

Research Article

Re-sighting Egyptian Vulture, *Neophron percnopterus*, (Linnaeus, 1758) with raptors survey at East Al-Hammar marshes and Abo Al-Khaseeb, south of Iraq

Mufid kassim ABOU-TURAB¹, Husham Khirullah ABDUZHARA², Adil FADHIL ABBAS³

¹Biology Department/ College of Education for Pure Science/ University of Basrah, Basrah, Iraq.

²Department of Genetic and research Branch, Islamic Azad University, Tehran, Iran.

³Department of Ecology, College of Science, University of Basrah. Iraq.

*Email: mufid.mohammed@uobasrah.edu.iq

Abstract: Birds of prey play a vital ecological role in maintaining the ecological system. To evaluate the importance of Iraqi habitat for raptor as breeding or migrating sites, this study was aimed to survey the raptors in two ecologically different habitat, including East Al-Hammar marshes and Abo Al-Khaseeb in North and South of Basrah Province, Iraq. The most significant finding in this study was re-observing the Egyptian vulture, *Neophron percnopterus* in both studying areas. The results showed the presence of 13 species of raptors. Five out of 13 species were classified by International Union for Conservation Nature (IUCN) under different threatened categories, viz. *Circus aeruginosus* and *Aquila heliaca* as vulnerable species, and *C. macrourus* as near threatened species. Additionally, East Al-Hammar showed more diversity of raptors than Abo Al-Khaseeb. In conclusion, the different habitats in Iraq showed to have a fundamental role for various bird species. More investigations are required to evaluate the habitat for this group of birds.

Keywords: Egyptian vulture, Raptors, Diversity, East Al-Hammar marshes, Abo Al Khaseeb.

Citation: Abou-Turab, M.K.; Abduzahra, H.K. & Fadhil Abbas, A. 2021. Re-sighting Egyptian Vulture *Neophron percnopterus*, (Linnaeus, 1758) with raptors survey at East Al-Hammar marshes and Abo Al-Khaseeb, south of Iraq. Iranian Journal of Ichthyology 8(ICAEAS 2021): 8-15.

Introduction

Birds of prey play a fundamental ecological role in preserving and maintaining the ecological systems (Donazar et al. 2016). Arockianathan & Balasundaram (2016) pointed out that the sanitation practices of vultures emanate from their foraging behaviour are considered as main scavengers by eating the carcasses. In addition, these birds have less ability to spread the pathogens. However, Şen (2012) mentioned that all scavengers will undergo the highest rate of extinction of functional deficient by 2100. This has been evidently supported later by many investigations that emphasised that severe and continuous decline in population of raptors globally

(McClure & Rolek 2020). In Estonia, Väli et al. (2018) observed a reduction in the wintering and breeding population size of the Goshawk and Sparrow hawk. In general, the population trend of scavengers in Europe showed a stable trend owing to the endeavours of conservation managements; conversely, in Asia and Africa. The decline trend is continuous (Safford et al. 2019) e.g. in India, *Gyps bengalensis* has suffered from extreme population deterioration (Anoop et al. 2020).

The decline tendency in population size of bird of prey is occurred as a consequence of many influential drivers such as a worldwide hunting practices (Wacher et al. 2013; Nikolov et al. 2016), habitat

destruction (McClure et al. 2018), pollution (Falk et al. 2018), high powered electrical lines (Eccleston & Harness 2018), and climate changes (Kouba et al. 2020). McClure et al. (2018) identified and classified the raptors' threats according to their global potential; agriculture and aquaculture were considered as the most prevalent risk followed by wood harvesting and hunting.

