OVERVIEW OF THE TRANSBOUNDARY IWC ON SKADAR /SHKODRA LAKE 1993-2024

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Introduction

Shared between Montenegro and Albania, Skadar (Shkodra) Lake is among the most important waterbird wintering sites in SE Europe. IWC on Skadar Lake has been performed by both countries since 1993, with a few interruptions. This presentation is the first attempt to analyse the data on a transboundary level. The goal of this collaboration is to assess water bird trends on a long time scale, emphasize the most threatened species and to highlight the importance of IWC for both conservation of wetlands and meeting international monitoring standards.

Fig.1: Skadar/Shkodra Lake is the largest lake in Balkans

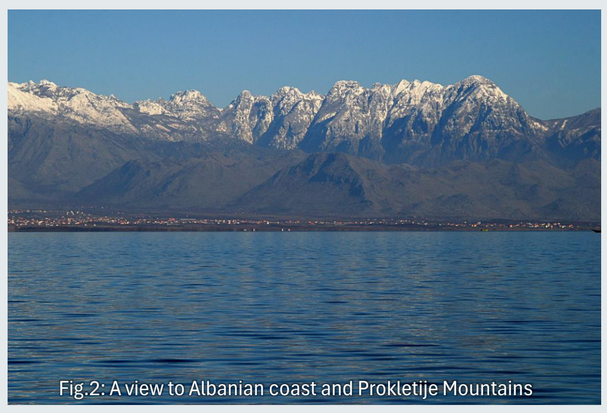


Fig.2: A view to Albanian coast and Prokletije Mountains

Methods

The complete coverage of Skadar Lake is only possible with a combination of boat and shore counts. Since the beginning of IWC, counting practices evolved according to the best use of resources and contemporary census recommendations. Average number of counters in the whole period, for both Albania and Montenegro was 4, which accounts for 44 km^2 per counter in ALB and 89 km^2 per counter in MNE. All counts have been performed within January, with time window fluctuating from 1-5 days.


Fig.3: Boat counts are essential for the Montenegrin side


Fig.4: Telescope counts from an elevated coastal point

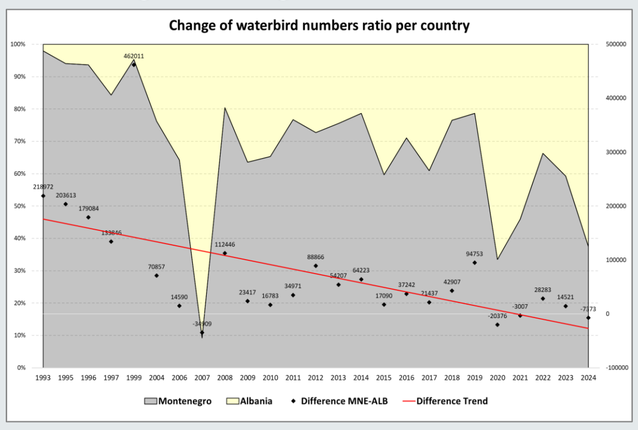
Trend analysis methods:

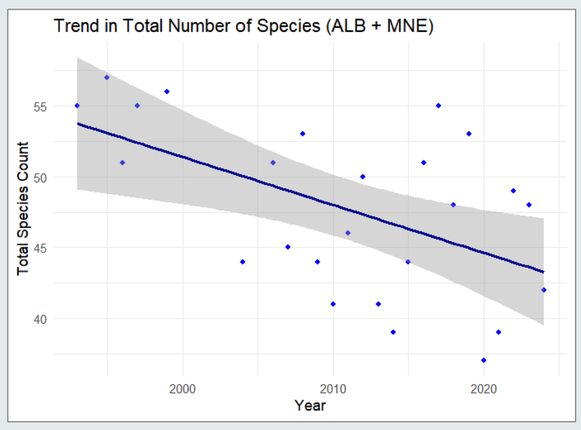
For the trend analysis we used the complete Skadar/Shkodra Lake IWC dataset for Albania and Montenegro exported from Wetland International database. GLMMs were fitted using glmmTMB (nbinom2 family), and diagnosed via DHARMa. Environmental variables: temperature, wind and precipitation in January were included in the model.

Results

Population size:

In the period 1993-2024, total number of waterbirds largely fluctuated between 25.000 and 500.000. On average, 50% more water birds are counted on MNE side, with a few exceptions. However, the difference in numbers between sides is declining on a long scale.



