Ecological Life Sciences
ISSN: 1308 7258
Article ID: 5A0233

Status : Research Article
Received: 02.01.2025
Accepted: 25.04.2025

Tuncay Ateşşahin
Fırat University, tatessahin@firat.edu.tr, Elazığ-Türkiye
Orhan Fulin
Fırat University, Graduate School of Natural and Applied Sciences, (Fishing Technology and Seafood Processing Technology), orhanfulin@gmail.com, Elazığ- Türkiye

DOI	http://dx.doi.org/10.12739/NWSA.2025.20.2.5A0233	
ORCID ID	0000-0001-9168-5444	0009-0007-0506-2939
Corresponding Author	Tuncay Ateşşahin	

RECREATIONAL FISHING IN KEBAN DAM LAKE UNDER CLIMATE CHANGE AND INVASION PRESSURE

ABSTRACT

This study aimed to evaluate recreational anglers' perceptions of climate change, fishing habits, and experiences with invasive species around the Keban Dam Lake, a region where freshwater ecosystems are increasingly vulnerable to environmental stressors. A total of 184 male amateur fishermen participated in face-to-face surveys, and the data were analyzed based on sociodemographic characteristics, environmental awareness, and species knowledge. The findings revealed that 86% of participants believed that climate change would negatively affect recreational fishing activities, with this perception being more prevalent among university graduates (65.4%), individuals with 40 or more years of experience (72.2%), and those aged 61–75 years (69.8%). These results suggest that age, education, and fishing experience increase environmental awareness. Similarly, awareness of the invasive species *Carassius gibelio* followed a similar trend, with 61.5% of university graduates and 68.2% of experienced anglers reporting encounters with this species. Additionally, 73.8% of the respondents observed a decline in fish abundance, indicating the compounded impact of climate change and biological invasions on fish populations and angling success. These insights highlight the need for targeted educational programs, community-based monitoring, and policy interventions to promote ecological sustainability and climate resilience. Integrating local knowledge with scientific research can enhance recreational fishers' adaptive capacity and foster stewardship. In conclusion, climate change and invasive species pose direct threats to recreational fishing, and proactive strategies—such as public awareness campaigns, habitat protection, and invasive species control—are essential for ensuring the long-term sustainability of freshwater fisheries in Türkiye.

Keywords: Climate Change, Recreational Fishing, Freshwater Ecosystems, Invasive Species

1. INTRODUCTION

Amateur fishing is an important recreational activity that individuals engage in for sport, leisure, or hobby purposes without commercial gain, where the catch is not sold, and offers the potential for communing with nature and mental relaxation [1, 2, 3 and 4]. Scientific studies are being conducted on aquatic ecosystems and fish

How to Cite:
Ateşşahin, T. and Fulin, O., (2025). Recreational fishing in Keban Dam Lake under climate change and invasion pressure. Ecological Life Sciences, 20(2):84-94, DOI: 10.12739/NWSA.2025.20.2.5A0233.

stocks in relation to this activity, which is popular both globally and in our country [5, 6, 7, and 8].

Research on amateur angling in inland waters has generally focused on understanding the different phases of fishing activity [9 and 10]. A significant amount of this research has focused on determining the recreational fishermen's socio-economic and demographic characteristics. Studies have concentrated on topics such as anglers' fishing motivations, fishing frequency, and the purposes for which they typically use the fish they catch. In addition, fishing productivity parameters, such as the composition of fish species caught, catch per unit effort, and seasonal variations, have been examined. The effects of fishing gear types, bait types, hook sizes, and colors on fishing productivity and selectivity have also been studied. The legal regulations in Turkey, the extent to which amateur fishermen are familiar with these regulations, and the necessary steps for sustainable fishing management have also been addressed [2 and 3, 11, 12, 13, 14, 15, and 16].

Researchers have also highlighted the environmental impacts of amateur fishing. In particular, the use of prohibited fishing gear such as "tırıvırı" has been noted to cause "ghost fishing," which harms both aquatic and terrestrial organisms [17]. Uncontrolled fishing and waste are damaging fish populations and the environment; therefore, awareness and control are needed.