In Iraq, few attentions have been devoted to raptors distribution, diversity as well as threats factors which drive adverse effects on these birds' population. In Southern marshes of Iraq, more than one thousands individuals were detected belonging to 15 species during wintering migration in 1979, such as *Pandion haliaetus*, *Milvus migrans*, *Haliaeetus albicilla*, *Aegypius monachus*, *Circus aeruginosus*, *C. macrourus*, *Buteo rufinus*, *Aquila clana*, *A. nipalensis*, *A. heliaca*, *Falco tinnunculus*, *F. columbarius* and *F. peregrinus*. (Bedair et al. 2006). Four hundred and thirty-seven black Kites, *M. migrans* and 450 individuals of lesser kestrels, *F. naumanni* observed in east of Tharthaar Lake (Raza et al. 2011). Furthermore, about 22 species belong to two families (Falconidae and Accipitridae) were observed Northern of Iraq (Ararat 2009). Two species of raptors, including Steppe Eagles, *A. nipalensis* and Eastern Imperial Eagles, *A. heliaca* were detected in Iraq after ringing recoveries from Russia and Kazakhstan as well as alongside Iraqi border with Iran, Kuwait, and Arabia Saudia (Al-Sheikhly et al. 2017).

However, many potentials threatened pose a negative effects on raptors in Iraq. Al-Sheikhly (2011) highlighted that the raptors diversity is at the risk of anthropological impacts, such as trading and marketing of different species. Raza et al. (2011) stated the potential consequences of hunting on many species of birds of prey Iraq e.g. *Falco cherrug* is widely hunted in different sites in Anbar and Mosul governorates. Peregrine Falcons, *F. peregrinus* is mainly hunted close to large water habitats such as Duhuk Reservoir in Sulimania Governorate.

Egyptian vulture, *Neophron percnopterus*,

(Linnaeus 1758) (Accipitridae) is one of migrating species which visits Iraq during wintering period. International Union of Conservation Nature (IUCN) stated that Egyptian vulture is endangered species as a consequence of dramatic decline in their population (BirdLife International 2019). Between 1970 and 1990 the breeding population in of this species in Europe was dropped significantly (Birdlife International 2004), this decline was showed a continuous trend in most European countries such as Spain and Turkey (Garclá-Ripollés & López-López 2006). Egyptian vulture breeding period starts in March to August. Individuals of this species are territorial and mostly nesting in cliff with average of about 2 clutch size. Breeding area extend from south Europe to North Africa as well as Asia (Liberatori & Penteriani 2001). Afterwards, the migration of this species starts in September towards south to Africa and South Asia (Şen 2012). Dobrev et al. (2015) cited that the diet composition of Egyptian vulture were the ruminants of mammals with a wide range of other animals remains such as invertebrates, reptiles and aves. In the last few decades, *N. percnopterus* has not been observed a wide distribution in south of Iraq mainly in Basrah during migration period. Likewise, community composition of raptors in the south of Basrah city has not been identified clearly from previous studies, especially after habitat changes during last few decades. Hence this study was sight to elucidate the diversity of birds of prey species in Basrah at two different habitats (East Al-Hammar marsh and Abo Al-Khaseeb site) with focusing on the re-sighting the Egyptian vulture.

Materials and Methods

Study Area: The East Al-Hammar marshes locates in north of Basrah Governorate (Fig. 1) and it is broad stream water consisting about 3.500 Km² and extends for 125 km with a wide about 25 km (BirdLife International 2020). The focus of the current survey was Al-Masehab and Al-Salal areas (30°41'17.32"N, 47°35'43.25"E). These locations are considered as tidal zone area, which is affected by the tidal

