sciendo

Ornis Hungarica 2023. 31(2): 89–98.
DOI: 10.2478/orhu-2023-0021

Long-term population changes of the Moustached Warbler *(Acrocephalus melanopogon)* in a Central Hungarian wetland habitat

László Bozó[1], Ákos Németh[2] & Tibor Csörgő[3]

Received: July 12, 2023 – Revised: September 29, 2023 – Accepted: September 30, 2023

Bozó L., Németh, Á. & Csörgő, T. 2023. Long-term population changes of the Moustached Warbler *(Acrocephalus melanopogon)* in a Central Hungarian wetland habitat. – Ornis Hungarica 32(2): 89–98. DOI: 10.2478/orhu-2023-0021

Abstract In recent years, the breeding populations of many migratory songbird species have declined in the Carpathian Basin. However, there may be significant differences between different geographical regions, as most species have a much higher chance of successful breeding in protected areas. This is also the case for the Moustached Warbler, one of the most habitat-specialist passerine. It colonises only perennial, unharvested reedbeds, therefore its conservation management is essential. We studied the population changes of this species between 2001 and 2022 at Lake Kolon in Izsák, based on bird ringing data from 10–24 July. Data of 12,817 ringed and 5,075 recaptured birds were used in the analyses. The annual capture rate decreased significantly during the study period. The proportion of juveniles was higher at higher water levels during the whole breeding season. In contrast, when looking at winter and first and second broods separately, water level had no effect on the juvenile/adult ratio. This is because the birds compensate for unsuccessful first broods by increasing the proportion of second and replacement broods. If the first broods are successful, the ratio of second and replacement broods will be lower. As reed management is practically non-existent in this area, the perennial reedbeds provide suitable nesting conditions for the species. Changes in the wintering sites may be responsible for the declining trend. Protection of the area is of particular importance for the conservation of the species.

Keywords: reed management, precipitation, Passerine migration, bird ringing

Összefoglalás Az utóbbi években számos vonuló énekesmadár-faj fészkelő állománya csökkent a Kárpát-medencében. Jelentős eltérések lehetnek azonban különböző földrajzi régiók között, mivel a védett területeken a legtöbb faj esélyei jóval magasabbak a sikeres költésre. Ez jellemző a fülemülesitkére is, amely egyike a legspeciálisabb élőhelyigényű énekesmadaraknak. Csak többéves, aratatlan nádas-gyékényesekben telepszik meg, így ezek természetvédelmi kezelése elengedhetetlen a faj számára. Munkánk során 2001 és 2022 között az izsáki Kolon-tónál vizsgáltuk meg a faj állományváltozását a július 10–24. között gyűrűzési adatok alapján. Az elemzések során 12 817 gyűrűzött és 5075 visszafogott madár adatát használtuk fel. A vizsgált időszakban az éves fogásszám szignifikánsan csökkent. A teljes költési szezon alatti magasabb vízszint esetén a fiatalok aránya magasabb volt, mint ellenkező esetben. Ezzel szemben a téli, valamint az első és második költések időszakát külön vizsgálva, a vízszint nem volt befolyással a fiatal/öreg arányra. Ennek az az oka, hogy a madarak a másod- és pótköltések arányának növelésével kompenzálják a sikertelen első költéseket. Ha az első költések sikeresek, akkor a másod- és pótköltések aránya alacsonyabb lesz. Mivel nádgazdálkodás ezen a területen gyakorlatilag nincs, így a sokéves nádas megfelelő fészkelési feltételeket biztosít a faj számára. A trendszerű állománycsökkenés hátterében a telelőhelyeken történt változások állhatnak. A terület védelme kiemelten fontos a faj megóvása érdekében.

Kulcsszavak: nádgazdálkodás, csapadék, énekesmadár vonulás, madárgyűrűzés

[1] *Eötvös Loránd University, Department of Systematic Zoology and Ecology, 1117 Budapest, Pázmány Péter sétány 1/c, Hungary*
[2] *Bird Protection Society of Kiskunság, 6070 Izsák, Matyó dűlő 64., Hungary*
[3] *Eötvös Loránd University, Department of Anatomy, Cell- and Developmental Biology, 1117 Budapest, Pázmány Péter sétány 1/c, Hungary*
** corresponding author, e-mail: bozolaszlo91@gmail.com*