However, very few comprehensive studies have addressed the direct interactions between recreational fishing in inland waters and climate change and invasive species [18, 19, and 20]. The potential effects of climate change on fish stocks and the benefits provided by recreational fishing represent an important research gap for future studies. While current studies mention general factors, such as climate change, that could influence temporal changes in recreational fishing activities, research that examines this relationship in depth and in a specific manner remains limited. There is limited scientific data on the potential harm of recreational fishing to climate change and the effects of climate change on recreational fishing activities and stocks in inland waters. This situation highlights the need for future research on the management and sustainability of recreational fishing in inland waters [21].

Freshwater ecosystems are among the most sensitive natural systems to the effects of climate change, which directly affects recreational activities such as amateur fishing. Global warming, changes in rainfall patterns, increased evaporation rates, and water level fluctuations are reducing fish habitats [22, 23, and 24]. The decline in suitable habitats, particularly for species such as trout, has led to the replacement of these species by warm-water tolerant species of lower economic value. Therefore, comprehensive research into the effects of climate change on recreational fishing is of great importance for both species conservation and sustainable fisheries management.

2. RESEARCH SIGNIFICANCE

This study provides a critical contribution to the understanding of how climate change and invasive species affect recreational fishing activities in freshwater ecosystems, using Keban Dam Lake as a case study. The research reveals how socio-demographic factors influence ecological awareness and adaptive behavior by analyzing the perceptions and experiences of amateur anglers across different age groups, education levels, and fishing experience. The findings highlight that individuals with higher education and longer fishing experience demonstrate greater sensitivity to environmental changes

and threats from invasive species. Moreover, the study emphasizes the urgent need for sustainable management strategies in recreational fisheries, particularly in regions that are vulnerable to climate-induced ecological shifts. The integration of local knowledge and stakeholder perspectives offers valuable insights for policy development, conservation planning, and public awareness initiatives to mitigate the combined impacts of climate stress and biological invasions.

Highlights

- Educational level and fishing experience significantly influence awareness of climate change and invasive species.
- Recreational fishing in Keban Dam Lake is increasingly affected by climate change-related ecological pressures.
- Sustainable management requires the integration of local angler knowledge with climate adaptation strategies.

3. MATERIALS AND METHODS

3.1. Research Ares

This study was conducted around the Keban Dam Lake in the province of Elazığ. The fishing cooperatives of Ağın, Aydıncık, Çemişgezek, Keban, Kemaliye, Pertek, Uzunova, and Yurtbaşı were selected as research sites.

3.2. Data collection

Fieldwork was conducted between July 2023 and November 2023, with 15 field visits three times a month. A random sampling method was used in the data collection process, and face-to-face surveys were conducted with 184 amateur anglers.

3.3. Data Analysis

The collected data were evaluated using descriptive statistics. Categorical variables were presented as counts and percentages, while continuous variables were presented as mean ± standard deviation.

4. RESULT

A face-to-face survey with amateur anglers reached 184 people. All the amateur anglers were male (100%).