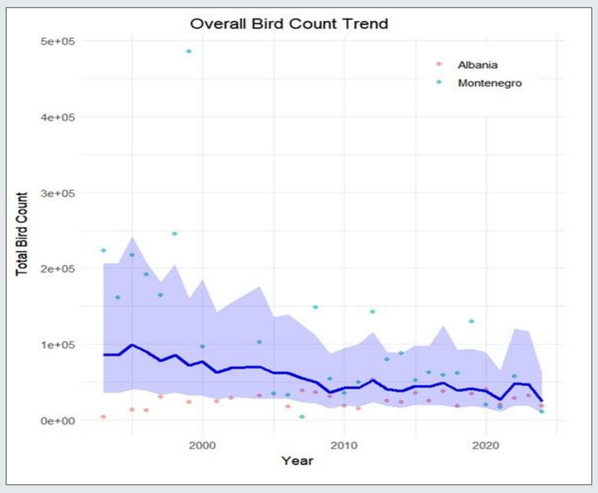


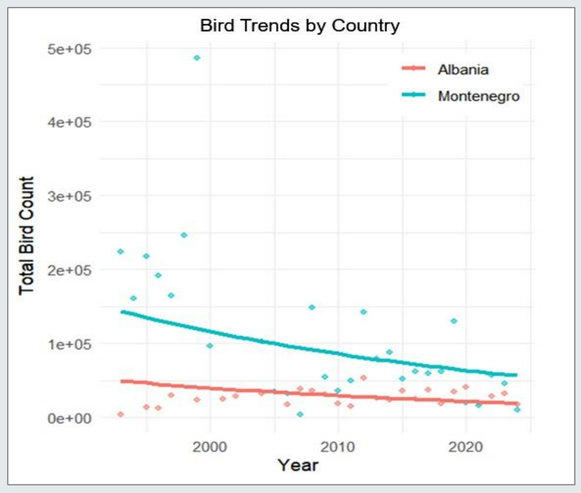
Species composition:

Overall number of waterbird species occurring on Skadar/Shkodra Lake in January is 64. Total of 55 species occur in ALB (Shannon Index H=1.26) and 56 species occur in MNE (H=1.66). Between 1993 and 2024, there has been a significant downward trend in the total number of species recorded across Albania and Montenegro. In the mid-1990s, total species counts per year were typically above 50. By the 2020s, they tend to fall below 45, with some years showing fewer than 40 species. On average, the total species number is declining by approximately 1 species per 3 years. Nine species are recorded only in ALB and seven species occur only in MNE.

Population trend:

Trend show a significant decline in bird counts over the years - about 3% per year. On the long term scale, the decline is constant and presents a dramatic ~60.5% decline of total bird numbers in the whole period. Left plot shows the overall modelled trend with a 95% confidence interval, incorporating data from both countries. Confidence intervals narrow over time which suggests more consistent data in later years.





Right plot shows separate trends for Albania (red) and Montenegro (blue). Both sides show a steady decline in total bird counts over time. The decline is visually more pronounced on Montenegrin side of the lake, which generally holds higher bird abundances.

Single species trends:

The table below table presents significant ($p<0.05$) long-term trends of selected water bird species, with values given as Modelled Trend (statistical model slope), Annual Trend (percentage change per year) and Annual Change Rate (estimated number of individuals gained or lost annually). Most species listed are showing negative trends. Tufted Duck and Northern Pintail show the most dramatic annual decline. Eurasian Coot and Common Pochard have the largest decline in numbers of individuals per year, but with lower annual trends due to their large population. Little Egret is the only species showing an annual increase in January numbers on Skadar Lake, which aligns with the northward range expansion of this species across Europe.

English Name	Scientific Name	Modelled Trend	Annual Trend %	Annual Change Rate
Eurasian Coot	*Fulica atra*	-0.36	-3.58	-490
Common Pochard	*Aythya ferina*	-0.57	-5.98	-122
Eurasian Teal	*Anas crecca*	-1.01	-10.22	-33
Little Egret	*Egretta garzetta*	+0.25	+2.70	+60
Great Crested Grebe	*Podiceps cristatus*	-0.30	-3.15	-17
Black-necked Grebe	*Podiceps nigricollis*	-0.16	-6.20	-74
Northern Pintail	*Anas acuta*	-1.4	-13.88	-6
Mallard	*Anas platyrhynchos*	-1.11	-11.2	-15
Tufted Duck	*Aythya fuligula*	-1.41	-13.97	-25
Common Goldeneye	*Bucephala clangula*	-0.78	-7.99	-13

Discussion

Our analysis reveals a strong and consistent decline in wintering waterbird numbers on both the Albanian and Montenegrin sides of Lake Skadar/Shkodra, with an estimated 60.5% decrease in total counts over the 30-year monitoring period. The annual decline rate of -2.95% is nearly identical across both sides of the lake, suggesting that shared pressures are affecting the entire wetland ecosystem, regardless of national boundaries. However, the decrease of difference in overall numbers on either side may suggest the shift of birds towards Albanian side. The number of species detected per year shows a statistically significant downward trend, which suggests a long-term decline in species richness. Environmental covariates (temperature, wind, precipitation) did not affect the model suggesting that non-climatic pressures may play a larger role. Despite lake's status as a Ramsar Site and protected wetland of international importance, our analysis reveals a consistent and significant decline in wintering water bird populations over the past three decades. This suggests that current conservation measures may be inadequate to counteract increased human pressure. These results confirm the value of IWC program for informing the reinforced conservation policies aimed at transboundary cooperation, safeguarding the lake's ecological integrity and fulfilling international conservation commitments.