



## THE BREEDING AVIAN FAUNA OF MARMARIK RESERVOIR, KOTAYK REGION, ARMENIA

M.V. ASIKYAN<sup>1</sup>, S.A. AGHAYAN<sup>1,2</sup>, G.G. GRIGORYAN<sup>2</sup>,  
E.A. KHACHATRYAN<sup>1</sup>, K.E. AGHABABYAN<sup>1</sup>

<sup>1</sup>Yerevan State University, Chair of Zoology

<sup>2</sup>Scientific Center of Zoology and Hydroecology NAS RA, Laboratory of Molecular Parasitology

As a result of human activity, ecological shifts always occur in nature. Being an indicator of ecosystem birds are important objects to monitor regularly. We conducted research on the bird species composition in the Marmarik reservoir area, Kotayk Marz, Armenia where the renovating and construction was conducted. For our research we used transect and mist net methods and collected literature data referring to bird biodiversity in our study area for the last years. The results revealed that the reconstruction of Marmarik reservoir affected bird species composition.

### *Water reservoirs – birds' diversity – construction*

Մարդու գործունեության արդյունքում բնության մեջ միշտ տեղի են ունենում շրջակա միջավայրի փոփոխություններ: Որպես էկոհամակարգի ինդիկատոր՝ թռչունները կարևոր օբյեկտներ են կանոնավոր մոնիթորինգի համար: ՀՀ Կոտայքի մարզի Մարմարիկի ջրամբարի տարածքում, որտեղ իրականացվել են վերանորոգման և շինարարական աշխատանքներ, իրականացրել ենք թռչունների տեսակային կազմի ուսումնասիրություն: Մեր ուսումնասիրությունների համար օգտագործել ենք տրանսեկտային և ցանցային մեթոդները, ինչպես նաև հավաքագրել ենք գրականության տվյալներ՝ կապված վերջին տարիներին մեր ուսումնասիրության տարածքում թռչունների կենսաբազմազանության հետ: Արդյունքները ցույց են տվել, որ Մարմարիկի ջրամբարի վերակառուցումն ազդել է թռչունների տեսակային կազմի վրա:

### *Ջրամբարներ – թռչունների բազմազանություն – շինարարություն*

В результате деятельности человека в природе всегда происходят экологические сдвиги. Птицы, как индикаторы экосистем, являются важным объектом для регулярного мониторинга. Нами было проведено исследование видового состава птиц в районе Мармарикского водохранилища Котайкской области Армении, где велись ремонтно-строительные работы с целью изучения изменения разнообразия в исследуемых зонах. Для наших исследований мы использовали трансектный метод и метод ловли сетями, а также собрали литературные данные, касающиеся биоразнообразия птиц в исследуемой территории за последние годы. Результаты показали, что реконструкция Мармарикского водохранилища позитивно повлияла на видовой состав птиц.

### *Водоёмы – разнообразие птиц – строительство*

During the recent years we observe considerable changes in environment and ecosystems due to human activity, settlement expansion and other factors [5]. Nature protection is impossible without population state and quantity monitoring. Particularly changes can affect the birds' biodiversity which are an important part of natural ecosystems. Birds are known to be bio indicators of various landscapes and are crucially affected by human activities [7]. For effective research of biodiversity you need to study the whole area conditions and animal species [8,7].

There are more than 80 natural and artificial ponds in Republic of Armenia, including the Marmarik reservoir. This reservoir is located between Hankavan and Artavaz villages in Kotayk region. It is situated on river Marmarik and is powered by its water. The volume of Marmarik reservoir is 24 cubic meters and the capacity storage is 23 cubic meters. The height of reservoirs rampart is 55 meters. Marmarik reservoir had will be fully poured in 2014[11].

Marmarik reservoir is surrounded by Pambak and Tsaghkuni mountain ranges. The two sides of its area differ with their landscapes. The slopes of Pambak Mountains are mostly covered by mountain-steppe and mountain-meadow plants. There are also pine forests on Pambak slopes. The slopes of Tsaghkuni Mountains are mostly covered by mountain-forest landscapes and mountain-meadows in higher areas. 148 species of edible plants, spices and herbs are found in investigated area. Some of these plants are included in Red Book of Armenia as endangered species [2,12,10]. Despite the landscape variations and the specific structure of ecosystem there is a lack of published data about birds in Marmarik reservoir area and adjacent territories. In the light of continued threats to birds through climate changes and anthropogenic pressures, we undertook further surveys of Marmarik reservoir from 2007.