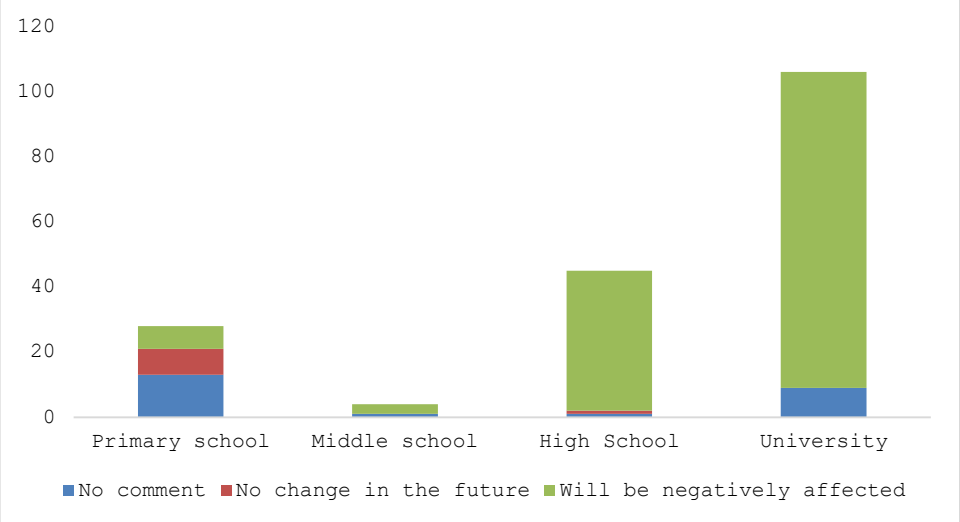

Figure 1. Level of interaction between education and climate change

65.4% of university graduates stated that climate change would negatively affect recreational fishing. In contrast, only 28.7% of primary school graduates agreed, while 41.3% said they had no opinion. This difference shows that environmental awareness increases with education level.

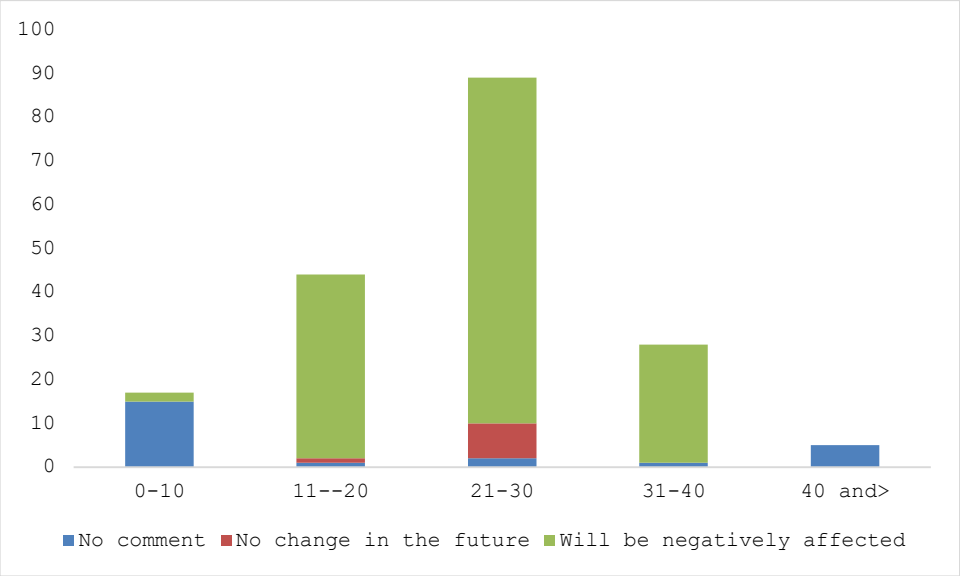

Figure 2. Anglers' perceptions of climate change and its reported effects on fishing experiences

Among the amateur anglers who participated in the survey, 72.2% of those with 40 years or more of experience indicated that climate change would have negative effects. In contrast, this percentage was 38.6% among those with 0–10 years of experience. As experience increases, changes in nature are observed more clearly.