Introduction

The Moustached Warbler *(Acrocephalus melanopogon)* is a member of the striped reed warbler group (Leisler *et al.* 1997). It has three subspecies. One of the two distribution areas of the nominate race *(A. m. melanopogon)* is contiguous from the Danube Delta to the Don River. Breeding birds winter on the western and southern coast of Asia Minor and the southern Balkan Peninsula. The other population has a patchy distribution in northern Morocco and Tunisia, on the Mediterranean coast and inland areas of the Iberian Peninsula, in patches on the Balearic Islands and Sardinia, Corsica, Sicily, the Rhone, the Appennine Peninsula along the Po and Arno rivers, the Carpathian Basin, the Balkan Peninsula, and the interior of Asia Minor (Dyrcz 2006). Occasional breeding occurs in the Czech Republic (Hudec *et al.* 1995). In Switzerland, an isolated small population has developed in the last decade (Volet & Burkhardt 2006). The European population size is estimated to be between 76,100 and 124,000 pairs, but this still needs validation (Birdlife International 2016). The largest European populations are found in the Danube Delta, southern Azerbaijan, the lower Don River, Hungary and Austria (Keller & Sokolov 2020).

The subspecies *A. m. albiventris* is found along the coast of the Sea of Azov, the lower Don river and adjacent areas of southeastern Ukraine and southern Russia, while *A. m. mimicus* nests in southern and eastern Turkey, Iraq, southern Russia along the lower Volga River, northern Iran and as far east as eastern Kazakhstan (Dyrcz 2006).

It is a species with special habitat requirements, as it colonises only perennial, unharvested reedbeds (Csörgő 1995, Vadász *et al.* 2008a), which is the main reason for its patchy distribution (Keller & Sokolov 2020).

Western populations are resident or short-distance migrants and typically spend the winter in the Mediterranean. Eastern populations winter in the Levant, Mesopotamia, southeastern Afghanistan, Pakistan (Indus Valley) and northwestern India (Dyrcz 2006).

The first individuals return from wintering grounds in late February, with a migration peak only in mid-March. The earliest nesting species among reed warblers. In the Carpathian Basin, the first clutches are laid between April and May, the second between late May and early July (Haraszthy 2019). After the breeding period, the dispersal movements of the birds starts late July and the migration finishes as late as early November (Kovács & Konyhás 2004, Németh & Králl 2009).

In several Mediterranean countries (Spain, France, Italy, Turkey), the population is in decline (Birdlife International 2016). The Tuscan population has declined by about 40% since 1990 (Keller & Sokolov 2020), but in Europe is classified as a species with stable population by the IUCN (International Union for Conservation of Nature), as there are no specific surveys or population change data from the eastern part of its range (Birdlife

International 2016). In Russia, a slight northern expansion of the population has been observed (Keller & Sokolov 2020).

A significant part of the European population is found in the Carpathian Basin, with about 10% in Hungary (Keller & Sokolov 2020). Its distribution is patchy. The most important nesting sites are Lake Fertő with 10,000–20,000 pairs (Vadász *et al.* 2011) and Lake Kolon in Izsák with 800–1,000 pairs (Biró & Morvai 2016). Other important nesting sites are Lake Velencei (BirdLife Hungary 2018a), Kis-Balaton (BirdLife Hungary 2018b), Kunkápolnási-mocsár (Kovács & Konyhás 2004) and Ócsai-turjánvidék (Csörgő *et al.* 2016). It also occurs in lowland saline lakes, in the Slovakian Párizsi-mocsár (Trnka 2003) and sporadically in backwaters and fishponds (Haraszthy 2019).

In Hungary, it was still considered a common species in the 1980s (Keve 1984). Its population was estimated at 1,000–1,200 pairs between 1979 and 1993 and in 1998 (Magyar *et al.* 1998, Kovács & Konyhás 2004), and at 3,000–5,000 pairs between 2005 and 2007 (Hadarics & Zalai 2008). Recent estimates suggest that this number may be around 2,500–3,500 pairs, but the trend at the national level is unknown (Csörgő & Gyurácz 2021).

During our work, we estimated the local population change of the species based on data from Lake Kolon in Izsák between 2001 and 2022. We aimed to know whether the population change was related to the current water level of Lake Kolon as one of the most important environmental conditions that could affect the population of the species. Given that it is possible to determine the age of the birds (Svensson 1992, Demongin 2016), we also examined the difference in the number of annual captures between the different age groups as well as the ratio of juveniles and adults.

Material and Methods

The data was collected at Lake Kolon, located in the Kiskunság National Park. It declared protected in 1975, and its current extent is 3,057.9 hectares. Lake Kolon is one of the country's most extensive freshwater wetlands and marshes. Usually, during the spring high water level, water depths can reach 1.5 m in some places, especially in the north, but during the year, water level fluctuations can reach 1 m. Bird ringing were carried out here between 2001 and 2022, in the period of 10–24 July each year, using standard methods. The survey was carried out on the Lower Matyó embankment, which crosses the lake in an east-west direction, using 133 Japanese type mist-nets (each 2.5 m high and 12 m long) divided into 4 blocks. The study area covers the entire cross-section of the lake. On both sides of the embankment, a narrow band of reedbeds, while on the embankment, grey willows *(Salix cinerea)* can be found. Shrub encroachment has been prevalent on the western side of the study area in recent times. Here, this process has also occurred in small areas of the reedbeds. The quality of the reed is not uniform across the study area. The east side of the lake has a lower thinner dense reed, while the west side has a thinner thicker reed.