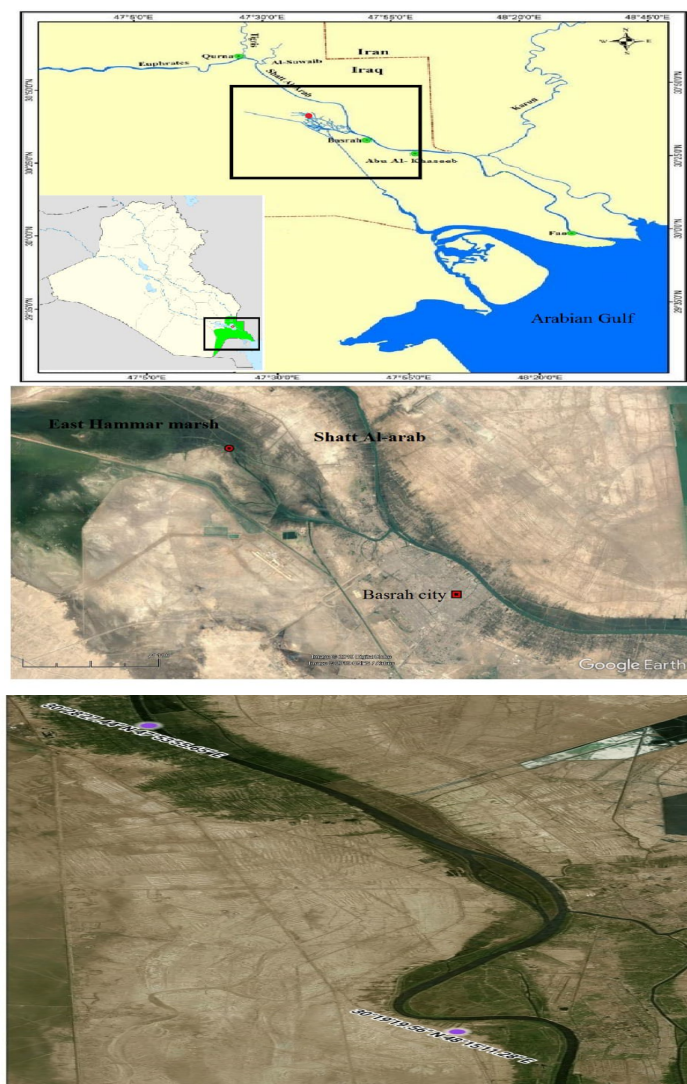


Fig. 1 and 2. East Al-Hammar Marsh (above) and Abo Al-Khaseeb (below) sites.

fluctuation of Persian Gulf. The most common vegetation covers are *Phragmites australis*, *Schoenoplectus litoralis*, *Typha domingensis* and *Juncus rigidus*. Furthermore, the date palm cultural area spreads out alongside the east and west borders of water stream. The second area extended from Abo-Alkhaseeb district to Al-Seeba city in the south of Basrah. The area is boarded from east by Shatt Al-Arab River and from the west by the road connecting the city center with Al-Faw (Fig. 2). Historically, this area is farmland area dominated with date palms. However, these features were changed throughout Iraqi-Iranian war. Currently, most of this site is semi-



Fig. 3. Egyptian vulture in flight position in East Al-Hammar Marsh.

arid with few ponds of salts water. The residents have been established many piscicultures using the natural water that supplemented by water stream branches from Shatt Al-Arab. The vegetation cover is rare and distributed scarcely *Bienertia sinuspersici*, *Alhagi maurorum*, and *Ceratonia siliqua* (Abou Turab et al. 2017). As well as date palms tree batches are obvious alongside Shatt Al-Arab River.

Bird Survey: Survey was done from September 2018 to July 2019. Line transect strategy was applied as was described by Bibby et al. (2000) and Sutherland et al. (2008). Motor boat was used to move along the water stream in marsh. While in Abo-Khaseeb to Al-Seeba car was used to transport on the road that connect between city centre and Al-Faw city, south of Basrah Governorate, sometimes walking was used in case of area located onward of road. At the commencing of each observation, area was scanned using binocular (BRESSER, 10×50). In case of detecting any individual bird belong to raptors, telescope type of Celestron was used for identification. Twice visits for each site were performed due to complete the whole area. The

Table 1. List and status of population trends of birds of prey in Al-Hammar marsh and Abo Al-Khaseeb.

Common	English	Scientific name	Stat	Order	Family
Western	marsh	<i>Circus</i>	LC		
Egyptian Vulture		<i>Neophron</i>	EN		
Hen Harrier		<i>Circus cyaneus</i>	LC		
Eurasian		<i>Accipiter nisus</i>	LC		
Pallid Harrier		<i>Circus macrourus</i>	NT	Accipitrifor	Accipitri
Greater Spotted		<i>Clanga clanga</i>	VU	mes	dae
Steppe Eagle		<i>Aquila nipalensis</i>	EN		
Eastern Imperial		<i>Aquila heliaca</i>	VU		
Short-toed Snake-		<i>Circaetus</i>	LC		
Eurasian Buzzard		<i>Buteo buteo</i>	LC		
Osprey		<i>Pandion</i>	LC		Pandioni
Lesser Kestrel		<i>Falco naumanni</i>	LC	Falconiform	Falconida
Common Kestrel		<i>Falco tinnunculus</i>	LC	Falconiform	Falconida

Table 2. List and population of birds of prey were recorded in east Al-Hammar marsh.