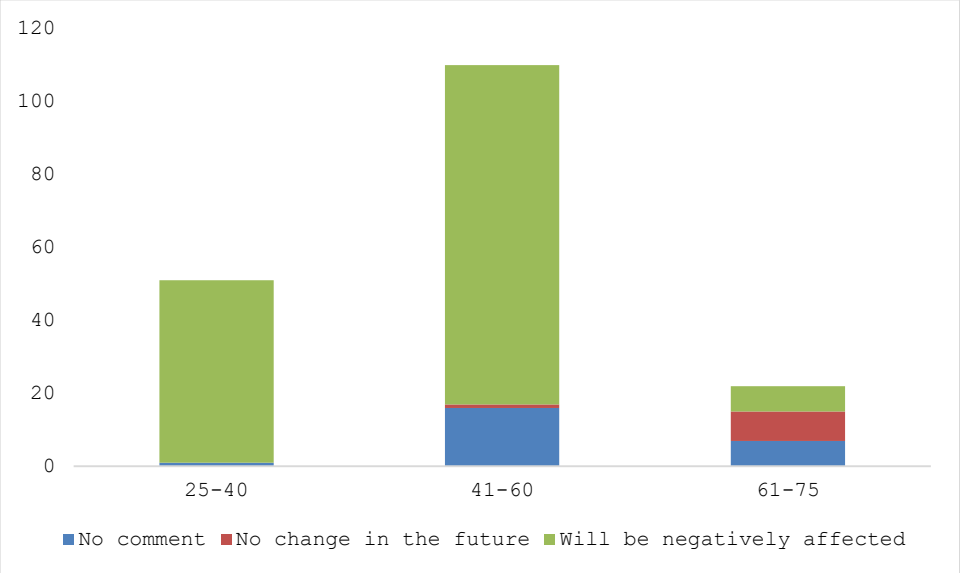

Figure 3. Age-based distribution of anglers' perceptions regarding the impacts of climate change on fishing activities

69.8% of amateur anglers aged 61–75 years who participated in the survey believe that climate change will have negative effects.

This rate is 42.1% in the 25-40 age groups, with 31.6% responding "no comment." Environmental awareness increases with age.

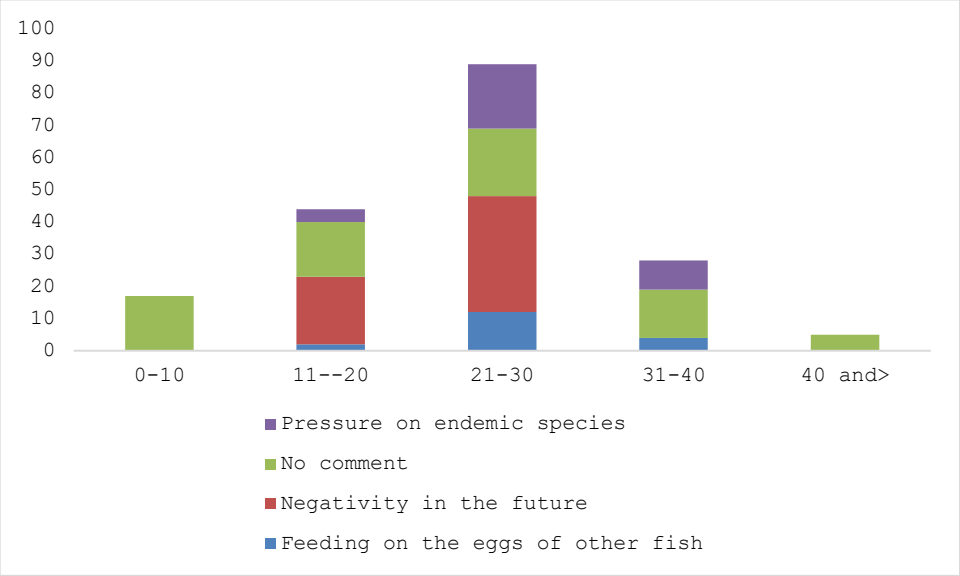

Figure 4. Age-based distribution of anglers' perceptions regarding ecological impacts of invasive species

48.7% of individuals with 40 years or more of experience consider pressure on endemic species to be the greatest threat, while 31.6% consider feeding on eggs to be the greatest threat. Among individuals with less experience, the "no comment" rate increased to 35.2%.

