Extremely numerous and in all parts of the country and at all seasons of the year (1884). |
| Short-toed Snake Eagle <i>Circus gallicus</i> | PM, WV, SV, LC | See species accounts below |
| Western Marsh Harrier <i>Circus aeruginosus</i> | PM, WV, SB, RE (as breeder) | See species accounts below |
| Hen Harrier <i>Circus cyaneus</i> | PM, WV, VU | Common permanent resident of the plains (1867, p 260). |
| Lammergeier <i>Gypaetus barbatus</i> | AV, RE | See species accounts below |
| Eurasian Griffon Vulture <i>Gyps fulvus</i> | RB, PM, WV, VU | See species accounts below |
| Bonelli's Eagle <i>Aquila fasciatus</i> | RB, PM, WV, EN | "rather common in every part of the country" (1865, p 252, 1867, & 1884 as <i>Aquila bonelli</i>). (Now extremely rare) |
| Booted Eagle <i>Aquila pennata</i> | PM, WV, LC | Not common, mostly north (1867) |
| White-tailed Eagle <i>Haliaeetus albicilla</i> | EX, RE (reintroduced) | See species accounts below |
| Eurasian Black Kite <i>Milvus migrans</i> | PM, RE (as Breeder) | See species accounts below |
| Red Kite <i>Milvus milvus</i> | AV, NT | Common (1865, 1884) |
| Egyptian Vulture <i>Neophron percnopterus</i> | PM, WV, SB, VU | See species accounts below |
| European Honey Buzzard <i>Pernis apivorus</i> | PM, SB, SV, VU | "observed it in November and December near the coast.. a specimen near Nazareth in April" (1867, P 255). |

| Species | Status | Tristram's notes |
|---|--------------------------------|---|
| PANDIONIDAE | | |
| Western Osprey <i>Pandion heliatus</i> | PM, WV, SV, VU | "We never paid a visit, either in winter or spring, the neighbourhood of Carmel and the Kishon without seeing the Osprey" (1865, p253). |
| FALCONIDAE | | |
| Lanner Falcon <i>Falco biarmicus</i> | RB, PM, WV, VU | "Most common of the large falcons in Palestine" (1884, p99) |
| Eleonora's Falcon <i>Falco eleonora</i> | PM, SB, SV, LC | Observed several times in spring (1867). |
| Lesser Kestrel <i>Falco naumanni</i> | PM, WV, SB, NT | Returns in March. Seen everywhere (1858, 1865 1867, 1884 as <i>Tinnunculus cenchrus</i>) |
| Peregrine Falcon <i>Falco peregrinus</i> | PM, WV, SV, RE (as breeder) | See species accounts below |
| Eurasian Hobby <i>Falco subbuteo</i> | PM, SB | Summer visitor returning rather late in spring (1884) |
| Common Kestrel <i>Falco tinnunculus</i> | RB, PM, WV, LC | Common in every part of the country, east and west, to the confines of the southern desert, throughout the year (1867, 1884). |
| TYTONIDAE | | |
| Western Barn Owl <i>Tyto alba</i> | RB, RD, NT | Met with especially around ruins (as <i>Strix flammea</i> , 1884) |
| Strigidae | | |
| Long-eared Owl <i>Asio otus</i> | RB, PM, WV, LC | Plentiful in many forest areas including district of Safed. Prefers old ruins and olive groves (1867, 1884 as <i>Scops zorca</i>). |
| Short-eared Owl <i>Asio flammeus</i> | PM, WV, SB, DD | "Winter visitant...in the hill country of the south and sometimes in the north" (1884). |
| Little Owl <i>Athene noctua</i> | RB, NT | The most common owl and in every part of the Holy Land (1867, 1884 as <i>persica</i>) |
| Eurasian Eagle Owl <i>Bubo bubo</i> | RB, RD, NT | Very Common (1867, 1884, also as <i>ascalaphus</i>) |
| Brown Fish Owl <i>Bubo zeylonensis</i> | RE | See species accounts below |
| Eurasian Scops Owl <i>Otus scops</i> | PM, WV, SB, LC | Common (1884) |
| Tawny Owl <i>Strix aluco</i> | RB, NT | Not uncommon in the forest districts of Gilead and Bashan (1884). |

Accounts of selected species

Cinereous Vulture *Aegypius monachus*

Tristram noted that "It occurs sparingly throughout the country, being chiefly seen in the wild uplands of the South and on the plains of Moab; seldom more than two together" (1884 p 95). A breeding pair was observed on the Arbel Cliffs near Tiberias by Tristram (1867). Shirihai (1996) records observations from Jerusalem, Jericho and mount Tavor and noted that after the 1980s small flocks of a few vultures were noted in the Golan Heights and Galilee (Shirihai 1996). One of these vultures apparently succumbed to thallium used as a rodenticide in Wadi Araba (Mendelssohn 1972). It is now listed as regionally extinct as a breeder (Dolev & Perevolotsky 2004).