A total of 12,817 birds were ringed during the study period. Of these, 5,075 different individuals were recaptured 6,763 times at the ringing site during the same period. Age determination was possible for 12,746 ringed birds (4,142 adults and 8,604 juveniles).

Chi-square test was used to compare the number of annual captures, while linear regression was used to establish the trend. Multiple regression analyses were used to examine the relationship between water level data and annual captures in winter (January–March), during the first brood (April–May), during the second brood (June–July) and between January and July. Each breeding period was defined based on published data (Haraszthy 2019). For investigating the association between the number of juvenile per pair and average water level, we used Spearman's correlation. Provided that trapping efficiency was constant (including numbers, types and location of nets) in each year, the proportion of juveniles captured should constitute a valid index of annual changes in breeding productivity (Peach *et al.* 1996, Dunn & Ralph 2004). Given that the species is monogamous (Dyrcz 2006) and the fact that dispersal movements have not yet started, it was possible to estimate the number of juveniles per pair. Capture probability was also similar for the two sexes as both males and females are involved in the incubation (Haraszthy 2019). For this reason, the number of adult birds caught in a given year was divided by two, and the number of juvenile birds caught in that year was then divided by this value. For statistical analyses, the program Past 3.14 was used (Hammer *et al.* 2001).

Results

The number of annual captures was significantly different ($\chi^2 = 1079.6$, $P < 0.001$), with the fewest birds caught in 2009 and in the period 2020–2022, while the most birds caught in 2001. Both the number of birds caught ($R^2 = 0.251$, $P = 0.017$) and recaptured ($R^2 = 0.377$, $P = 0.002$) significantly decreased over the study period *(Figure 1, 2)*.

On average, adults accounted for 32.9% of total catches and juveniles for 67.1%, but there were significant differences between years ($\chi^2 = 606.4$, $P < 0.001$). The proportion of adults was lowest in 2006, while at one point, in 2020, it exceeded that of juveniles *(Figure 3)*.

The average number of juveniles per two adults (pairs) was 4.75 (SD = 2.44), with the lowest value (1.85) in 2020 and the highest (10.33) in 2006 *(Figure 4)*. No significant trend over time was detected ($P > 0.05$).

Water levels of Lake Kolon during the winter, first and second broods did not affect the annual numbers of either adults ($F = 0.275$, $P = 0.89$) or juveniles ($F = 2.08$, $P = 0.13$) *(Table 1)*.

There was a significant positive correlation between the annual average water level and the juvenile/adult ratio: when the water level decreased, the juvenile/adult ratio also decreased and vice versa ($R^2 = 0.321$, $P = 0.005$) *(Figure 5)*.

Discussion

The populations of most migratory bird species have been declining in Hungary in recent years (Szép *et al.* 2021), but the decline we have showed for Moustached Warbler in Lake Kolon is much more severe than even that of long-distance migratory reed warbler species (Szép *et al.* 2012, 2021). In just over two decades, the number of birds captured has declined by 90%.