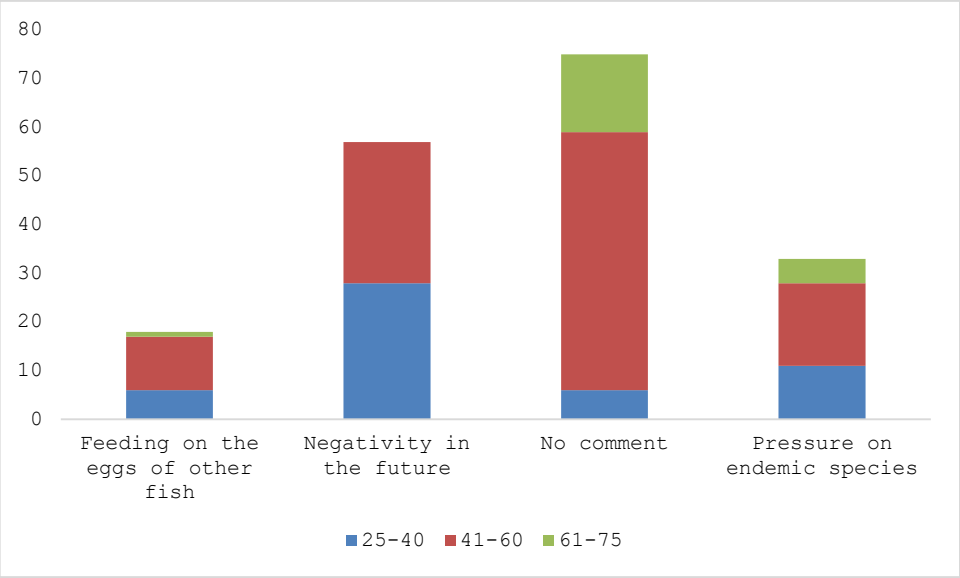

Figure 5. Category-based distribution of anglers' perceptions of ecological impacts across age groups

44.3% of the 41-60 age group emphasized pressure on endemic species, while 29.1% emphasized the impact of feeding on eggs. The "no comment" rate was higher in the younger age group (33.8%).

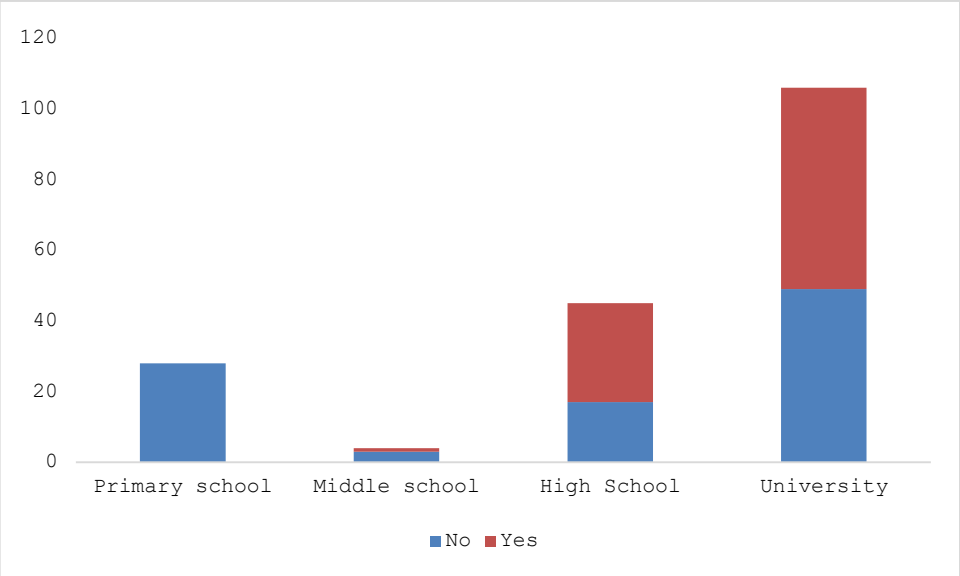

Figure 6. Silver carp catch rates in relation to anglers' education level

61.5% of university graduates reported that they had caught this fish. In contrast, the rate among primary school graduates was 29.4%. As education levels increase, species knowledge and targeted fishing also increase.