Common	English	Scientific name	N
Egyptian Vulture		<i>Neophron</i>	2
Hen Harrier		<i>Circus cyaneus</i>	10
Eurasian		<i>Accipiter nisus</i>	8
Greater Spotted Eagle		<i>Clanga clanga</i>	7
Steppe Eagle		<i>Aquila nipalensis</i>	9
OsprAey		<i>Pandion haliaetus</i>	3
Lesser Kestrel		<i>Falco naumanni</i>	8
Common Kestrel		<i>Falco tinnunculus</i>	11
Sum			58

Table 3. List and population of birds of prey were recorded in Abo Al-Khaseeb

Common	English name	Scientific name	No
Western	marsh harrier	<i>Circus aeruginosus</i>	9
Egyptian Vulture		<i>Neophron</i>	3
Hen Harrier		<i>Circus cyaneus</i>	11
Eurasian Sparrowhawk		<i>Accipiter nisus</i>	6
Pallid Harrier		<i>Circus macrourus</i>	27
Greater Spotted Eagle		<i>Clanga clanga</i>	31
Steppe Eagle		<i>Aquila nipalensis</i>	57
Eastern Imperial Eagle		<i>Aquila heliaca</i>	43
Short-toed Snake-eagle		<i>Circaetus gallicus</i>	6
Eurasian Buzzard		<i>Buteo buteo</i>	46
Osprey		<i>Pandion haliaetus</i>	7
Lesser Kestrel		<i>Falco naumanni</i>	12
Common Kestrel		<i>Falco tinnunculus</i>	10
Sum			26

survey started at 7 am to 12 pm. Observations were not organised in case of harsh weather conditions such as cloud with poor light and high speed wind.

Shannon-Weiner and Equitability calculation:

Shannon-Weiner was calculated using the equation of $H' = -\sum (Pi * LnPi)$, where Pi : is the proportion of each species number in the community and $LnPi$ is the logarithm for the proportion of species. While equitability for Shannon Weiner (pielou) index was calculated using the equation of $EH' = H'/LnS$, where H' is Shannon-Weiner index value and LnS , Natural logarithm of the species richness in site.

Results

Re-sighting Egyptian vulture: The most interesting point in our findings was re-sighting Egyptian Vulture, *N. percnopters* that observed flying over the studying sites (Fig. 3). This species is white plumage with black flight feathers. Head shape is small and

pointed with a long and thin bill. Egyptian vulture as a scavenger species, feeds mainly on meat of carcass, and in the studying sites mostly from ruminants of mammals with a wide range of other animal remains such as vertebrates, reptiles and birds.

Bird of prey community composition: The recorded species in this study areas were summarized in Table 1. Thirteen species of the birds of prey were observed in both sites. Two out of 13 species belonged to the family Falconidea viz. lesser kestrel, *F. naumanni* and common kestrel, *F. tinnunculus*. One out of the other eleven species, belonged to the family Pandionidae, namely osprey, *Pandion haliaetus*. While, the other ten species were from the family Accipitridae viz. western marsh harrier,

Circus aeruginosus, egyptian vulture *N. percnopters*, hen harrier, *C. cyaneus*, eurasian sparrowhawk, *Accipiter nisus*, pallid harrier *C. macrourus*, greater spotted eagle, *Clanga clanga*, steppe eagle, *A. nipalensis*, eastern imperial eagle, *A. heliacal*, short-toed snake-eagle, *Circaetus gallicus* and eurasian buzzard, *Buteo buteo*. The interesting figure of this results was that the studying areas supported ecologically five species of birds of prey that were classified under different threatened categories. As a consequent of International Union of Conservation Nature (IUCN) assessment, *C. aeruginosus* and *A. nipalensis* are classified as endangered species, *C. clanga* and *A. heliaca* are vulnerable species, while, *C. macrourus* is considered as near threatened species.