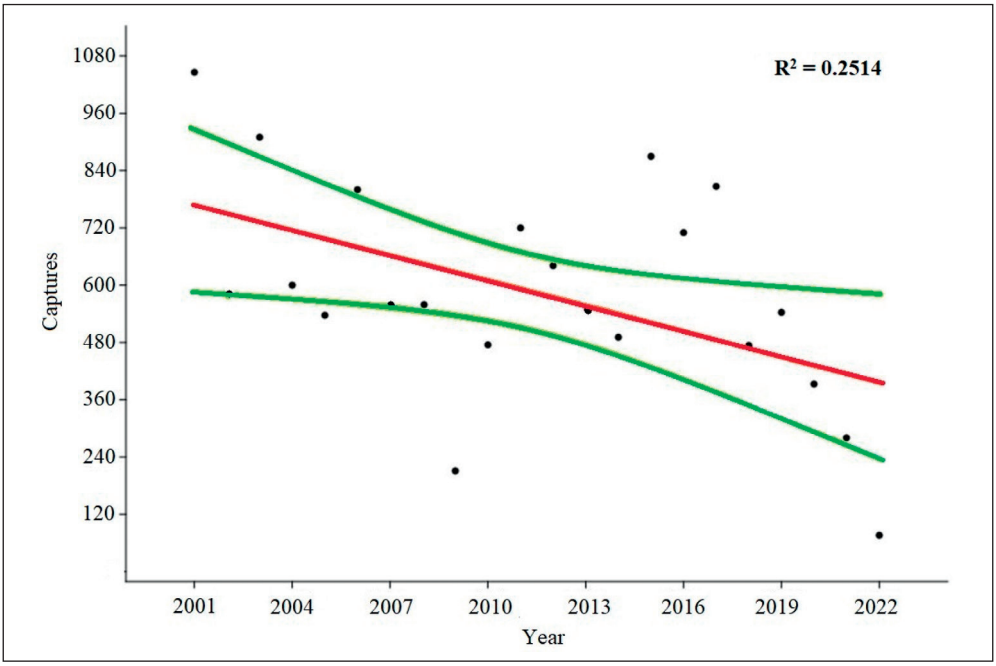

Figure 1. Changes in the number of ringed birds between 2001 and 2022
1.ábra A gyűrűzött madarak számának változása 2001 és 2022 között

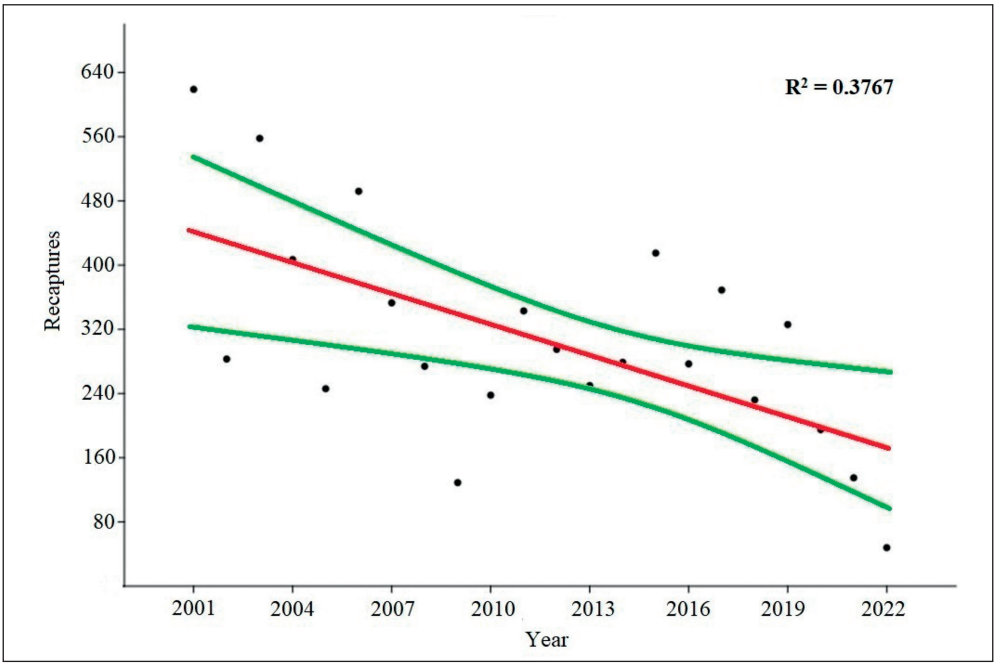

Figure 2. Changes in the number of recaptured birds between 2001 and 2022
2. ábra A visszafogott madarak számának változása 2001 és 2022 között

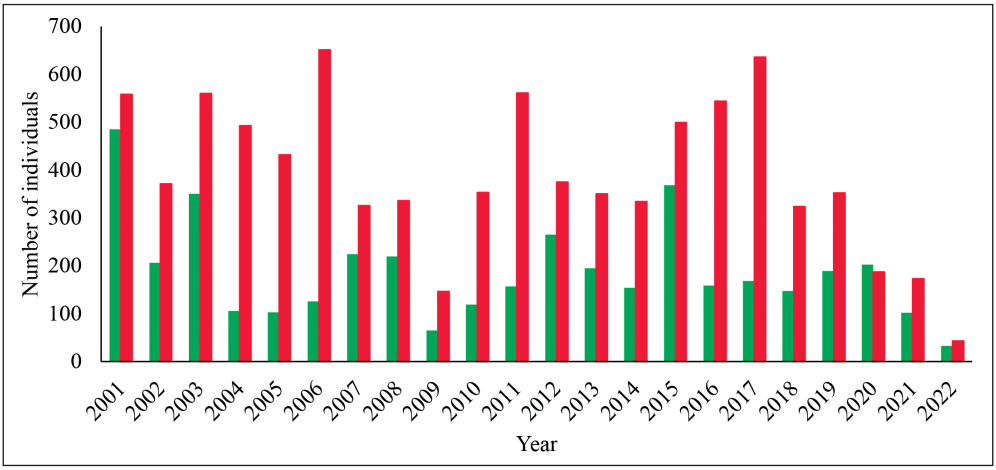

Figure 3. The number of adults (green bar) and juveniles (red bar) captured during the study period
3. ábra A vizsgálati időszakban fogott öreg (zöld oszlop) és fiatal (piros oszlop) fülemülesitkék számának változása