The aim of our work is to observe the breeding avian community in Marmarik reservoir area taking into consideration reservoir reconstruction. We also aim to check the area for compliance to Important Bird Area (IBA) criteria 6].

The Important Bird Areas (IBA) programme of BirdLife International is a global initiative aimed at identifying and protecting a network of critical sites for the conservation of the world's birds. There are 18 IBAs in Armenia and only three of them are Special Protection Areas (Lake Arpi IBA, Khosrov IBA, Lake Sevan IBA) [9].

**Materials and methods.** We have studied bird diversity in these areas using line transects and mist nets methods. Our research team had collected data during 2007, 2008, 2011, 2012, 2015 years. The studies were done during the breeding season so we have a lack of data concerning to wintering species. We Investigated number of species and changes due to reservoir exploitation. The birds' conservation status was obtained from books and online databases [1, 4].

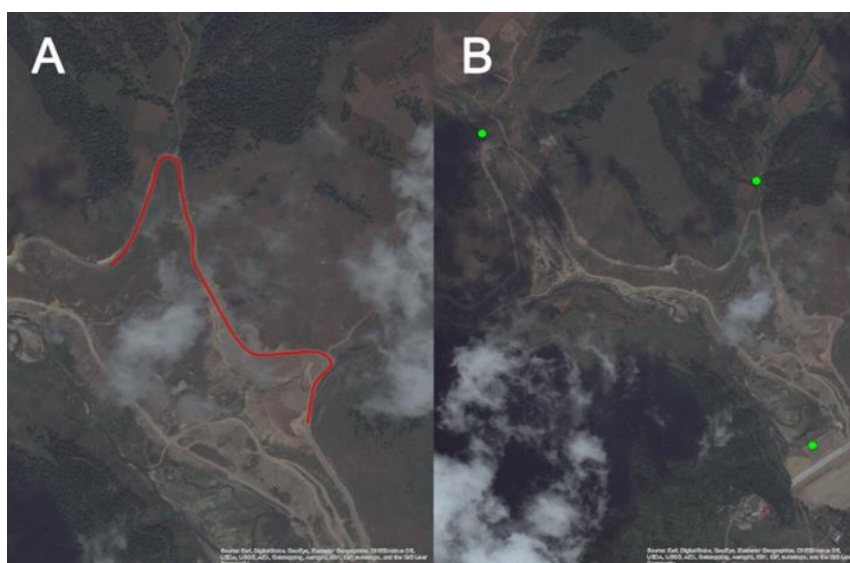
The analyzing of maps from "Field Guide to Birds of Armenia" [7] revealed that potentially there can be 120 bird species in our target area. All of them were referred to the book publication year 1997.

Using line transect method the researches were done during 14 days in June and July, for about 2-3 times a day, from 07:00 – 08:00 am, 14:00 – 15:00 pm and 18:00 – 20:00 pm. The birds recorded during line transect, were identified according to the "Field Guide to Birds of Armenia". (fig. 1-A)

Birds were also captured by mist nets (black nylon, 38-mm mesh, four- to five shelf, 2.636–9-m mist nets, Avinet, Inc., Dryden, New York, USA). The nets were checked once in each 1 hour from 07:00am to 20:00pm. The captured birds were identified according to the "Field Guide to Birds of Armenia". (fig. 1-B)

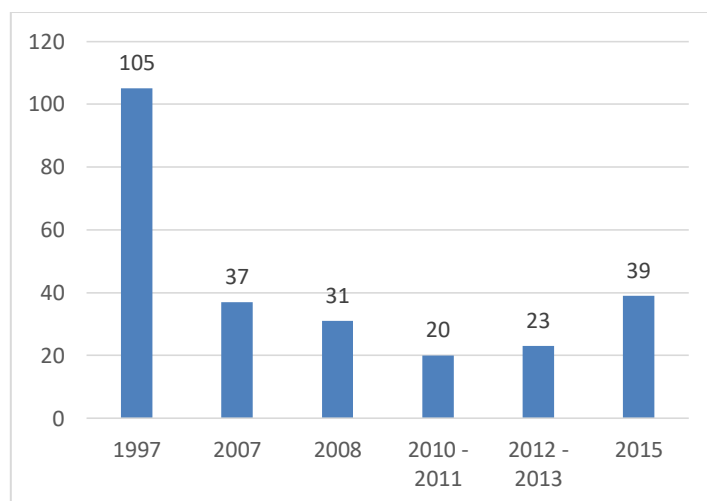
We checked the area for compliance to 3 main IBA criteria:

1. Significant assemblages of birds occur (defined as 5000 birds at a national level, or 20000 globally)
2. Significant numbers of restricted-range or biome-specific birds occur
3. Significant numbers of threatened birds occur (i.e. globally and nationally threatened Red Data species), or 1% of the world population of any species occurs.