Birds of prey in Al-Hammar marsh: Fifty-eight out of 326 individuals of birds of prey were recorded in East Al-Hammar marsh (Table 2). Both *F. tinnunculus* and *C. cyaneus* are the common species in this area, their numbers were (11 and 10), respectively, in this study. While the lowest number of birds of prey was in East Al-Hammar marsh was for *N. percnopters* with 2 individuals followed by *P. haliaetus*, with 3. Three populations of birds of prey that have been categorised by IUCN under different conservation status were supported by this site which were *N. percnopters* and *A. nipalensis* as endangered species as well as *C. clanga* as vulnerable species (Tables 1, 2).

Birds of prey in Abo Al-Khaseeb South of Basrah: A total of 268 individuals were observed in south of Basrah Governorate (Table 3). The highest number species in this site was *A. nipalensis* with 57 individuals. *Buteo buteo* and *A. heliaca* followed the Egyptian vulture in their populations with 46 and 43, respectively. Whereas, the lowest populations of birds of prey were *N. percnopters* (3), *A. nisus* and *C. gallicus* with 6 for each and *P. haliaetus* (7). Five of the recorded species which highlighted by IUCN as species required a specific conservation actions were found in this site, including *N. percnopters* and *A. nipalensis* as endangered species, *C. macrourus* as

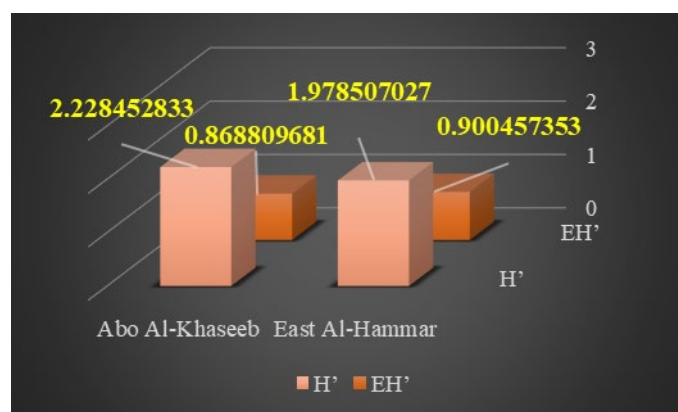


Fig 3. Shannon Weiner and equitability biodiversity indices in both studied areas.

near threatened species, and *C. clanga* and *A. heliaca* as vulnerable species (Tables 1, 3).

Birds of prey diversity: The highest diversity value for Shannon-Weiner index was calculated in Abo Al-Khaseeb site as $H' = 2.228$, while in East Al-Hammar was $H' = 1.978$. Conversely, the equitability index was the higher in East Al-Hammar marsh ($EH' = 0.900$), than that of Abo Al-Khaseeb site ($EH' = 0.869$) (Fig. 4).

Discussion

Current study aimed to record the birds of prey species in East Al-Hammar marsh and Abo Al-Khaseeb site in Basrah Governorate. The findings indicated the presence of Egyptian Vulture in the south most of East Al-Hammar marsh extending to the south of Al-Basrah Province, accurately within the west parts of Abo Al-Khaseeb city, alongside the main road. Until, 2009 no detection was mentioned for *N. percnopterus*. Salim et al. (2009) did not list *Percnopterus* during their survey in Iraqi marshes. After that, *N. percnopterus* was recorded in north of Iraq within broad survey for different animal taxa (Lahony et al. 2013). Recently, Al-Sheikhly & Al-Azawi (2019a) recorded eight species of raptors in the central marshes in Iraq that are categorized by IUCN under different threatened levels and Egyptian vulture was one of them. However, Bougain (2016) reported that Iraq is not considered as hotspot area for Egyptian vulture owing to the short time of resting

period which is spent by this species in Iraq. This outcome was concluded after satellite tracking.