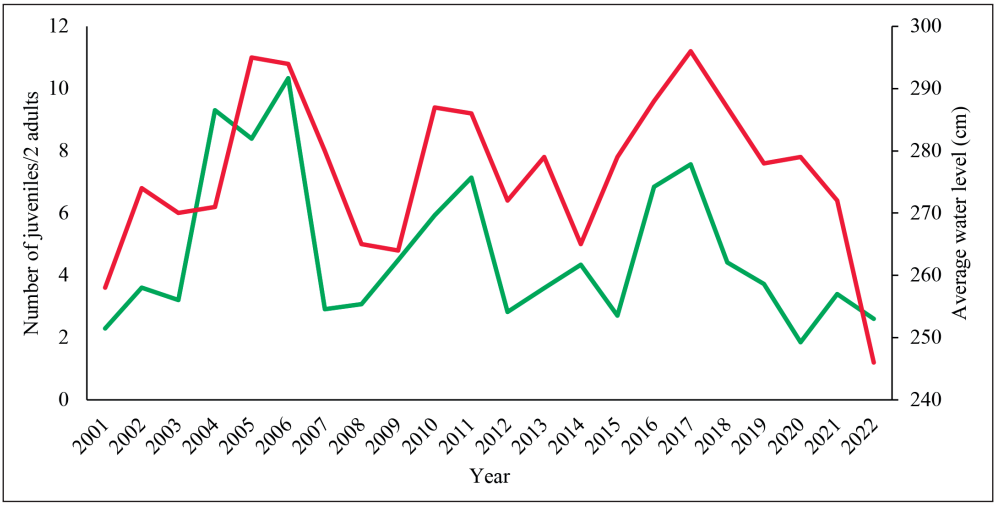

Figure 4. Distribution over time of the number of young per two birds (pairs) (green line) and the annual average water level of Lake Kolon (red line)
4. ábra A két madárra (pár) jutó fiatalok számának időbeli eloszlása (zöld vonal) és a Kolon-tó átlagos éves vízszintje (piros vonal)

Due to its special habitat requirements, the species may be threatened by several factors. The fragmentation and removal of old, perennial reedbeds with a small area of old reedbeds used by the species is still ongoing in both breeding and wintering areas. Burning and intensive management of these habitats (industrial reed cutting) negatively affect the presence of the species, as freshly emerged annual reedbeds are unsuitable for it (Báldi & Moskát 1995, Poulin *et al.* 2002, Trnka & Prokop 2006). Climate change-induced extreme weather events, such as cooling during the first brood or high temperatures during the second brood can

Table 1. The relationship between water level of Lake Kolon and captures of adult and juvenile birds

1. táblázat A Kolon-tó vízszintje és a fogásszám közti összefüggés vizsgálatának eredményei az öreg és fiatal madarak esetében

	Variable	Coefficient	S.E.	t	p	R^2
Adults	winter	17.19	41.21	0.417	0.681	0.006
	1. brood	11.12	21.911	0.507	0.618	0.014
	2. brood	9.84	45.034	0.332	0.744	0.039
	Jan. – Jul.	-39.39	93.068	-0.423	0.677	0.021
Juveniles	winter	-35.18	53.939	-0.652	0.523	0.172
	1. brood	-18.60	28.68	-0.648	0.525	0.259
	2. brood	-21.96	38.744	-0.567	0.578	0.291
	Jan. – Jul.	83.37	121.82	0.684	0.503	0.291