**Picture 1.** A – Line transect pathway. B – Mist net points.

**Results and Discussion.** Our observations resulted 57 species of breeding birds in studied area (tab. 1). Three new species were identified for Marmarik region not mentioned in Birds of Armenia guidebook: *Sylvia borin*, *Turdus philomelus*, *Erythacus rubecula*. 19 of observed species are registered in Red Book of Armenia as vulnerable. The status of *Falco naumanni* is unknown due to lack of data. We have studied also bird community changes during renovation of Marmarik reservoir (fig. 1).



**Fig. 1.** The number of bird species registered by years

**Table 1.** Marmarik reservoir and adjacent area bird species list. The grey highlighted species do not breed in Armenia. The red highlighted species are registered in Red Book of Armenia

Lat. Name	Eng. name	1997	2007	2008	2010 - 2011	2012 - 2013	2015
<i>Gypaetus barbatus</i>	Lammergeier	+					
<i>Gyps fulvus</i>	Eurasian Griffon Vulture	+					
<i>Aegypius monachus</i>	Eurasian Black Vulture	+					
<i>Circus gallicus</i>	Short-toed Snake-eagle	+					
<i>Circus cyaneus</i>	Northern Harrier	+					
<i>Circus macrourus</i>	Pallid Harrier	+					
<i>Circus pygargus</i>	Montagu's Harrier	+					
<i>Accipiter brevipes</i>	Levant Sparrowhawk	+					
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	+	1				
<i>Buteo buteo</i>	Common Buzzard	+	4	5			2
<i>Buteo rufinus</i>	Long-legged Buzzard	+	2	2			
<i>Aquila pomarina</i>	Lesser Spotted Eagle	+	2	1			
<i>Aquila clanga</i>	Greater Spotted Eagle	+					
<i>Aquila nipalensis</i>	Steppe Eagle	+					
<i>Aquila heliaca</i>	Imperial Eagle	+					
<i>Aquila chrysaetos</i>	Golden Eagle	+		1			
<i>Hieraetus pennatus</i>	Booted Eagle	+	1	2			
<i>Falco naumanni</i>	Lesser Kestrel	+					
<i>Falco tinnunculus</i>	Common Kestrel	+	3	5			
<i>Falco vespertinus</i>	Red-footed Falcon	+					
<i>Falco columbarius</i>	Merlin	+					
<i>Falco subbuteo</i>	Eurasian Hobby	+				1	
<i>Falco biarmicus</i>	Lanner Falcon	+					
<i>Falco peregrinus</i>	Peregrine Falcon	+					
<i>Tadorna ferruginea</i>	Ruddy shelduck	+					
<i>Anas penelope</i>	Eurasian Wigeon	+					
<i>Alectoris chukar</i>	Chukar	+					
<i>Tetrao mlokosiewiczii</i>	Caucasian Grouse	+					
<i>Tetraogallus caspius</i>	Caspian Snowcock	+					
<i>Perdix perdix</i>	Grey Partridge	+					
<i>Coturnix coturnix</i>	Common Quail	+	1				
<i>Anthropoides virgo</i>	Demoiselle Crane	+					
<i>Crex crex</i>	Corn Crane	+					
<i>Vanellus vanellus</i>	Northern Lapwing	+					
<i>Actitis hypoleucos</i>	Common Sandpiper	+	1	2			
<i>Scolopax rusticola</i>	Eurasian Woodcock	+					
<i>Larus armenicus</i>	Armenian Gull	+	5	4			4
<i>Columba oenas</i>	Stock Dove	+					
<i>Columba palumbus</i>	Common Wood-pigeon	+					
<i>Streptopelia decaocto</i>	Eurasian collared dove	+					
<i>Cuculus canorus</i>	Common Cuckoo	+	2	2			
<i>Otus scops</i>	Eurasian Scops-owl	+					
<i>Bubo bubo</i>	Eurasian Eagle-owl	+					
<i>Athene noctua</i>	Little Owl	+					
<i>Asio otus</i>	Long-eared Owl	+					
<i>Caprimulgus europaeus</i>	European Nightjar	+					
<i>Apus apus</i>	Common Swift	+					
<i>Apus melba</i>	Alpine Swift	+	50	50			40
<i>Merops apiaster</i>	European Bee-eater	+					