The current study supported that the marshes in south of Iraq have been reverted as a target for many organisms after long term of habitat destruction. Thus, it is respected as a unique habitat having an outstanding biological and ecological diversity (Al-Zaidy et al. 2019). Our findings showed that there are 13 raptors use the habitat in Abo Al Khaseeb and the most south of Al-Hammar marshes in the south of Iraq. The number of birds of prey in Al Hammar marsh was 8 during the period of survey. However, Salim et al. (2009) reported nine raptors in this area viz. Common Kestrel, *F. tinnunculus*, Western Marsh Harrier, *C. aeruginosus*, Black-winged Kite, *Elanus caeruleus*, Long-legged Buzzard, *B. rufinus*, Hen Harrier, *C. cyaneus*, Eurasian Sparrowhawk *A. nisus*, Greater Spotted Eagle, *A. clanga*, Steppe Eagle, *A. nipalensis* and Asian Imperial Eagle, *A. heliaca*. Fazaa and et al. (2017) showed the existence of four birds of prey in the central marshes of Iraq including *A. clanga*, *A. heliacal* as vulnerable species, and Cinereous Vulture, *Aegyptius monachus* and *C. cyaneus* as near threatened species. However, Al-Sheikhly et al. (2019a) recorded 32 species of raptors in the central marshes in the south of Iraq and identified eight species were categorized under variety of conservation concern according to the IUCN.

Our findings indicated that *F. tinnunculus* is the most abundant species in Al- Hammar marsh and in Abo Al-Khaseeb, *A. nipalensis* is abundant one that may interpret by the ecologic requirements availability for both species in indicated areas. BirdLife International (2016) reported that *F. tinnunculus* can be cover a wide range of open area and from the conservation view this species necessitates required a site for perching and roosting that characterized by existence of trees. Therefore, *A. nipalensis* that found more abundant in Abo Al-Khaseeb due to the preferable. BirdLife International (2020) mentioned that Steppe Eagle prefers semi-arid and steppe areas and these characteristics can be

found in Abo Al-Khaseeb especially in the studied area. Eurasian marsh harrier was the most abundant species in central marshes in Iraq among all *circus* harriers (Sheikhly et al. 2019b)

Although the Shannon-Weiner index value was high in Abo Al-Khaseeb site, the homogeneity of species indicated that the raptors community in marsh was more homogenized than Abo Al-Khaseeb area. Habitat preferences and availability of resources which are essential for raptors seems to be more accessible in Al-Hammar marsh than in Abo Al-Khaseeb. Mainly, vegetation cover, open wide area and food resources are provided in Al-Hammar more than those of Abo Al-Khaseeb. In the south of Iraq, hunting and persecution are the most common threat for raptors as well as parasitic infection (Al-Sheikhly et al. 2019a; Hatem et al. in press). Different ecological requirements of raptors species were discussed and mentioned in detailed by many references issued by IUCN.

Conclusion

The vast geographical distribution of *N. Percnopterus* in Iraq as referenced in the current and previous works revealed manifestly to some extent that Iraqi habitat can be a selective habitat for this specie. This indication might be interpreted by characterising the *N. Percnopterus* with high ecological flexibility or genetic diversity that increase the ability of species to select and move between diverse habitats. Additionally, both habitats revealed undoubtedly their ability to provide considerable ecological requirements for birds in general and for birds of prey in especially.

References

- Mufid, K.A.T.; Abduzahra, H.K.; Nasir, N.A. & Al-Shammary, A.C. 2017. The value of small dispersed wetland areas for bird; Case of study Basrah Province/Iraq. Mesopotamia Environmental Journal 3(3).
- Afrasiab, S.R.; Mohammad, M.K.; Ali, H.H.; Al-Moussawi, A.A. & Abdul-Rassoul, M.S. 2013. Fauna