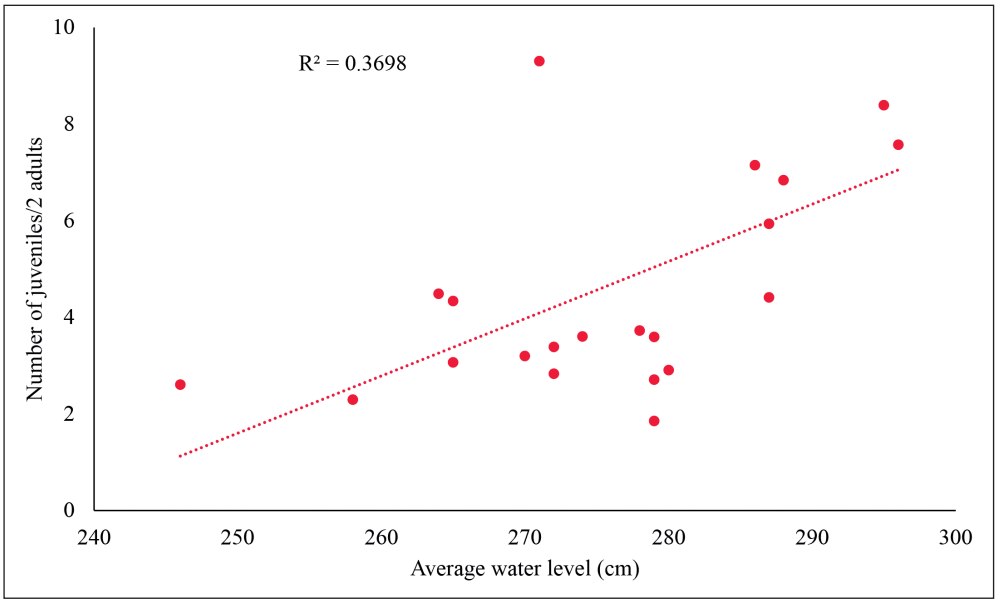

Figure 5. Correlation between the number of young per two birds (pairs) and the annual average water level of Lake Kolon

5. ábra A két madárra (pár) jutó fiatalok száma és a Kolon-tó átlagos éves vízszintje közötti összefüggés (korreláció)

also reduce breeding success and survival of individuals. These threats are common, but not uniform throughout the species' range.

In the Carpathian Basin, the larger breeding sites of Moustached Warblers are protected. The managers of the most important nesting sites pay special attention to the conservation of the species. Reed management activities are minimal in the approximately 1,000 hectares

of Lake Kolon. Between 20 and 60 hectares are cut each year, which should not significantly affect the number of individuals of the species in the area.

Males return to the area and usually occupy territory in or near the same place where they successfully bred the previous year. The second year birds also show a high site fidelity. Males are more territorial than females (Vadász *et al.* 2008b). They breed twice a year, with additional breeding occassions. The first breeding occurs very early. This may be compromised by recurrent cold or rising water levels. In a study in southern Spain, an increase in water level during the breeding period negatively affected the population of the species, as higher water levels destroyed nests (Alambiaga *et al.* 2021). For our own data, a significant positive correlation between water level and juvenile/adult ratio was found when the water level of the whole breeding season and the average annual water level was considered. In contrast, water level had no influence when considering the winter and the first and second breeding seasons separately. The reason for this is that birds compensate for unsuccessful first broods by increasing the proportion of second and subsequent broods, if the conditions changes for the better (Haraszthy 2019).

During the breeding season, it is important to ensure adequate water cover in the habitat. At Lake Kolon, water level control is carried out according to the possibilities offered by precipitation conditions. During high water levels, it is possible to drain excess water, but unfortunately, as the area has no surface water recharge, there is no way to supply water in drought years. The Moustached Warblers feed at the lowest part of the reedbed or from the water surface (Dyrcz 2006). The water level measured in the channel, which is the data available, does not accurately reflect the water cover conditions within the marsh. Due to the specific micro-relief of the marsh, a drop of a few centimetres in the water level in the channel can cause drying out of a significant part of the inner marsh, and therefore the annual fluctuation of the water level can cause significant fluctuations in the annual breeding success in addition to other reasons not studied yet (e. g. nest predators, parasitic insects) (Haraszthy 2019). The presence or absence of water in the area mainly determines the number of pairs starting to breed (Németh Á. pers. obs.).

In conclusion, among the factors affecting the area, reed management certainly does not influence the local decline of the species, and weather factors can only affect it through drought. As similar fluctuations in the population of this species have been observed in a wetland in southern Spain, changes in migration routes and wintering sites may be the underlying causes, as is the case for so many long- and short-distance migratory bird species (Alambiaga *et al.* 2021, Petras & Vrezec 2022).

Acknowledgements

The authors would like to thank the volunteers and staff of the Lake Kolon bird ringing camp for their help in bird ringing and data collection.

References

Alambiaga, I., Carrasco, M., Ruiz, C., Mesquita-Joanes, F. & Monrós, J. S. 2021. Population trends and habitat selection of threatened marsh passerines in a protected Mediterranean wetland. – Avian Conservation and Ecology 16(2): 23. DOI: 10.5751/ACE-01953-160223

Báldi, A. & Moskát, Cs. 1995. Effect of reed burning and cutting on breeding bird communities. – In: Bisonette, J. A. & Krausman, P. R. (eds.) Integrating People and Wildlife for a Sustainable Future. – The Wildlife Society, Bethesda, Maryland. USA, pp. 637–642.