Table 1. Continious

Lat. Name	Eng. name	1997	2007	2008	2010 - 2011	2012 - 2013	2015
<i>Coracias garrulus</i>	European Roller	+					
<i>Upopa epops</i>	Hoopoe	+	6	8			6
<i>Picus viridis</i>	Eurasian Green Woodpecker	+					
<i>Dryocopus martius</i>	Black Woodpecker	+					
<i>Dendrocopos major</i>	Greater Spotted Woodpecker	+	1	1		2	
<i>Dendrocopos medius</i>	Middle Spotted Woodpecker	+					
<i>Melanocorypha calandra</i>	Calandra Lark	+					
<i>Melanocorypha bimaculata</i>	Bimaculated Lark	+					
<i>Calandrella brachydactyla</i>	Greater Short-toed Lark	+					
<i>Alauda arvensis</i>	Eurasian Skylark	+	12	15			2
<i>Eremophila alpestris</i>	Horned lark	+					
<i>Ptyonoprogne rupestris</i>	Eurasian Crag Martin	+	10	5			
<i>Hirundo rustica</i>	Barn Swallow	+	10	5			2
<i>Delichon urbica</i>	Northern House-martin	+	5	7			
<i>Motacilla flava</i>	Yellow Wagtail	+					
<i>Motacilla cinerea</i>	Grey Wagtail	+				1	
<i>Motacilla alba</i>	White wagtail	+					
<i>Anthus campestris</i>	Tawny Pipit	+					2
<i>Anthus trivialis</i>	Tree Pipit	+				4	2
<i>Anthus pratensis</i>	Meadow Pipit	+					
<i>Anthus spinoletta</i>	Water Pipit	+	7	6		3	2
<i>Lanius collurio</i>	Red-backed Shrike	+	8	8	1		10
<i>Cinclus cinclus</i>	White-throated Dipper	+	1				2
<i>Troglodytes troglodytes</i>	Winter Wren	+	1		3	1	
<i>Prunella modularis</i>	Dunnock	+			15	8	2
<i>Luscinia luscinia</i>	Thrush Nightingale	+					
<i>Phoenicurus ochruros</i>	Black Redstart	+	5				
<i>Phoenicurus phoenicurus</i>	Common Redstart	+			19	8	
<i>Saxicola rubetra</i>	Whinchat	+	6	8		2	2
<i>Saxicola torquata</i>	Common Stonechat	+					2
<i>Oenanthe oenanthe</i>	Northern Wheatear	+	8	8			2
<i>Monticola saxatilis</i>	Rufous-tailed Rock-thrush	+	2	4			
<i>Turdus torquatus</i>	Ring Ouzel	+					
<i>Turdus pilaris</i>	Fieldfare	+					
<i>Turdus viscivorus</i>	Mistle Thrush	+	5	8			
<i>Cettia cetti</i>	Cetti's Warbler	+	3				
<i>Locustella naevia</i>	Grasshopper Warbler	+					
<i>Phylloscopus trochilus</i>	Willow Warbler	+				8	
<i>Phylloscopus collybita</i>	Eurasian Chiffchaff	+					
<i>Phylloscopus lorenzti</i>	Blyth's leaf warbler	+	7	4	51	20	25
<i>Phylloscopus trochiloides</i>	Greenish Warbler	+			22		
<i>Sylvia atricapilla</i>	Blackcap	+					
<i>Sylvia communis</i>	Greater Whitethroat	+	14	16	22	9	2
<i>Sylvia curruca</i>	Lesser Whitethroat	+					
<i>Aegithalos caudatus</i>	Long-tailed Tit	+					
<i>Parus major</i>	Great Tit	+	11	6	9	6	2
<i>Parus caeruleus</i>	Blue Tit	+			22	2	2
<i>Sitta europaea</i>	Eurasian Nuthatch	+			1		
<i>Certhia familiaris</i>	Eurasian tree-creeper	+				1	
<i>Miliaria calandra</i>	Corn Bunting	+					