- and flora of Hawraman mountain (part one) Hawraman lowest zone, Kurdistan province north east of Iraq. *Bulletin of the Iraq Natural History Museum* 12(4): 7-34.
- Anoop, N.R.; Babu, S.; Nagarajan, R. & Sen, S. 2020. Identifying suitable reintroduction sites for the White-rumped Vulture (*Gyps bengalensis*) in India's Western Ghats using niche models and habitat requirements. *Ecological Engineering* 158: 106034.
- Samson, A. & Ramakarishnan, B. 2016. Observation of a population of Egyptian Vultures *Neophron percnopterus* in Ramanagaram Hills, Karnataka, southern India. *Vulture News* 71: 36-49.
- Al-Sheikhly, O.F. 2011. A survey report on trapping and trade of raptors in Iraq. *Wildlife Middle East News* 6(1): 6.
- Al-Sheikhly, O.F. & Al-Azawi, A.J. 2019a. The Diurnal birds of Prey (Raptors) in the Mesopotamian Marshes of Southern Iraq with notes on their conservation status. *Bulletin of the Iraq Natural History Museum* 15(4): 381-402.
- Al-Sheikhly, O.F. & Al-Azawi, A.J. 2019b. Migration pattern and wintering population of the Eurasian marsh harrier (*Circus aeruginosus*) in the Central Marshes, a wetland of international importance in southern Iraq. *Raptor Journal* 13(1): 127-137.
- Al-Sheikhly, O.F.; Al-Barazangi, A.N.; Haba, M.K.; Fazaa, N.A.; Abdulzahra, H.K.; Turab, M.K.A. & Al-Azawi, A.J. 2017. Ring Recoveries from Steppe Eagles and Eastern Imperial Eagles from the Russian and Kazakhstan Breeding Populations and a Review of Major Threats to Eagles in Iraq. *Raptors Conservation* 35: 51-61.
- Ararat, K. 2009. Key biodiversity areas: Rapid assessment of birds in Kurdistan, northern Iraq. *BioRisk* 3: 187-203.
- Bedaira, H.; Al Saad, H. & Salman, N. 2006. Iraq's southern marshes something special to be conserved; A case study. *Marsh Bulletin* 2(1): 99-126.
- Bibby, C.J.; Burgess, N.D.; Hill, D.A. & Mustoe, S. 2000. *Bird Census Techniques* (2nd edn.) London: Academic Press. 302 p.
- BirdLife International 2004. *Birds in the European Union: a status assessment*. BirdLife International, Wageningen, the Netherlands.
- BirdLife International. 2016. *Falco tinnunculus*. The IUCN Red List of Threatened Species 2016: e.T22696362A93556429. <https://dx.doi.org/10.2305/IUCN.UK.2016.RLTS.T22696362A93556429.en>. Downloaded on 23 January 2021.
- BirdLife International. 2019. *Neophron percnopterus*. The IUCN Red List of Threatened Species 2019: e.T22695180A154895845.
- BirdLife International. 2020. *Aquila nipalensis*. The IUCN Red List of Threatened Species 2020: e.T22696038A180479129. <https://dx.doi.org/10.2305/IUCN.UK.2020.RLTS.T22696038A180479129.en>. Downloaded on 23 January 2021.
- Bougain, C. 2016. Identification of important migration concentration areas of Egyptian vultures *Neophron percnopterus* from the Balkan population tracked by satellite telemetry. Training report. LIFE10 NAT/BG/000152.
- Dobrev, V.; Boev, Z.; Oppel, S.; Arkumarev, V.; Dobrev, D.; Kret, E.; Vavylis, D.; Saravia, V.; Bounas, A. & Nikolov, S. 2015. Diet of the Egyptian vulture (*Neophron percnopterus*) in Bulgaria and Greece (2005-2013). Technical Report Under Action A5 of the LIFE+ project "The Return of the Neophron" (LIFE10 NAT/BG/000152). BSPB, Sofia. 28 p.
- Donázar, J. A.; Cortés-Avizanda, A.; Fargallo, A.; Margalida, J.; Moleón, A.; Morales REYES, M.; Moreno-Opo, Z.; Pérez-García, R.; Sánchez-zapata, J.M.; Zuberogoitia J.A.; & Serrano, I.D. 2016. Roles of raptors in changing world: From flashing ships to provider's key ecosystem services. *Ardeola* 63(1): 181-234.
- Eccleston, D. & Harness, E. 2018. *Raptor Electrocutions and Power Line Collisions*. In: J. Sarasola, J. Grande, J. Negro (eds.), *Birds of Prey*. Springer, Cham. 522 p.
- Falk, K.; Møller, S.; Rigét, F.F.; Sørensen, P.B. & Vorkamp, K. 2018. Raptors are still affected by environmental pollutants: Greenlandic Peregrines will not have normal eggshell thickness until 2034, *Ornis Hungarica* 26(2): 171-176.
- García-Ripollés, C. & López-López, P. 2006. Population size and breeding performance of Egyptian vultures (*Neophron percnopterus*) in Eastern Iberian Peninsula. *Journal of Raptor Research* 40(3): 217-221.
- Hatem, A.; Abou Turab, M. & Abdul-Zahra, H.B. 2021. A survey of chewing lice of some raptors in southern Iraq, with remarks on prevalence and occurrence. *Iraqi*