Golden Eagle *Aquila chrysaetos*

This species was noted as "very common all the winter in the maritime plains and about Mount Camel, as well as in the south of Judaea" (Tristram 1865 p 251) and his later works found it throughout the country but mostly in the northern mountains (Tristram 1867, 1884). It is now mostly observed in the Golan Heights, the occupied West Bank and the

Negev region (Porter & Beaman 1985) and is listed as regionally Endangered (Dolev & Perevolotsky 2004).

Greater Spotted Eagle *Aquila clanga*

Tristram reports this eagle as “tolerably common but nowhere in great numbers together” (1867, p185) and later as “uncommon” (Tristram 1884). It was observed until the 1960s near the Hula plains and in the Carmel and Galilee hillsides and rarely thereafter (Paz 1986, Shirihai 1996). It is now regionally extinct as a breeding raptor (Porter & Beaman 1985, Dolev & Perevolotsky 2004).

Short-toed Snake Eagle *Circaetus gallicus*

“Most abundant of the eagle tribe, from early spring to the commencement of the winter” (Tristram 1884). Tristram noticed it on the hills near Bethlehem and also several individuals in the neighborhood (1867). Shirihai (1996) estimated 300-400 pairs in the desert zone in the 1980s but its current status needs more work.

Western Marsh Harrier *Circus aeruginosus*

This species was described as very common over marshes and in all the plains throughout the year (Tristram 1867, 1884). The 1950s era destroyed populations through the project that drained the Hula Wetlands (Shirihai 1996) and the use of insecticides in the 1950s and 1960s (Mendelssohn & Paz 1977). It is now listed as regionally extinct as a breeder (Dolev & Perevolotsky 2004).

Lammergeier *Gypaetus barbatus*

Tristram recorded the Lammergeier as being not common (1867), adding in 1884 that it is found by “the Dead Sea and the Jordan Valley, especially the ravines of the Arnon and the Callirhoe” (p 94). The last three breeding pairs in the country were recorded in the early 1980s and in an effort to save the species birds were brought to a zoo in Tel Aviv but were not successful breeders (Leshem 1984) and so the species is now considered regionally extinct (Dolev & Perevolotsky 2004).

Eurasian Griffon Vulture *Gyps fulvus*

Tristram remarked that “the numbers of the Griffon-Vultures in every part of Palestine are amazing; and they are found at all seasons of the year. I do not think that I ever surveyed a landscape without its being enlivened by the circling of a party of Griffons” (Tristram 1865, p246). In the same paper he mentioned that in one locality (Ginneseret) he counted over 500 birds. He mentioned particularly the abundance of this raptor in Wadi Qelt, near Jericho (Tristram 1865, 1867). Nowadays, the species is recorded as a rare resident, found only in small breeding colonies in the Golan Height, Galilee, the Negev and along the Jordan Valley (Shirihai 1996, Slotta-Bachmayr *et al* 2004). It is listed as regionally Vulnerable by Dolev & Perevolotsky (2004).

White-tailed Eagle *Haliaeetus albicilla*

This species was first described from Egypt and was breeding there until the 1800s (Maurer *et al* 2010). It was mentioned by Tristram (1887, 1884) as occurring mostly in the north of the country. Rare remaining pairs were reported breeding in the Hula Valley and Mount Gilboa until the 1950s but disappearing thereafter (Paz 1986, Shirihai 1996). It is listed as regionally Endangered (Dolev & Perevolotsky 2004).

Eurasian Black Kite *Milvus migrans*

In 1865, Tristram noted that: “No sooner has the Red Kite begun to retire northwards than the Black Kite, never once seen in winter, returns in immense numbers from the south and, about the beginning of March, scatters itself over the whole country, preferring especially the neighborhood of villages, where it is a welcome and unmolested guest” (p 256; also see 1884 p181). This is now a winter visitor and passage migrant especially observed along the Jordan valley and Wadi Araba, but breeding ceased in the region in the past 50 years (Porter & Beaman 1985, Shirihai *et al* 2000).