Table 1. Continious

Lat. Name	Eng. name	1997	2007	2008	2010 - 2011	2012 - 2013	2015
<i>Emberiza citrinella</i>	Yellowhammer	+					
<i>Emberiza hortulana</i>	Ortolan Bunting	+					
<i>Fringilla coelebs</i>	Chaffinch	+			5	1	4
<i>Fringilla montifringilla</i>	Brambling	+					
<i>Serinus pusillus</i>	Red-fronted Serin	+				1	3
<i>Carduelis chloris</i>	European Greenfinch	+					2
<i>Carduelis carduelis</i>	European Goldfinch	+	4	6			
<i>Carduelis flavirostris</i>	Twite	+					
<i>Carduelis cannabina</i>	Eurasian Linnet	+					
<i>Carpodacus erythrinus</i>	Common Rosefinch	+	8	9	10	1	2
<i>Pyrrhula pyrrhula</i>	Eurasian Bullfinch	+			11	7	2
<i>Passer domesticus</i>	House Sparrow	+					10
<i>Sturnus roseus</i>	Rose-coloured Starling	+					
<i>Sturnus vulgaris</i>	Common Starling	+	8	6			
<i>Garrulus glandarius</i>	Eurasian Jay	+			2	4	3
<i>Pica pica</i>	Black-billed Magpie	+	6	9			6
<i>Corvus corone</i>	Carrion Crow	+	4	8			5
<i>Corvus corax</i>	Common Raven	+	1	1			
<i>Dendrocopos medius</i>	Middle Spotted Woodpecker	+			1		
<i>Sylvia borin</i>	Garden Warbler				2		
<i>Riparia riparia</i>	Sand Martin	+	50	48	3	50	50
<i>Turdus merula</i>	Eurasian Blackbird	+			20	4	5
<i>Turdus philomelos</i>	Song Thrush						
<i>Erythacus rubecula</i>	European Robin				1	1	

We have revealed that there are probably 1000 individual birds in Marmarik reservoir area. The estimations were made in the following way: the data collected from each year has been brought to average value and the average data collected during 5 years was also brought to average value.

The selection of Important Bird and Biodiversity Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations [3]. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations, and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

Table 2. Conformity of Marmarik reservoir and adjacent areas to IBA criteria

	IBA criteria	Marmarik reservoir
Number of birds	5000	≈1000
Number of species	>1%	1.15%
Habitat characteristic species	Sufficient number	Data analyzing

As appears from the comparison the Marmarik reservoir area alone does not comply with the IBA criteria.

According to the researches there is a high biodiversity of birds in Armenia and we can consider a significant part of those in Hankavan Marmarik reservoir area [1, 4].

The reservoir has a vital importance for the birds and can affect the quantity of birds as well as the species composition and abundance.

The renovation of Marmarik reservoir was finished in 2012 and we observed bird biodiversity increase after 2012. This reflects that the reparation works negatively influenced on birds' habitat and caused the decrease of biodiversity. We found that the renovation of Marmarik reservoir from 2006 had an influence on birds' diversity. There were 37 breeding bird species registered in 2007 in Marmarik region including 3 Red Book species. In 2008 there were 32 breeding bird species registered with 4 Red book species. The influence of reservoir renovation works' is observed in 2007-2008 years, as the diversity of birds decreased and in 2010-2011 reached its lowest point. We considered only 19 breeding bird species in our study region from 2010 to 2011. From 2012 to 2015 the bird biodiversity gets regulated and reaches its normal point as in 2007. In 2012 our research team registered 22 breeding bird species and 1 nonbreeding species and in 2015 there were 30 breeding species with 1 of them registered in Red Book.

We also found out that the area does not comply with the criteria to be involved in IBA list, however year around studies might increase number of species and birds observed in the area

Our future work will include a full year research for finding out the biodiversity of wintering and migrating bird species in studied areas.

### CONCLUSIONS

- Despite Marmarik reservoir small area it is known for landscapes variety and a great diversity of bird species.
- The studies revealed that the diversity of birds in research area had ranged in from 1997 to 2015 due to renovation of Marmarik reservoir.
- Comparing the Marmarik reservoir area conditions we can conclude that there is compliance to two of three main IBA criteria.

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