BirdLife Hungary 2018a Natura 2000 adatbázis: Velencei-tó és Dinnyési-Fertő [Natura 2000 database: Velencei-tó és Dinnyési-Fertő]. – http://www.mme.hu/natura-2000-teruletek/hudi10007 (in Hungarian)

BirdLife Hungary 2018b Natura 2000 adatbázis: Kis-Balaton [Natura 2000 database: Kis-Balaton]. – http://www.mme.hu/natura-2000-teruletek/hubf30003 (in Hungarian)

Birdlife International 2016. *Acrocephalus melanopogon*. – In: The IUCN Red List of Threatened Species 2016: e.T22714693A87564683. DOI: 10.2305/IUCN.UK.2016-3.RLTS.T22714693A87564683.en

Biró, Cs. & Morvai, E. 2016. Fülemülesitke *(Acrocephalus melanopogon)* [Moustached Warbler]. – kolon004-35/30 https://onedrive.live.com/view.aspx?cid=32368e8598514fec&page=view&resid=32368E8598514FEC!466323&parId=32368E8598514FEC!1215&authkey=!AADD2LGva7269tg&app=Word (in Hungarian)

Csörgő, T. 1995. A nádas zonációk és szegélyvegetációk énekesmadarai [Passerines in the reedbed zonations and edge vegetations]. – In: Vásárhelyi, T. (ed.) A nádasok állatvilága [Animals in the reedbeds]. – Magyar Természettudományi Múzeum, Studia Naturalia 8: 138–144. (in Hungarian)

Csörgő, T. & Gyurácz, J. 2021. Fülemülesitke *Acrocephalus melanopogon* [Moustached Warbler]. – In: Szép, T., Csörgő, T., Halmos, G., Lovászi, P., Nagy, K. & Schmidt, A. (eds.) Magyarország madáratlasza [Bird Atlas of Hungary]. – Agrárminisztérium, Magyar Madártani és Természetvédelmi Egyesület, Budapest, pp. 545–546. (in Hungarian with English Summary)

Csörgő, T., Harnos, A., Rózsa, L., Karcza, Zs. & Fehérvári, P. 2016. Detailed description of the Ócsa Bird Ringing Station, Hungary. – Ornis Hungarica 24(2): 91–107. DOI: 10.1515/orhu-2016-0018

Demongin, L. 2016. Identification Guide to Birds in the Hand. – Beauregard-Vendon, France, p. 278.

Dunn, E. H. & Ralph, C. J. 2004. Use of mist nets as a tool for bird population monitoring. – Studies in Avian Biology 29: 1–6.

Dyrcz, A. 2006. Moustached Warbler *(Acrocephalus melanopogon)*. – In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) Handbook of the Birds of the World Alive, Vol. 11. Old World Flycatchers to Old World Warblers. – Lynx Edicions, Barcelona, pp. 616–617.

Hadarics, T. & Zalai, T. (eds.) 2008. Magyarország madarainak névjegyzéke. Nomenclator Avium Hungariae. – Magyar Madártani és Természetvédelmi Egyesület, Budapest p. 278. (in Hungarian and English)

Hammer, Ø., Harper, D. A. & Ryan, P. D. 2001. PAST: Paleontological statistics software package for education and data analysis. – Palaeontologia Electronica 4(1): 9.

Haraszthy, L. 2019. Fülemülesitke *Acrocephalus melanopogon* [Moustached Warbler]. – Magyarország fészkelő madarainak költésbiológiája. 2. kötet. Sárgarigóféléktől a sármányfélékig (Passeriformes) [Nesting Birds of Hungary. Vol. 2. Oriolidae – Emberizidae (Passeriformes)]. – Pro Vértes Nonprofit Zrt., Csákvár, pp. 220–223. (in Hungarian)

Hudec, K., Chytil, J, Šťastný, K. & Bejček, V. 1995. Ptáci České Republiky [Birds of Czech Republic]. – Sylvia 31: 97–149. (in Czech)

Keller, V. & Sokolov, A. Y. 2020. Moustached Warbler *Acrocephalus melanopogon*. – In: Keller, V., Herrando, S., Voříšek, P., Franch, M., Kipson, M., Milanesi, P., Martí, D., Anton, M., Klvanová, A., Kalyakin, M. V., Bauer, H-G. & Foppen, R. P. B. (eds.) European Breeding Bird Atlas 2. Distribution, Abundance and Change. – European Bird Census Council & Lynx Edicions, Barcelona, p. 617.

Keve, A. 1984. Magyarország madarainak névjegyzéke. Nomenclator Avium Hungariae. – Akadémiai Kiadó, Budapest, p. 73.