Egyptian Vulture *Neophron percnopterus*

According to Tristram this is “the most universally diffused of all the Raptors of Palestine during summer, it being impossible in any part of the country to travel a mile or two without putting up a pair” (Tristram 1865, p. 249) and especially noted it in spring (Tristram 1867, 1884). This is now an endangered species locally but supplemental feeding for it seems to make a difference (Meretsky & Mannan 1999). It is listed as regionally Vulnerable (Dolev & Perevolotsky 2004).

Peregrine Falcon *Falco peregrinus*

Tristram described Peregrine Falcons as being present throughout the year especially near the coast and watershed in the central part of the region and recorded it as a breeding species (1884). It was observed in large numbers in northern and southern mountains until the mid-1950s and was later found in the 1970s and 1980s in pairs or as single adults but not nesting and was believed decimated by the use of pesticides (Shirihai 1996). It is listed as regionally extinct as a breeder (Dolev & Perevolotsky 2004).

Brown Fish Owl *Ketupa zeylonensis*

This owl is found even in ancient remains (Gilbert 2002). Tristram (1865) collected a specimen on 8 December 1863 in Wady el Kurn near Acre close to the great ruin of Kulat-el-Kurn and observed three more in the vicinity. Another individual was collected in Wadi Hammam near Lake Tiberias in 1879 and the excitement of this caused the collection of four more specimens by Fathers Tepper and Schmitz (Shirihai 1996). According to Shirihai (1996), the last specimen was killed in 1950 and the last observation was in 1974-75. A specimen collected in Palestine (probably Galilee)



Plate 2. Specimen of Brown Fish Owl *Ketupa zeylonensis* at Talitha Kumi Lutheran school collected 1919, locality in Palestine unknown but possibly Galilee.

in 1919 is now housed at a school in Bethlehem (Plate 2). It is listed as regionally extinct (Dolev & Perevolotsky 2004).

DISCUSSION

Tristram was a meticulous researcher but rather influenced by trying to find connections of current fauna and humans to biblical issues. As a clergyman, it is apparent that he tried to link his observations to the Bible and such things sometimes verge on orientalist depictions (Goupil & Qumsiyeh 2018, Qumsiyeh & Saeed 2018). However when he spoke strictly of the native population's connection to nature he gave us some very valuable insights into issues of ethnozoology. For example he states that the "the native vocabulary for the Accipitres is much richer than for any other class. The Arabs distinguish all the Vultures except the rare *Vultur monachus*, which they confound with the Griffon. They have five names for the Falcons, three for the Eagles, and two for the Kites. They recognize both the Kestrels, the Sparrow-Hawks, and have a distinct appellation for the Harriers: while they distinguish the *Bubo asculaphus*, the White, Little, and Scops Owls" (Tristram 1865, p 242). Tristram's observations were limited by the dates he was here and the locations he visited and were sometimes uneven (eg his 1865 paper was far more rigorous than his 1859 one). However, Tristram's observations have provided the first modern scientific inventory of fauna and flora in the nineteenth century. Thus they provide a basis from which to understand the changes over the past 150-170 years in fauna including raptor populations as noted above and in Table 1. Raptors serve as indicators of environmental health and overall biodiversity (Duke 2008, Donázar *et al* 2016). Declines in raptors abundance can lead to loss of the ecological system and cascade effects on its components through altering the numbers and behaviors of their prey (Şekercioğlu 2006, Gaston *et al* 2018).

In Palestine, human pressure such as urbanization, overpopulation, and political instability have caused significant negative effects on biodiversity (Qumsiyeh *et al* 2014, 2017). For example, raptor declines have been attributed to the use in Israel of pesticides and insecticides (Mendelssohn & Paz 1977, Yom-Tov & Mendelssohn 1988). Our study of the diet of Eurasian Eagle Owl *Bubo bubo* in Wadi Al Makhrouf, Bethlehem noted that old pellets had higher diversity (arthropods, reptiles, birds and mammals) than newer pellets, which were dominated by *Rattus* (household rat) indicating a declining ecosystem (Amr *et al* 2016). The data shown above for changes since Tristram's time can enrich such studies by adding a longer-term dimension.

Top predators are excellent indicators of changes and can also themselves be an important tool in conservation efforts (Sergio *et al* 2008, Bennett & Owens 1997, Owens & Bennett 2000). The situation of raptors in Palestine needs to be studied in much more detail especially in light of the accelerating climate change impacts (Sternberg *et al* 2015). We suggest that earlier notes from past centuries should not be ignored, no matter how sparse they may be, because they shed light on changes. While museum specimens give some data, abundance data can only be gleaned from notes like those provided in Tristram's publications. Further studies should also look at DNA of specimens collected by Tristram and compare to moderns samples to understand population genetic changes (eg Nachman 2013, Hofman *et al* 2015)

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