- Journal of Veterinary Sciences. DOI: 10.33899/ijvs.2020.126717.1365. (In Press)
- Kouba, M.; Bartoš, L.; Bartošová, J.; Bartošová, J.; Hongisto, K. & Korpimäki, E. 2020. Interactive influences of fluctuations of main food resources and climate change on long-term population decline of Tengmalm's owls in the boreal forest. *Scientific Reports* 10(1): 1-14.
- Liberatori, F. & Penteriani, V. 2001. A long-term analysis of the declining population of the Egyptian vulture in the Italian peninsula: distribution, habitat preference, productivity and conservation implications. *Biological Conservation* 10: 1381-389.
- McClure, C.J. & Rolek, B.W. 2020. Relative conservation status of bird orders with special attention to raptors. *Frontiers in Ecology and Evolution* 8: 420
- McClure, C.; Johnson, J. Schulwitz, J.; Virani, S.; Davies, M.; Symes, R.; Wheatley, A.H.; Thorstrom, R.; Amar, A.; Buij, R.; Jones, V., Williams, N.; Buechley, E. & Butchart, S. 2018. State of the world's raptors: Distributions, threats, and conservation recommendations. *Biological Conservation* 227: 390-402.
- Nikolov, S.C.; Barov, B.; Bowden, C. & Williams, N. P. 2016. Flyway action plan for the conservation of the Balkan and Central Asian populations of the Egyptian Vulture *Neophron percnopterus* (EVFAP). BSPB Conservation Series No. 32, Sofia, CMS Raptors MoU Technical Publication No. 4, Abu Dhabi. 124 p.
- Raza, H.; Fadhel, O.; Ararat, K.; Haba, M. & Salim, M. 2011. Key biodiversity areas project report. Animal and bird trade & hunting in Iraq. *Nature Iraq & Iraqi Ministry of Environment*. Publication No: NI-0711-01
- Safford, R.; Andevski, J.; Botha, A.; Bowden, C.; Crockford, N.; Garbett, R.; Margalida, A.; Ramírez, I.; Shobrak, M.; Tavares, J. & Williams, N. 2019. Vulture conservation: the case for urgent action. *Bird Conservation International* 29: 1-9.
- Şen, B. 2012. Breeding ecology of the Egyptian vulture (*Neophron percnopterus*) population in Bey pazari. A thesis submitted to the Graduate School of Natural and Applied Science of Middle East Technical University.
- Sutherland, W.; Newton, I. & Green, R. 2008. *Bird Ecology and Conservation*. A hand book of techniques. United States, Oxford University Press. 385 p.
- Väli, Ü.; Elts, J. & Pehlak, H. 2018. Are common bird monitoring schemes and opportunistic observations appropriate for estimating raptor trends? *Bird Study* 65(sup1): S35-S42.
- Wacher, T.; Newby, J.; Houdou, I.; Harouna, A. & Rabeil, T. 2013. Vulture observations in the Sahelian zones of Chad and Niger. *Bull ABC* 20: 286-199.