Kovács, G. & Konyhás, S. 2004. Fülemülesitke [Moustached Warbler]. – In: Ecsedi, Z. (ed.) A Hortobágy madárvilága [Birds of Hortobágy]. – Hortobágy Természetvédelmi Egyesület, Winter Fair, Balmazújváros – Szeged, pp. 456–457. (in Hungarian)

Leisler, B., Heidrich, P., Schulze-Hagen, K. & Wink, M. 1997. Taxonomy and phylogeny of reed warblers (genus *Acrocephalus*) based on mtDNA sequences and morphology. – Journal für Ornithologie 138: 469–496.

Magyar, G., Hadarics, T., Waliczky, Z., Schmidt, A., Nagy, T. & Bankovics, A. 1998. Magyarország madarainak névjegyzéke. Nomenclator avium Hungariae. An Annotated List of the Birds of Hungary. – KTM Természetvédelmi Hivatal Madártani Intézete – Magyar Madártani és Természetvédelmi Egyesület, Winter Fair, Budapest – Szeged, p. 108. (in Hungarian and English)

Németh, Á. & Králl, A. 2009. Fülemülesitke *Acrocephalus melanopogon* [Moustached Warbler]. – In: Csörgő, T., Karcza, Zs., Halmos, G., Magyar, G., Gyurácz, J., Szép, T., Bankovics, A., Schmidt, A. & Schmidt, E. (eds.) Magyar madárvonulási atlasz [Hungarian Bird Migration Atlas]. – Kossuth Kiadó Zrt., Budapest, pp. 479–482. (in Hungarian with English Summary)

Peach, W. J., Buckland, S. T. & Baillie, S. R. 1996. The use of constant effort mist-netting to measure between-year changes in the abundance and productivity of common passerines. – Bird Study 43(2): 142–156. DOI: 10.1080/00063659609461007

Petras, T. & Vrezec, A. 2022. Long-term ringing data on migrating passerines reveal overall avian decline in Europe. – Diversity 14(11): 905. DOI: 10.3390/d14110905

Poulin, B., Lefebvre, G. & Mauchamp, A. 2002. Habitat requirements of passerines and reedbed management in southern France. – Biological Conservation 107(3): 315–325. DOI: 10.1016/S0006-3207(02)00070-8

Svensson, L. 1992. Identification Guide to European Passerines. – Svensson, Stockholm, pp. 174–175.

Szép, T., Csörgő, T., Halmos, G., Lovászi, P., Nagy, K. & Schmidt, A. (eds.) 2021. Magyarország madáratlasza [Bird Atlas of Hungary]. – Agrárminisztérium, Magyar Madártani és Természetvédelmi Egyesület, Budapest (in Hungarian with English Summary)

Szép, T., Nagy, K., Nagy, Zs. & Halmos, G. 2012. Population trends of common breeding and wintering birds in Hungary, decline of long-distance migrant and farmland birds during 1999–2012. – Ornis Hungarica 20(2): 13–63. DOI: 10.2478/orhu-2013-0007

Trnka, A. 2003. Vplyv počasia na hromadnýv výskyt trsteniarika tamari Škoveho *(Acrocephalus melanopogon)* v pohniezdnom obdobi na Slovensku v roku 2001 [Effect of weather on the mass postbreeding occurrence of the Moustached Warbler *(Acrocephalus melanopogon)* in Slovakia in 2001]. – Sylvia 39: 95–105. (in Slovak)

Trnka, A. & Prokop, P. 2006. Reedbed structure and habitat preference of reed passerines during the post-breeding period. – Biologia 61(2): 225–230. DOI: 10.2478/s11756-006-0034-8

Vadász, Cs., Németh, Á., Biró, Cs. & Csörgő, T. 2008a The effect of reed cutting on the abundance and diversity of breeding passerines. – Acta Zoologica Academiae Scientiarum Hungaricae 54(Suppl.1): 177–188.

Vadász, Cs., Németh, Á., Karcza, Zs., Loránt, M., Biró, Cs. & Csörgő, T. 2008b Study on breeding site fidelity of *Acrocephalus* warblers in Central Hungary. – Acta Zoologica Academiae Scientiarum Hungaricae 54(Suppl.1): 167–175.

Vadász, Cs., Mogyorósi, S., Pellinger, A., Aleksza, R. & Biró, Cs. 2011. Results of the breeding passerine census carried out at the Hungarian part of Lake Fertő in 2008. – Ornis Hungarica 19: 11–20.

Volet, B. & Burkhardt, M. 2006. Seltene und bemerkenswerte Brut- und Gastvögel und andere ornithologische Ereignisse 2005 in der Schweiz [Rare and unusual records of breeding, migrating and wintering bird species in Switzerland, 2005]. – Der Ornithologische Beobachter 103: 257–270. (in German with English Summary)