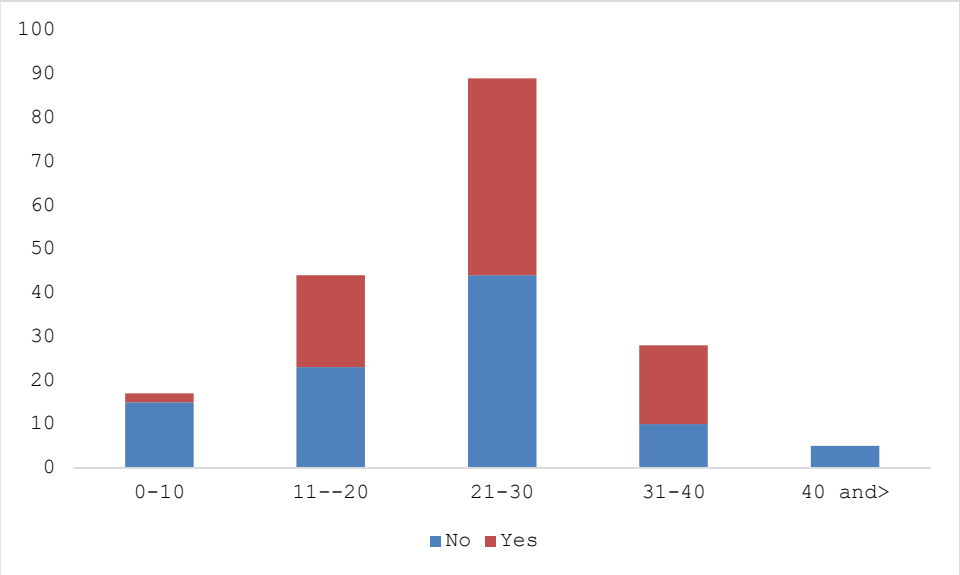

Figure 7. Silver carp catch rates in relation to anglers' fishing experience

68.2% of individuals with 40 years of experience reported catching this species. Among those with 0–10 years of experience, the rate was 34.7%. Experience is directly related to species diversity.

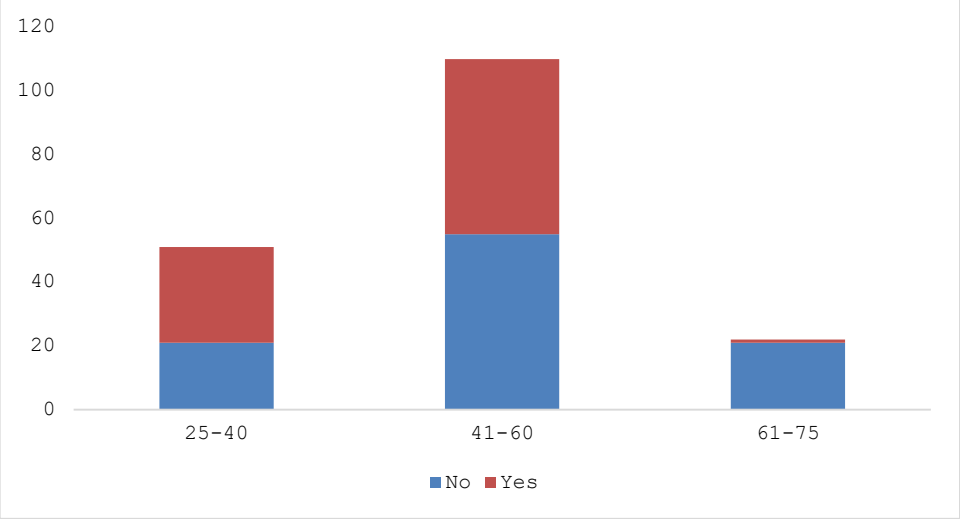

Figure 8. Silver carp catch rates in relation to anglers' age group

59.3% of the 41–60 age group reported catching this fish. The rate for the 25–40 age group was 36.8%. Knowledge of species and fishing skills increase with age.

A strong correlation was observed between educational level and environmental awareness. While 65.4% of university graduates stated that climate change would negatively affect recreational fishing, only 28.7% of primary school graduates shared this view. In addition, 41.3% of the primary school graduates responded with "no comment." This difference shows that environmental awareness and sensitivity to ecological threats increase as educational level increases. It is understood that changes in nature are observed more clearly as fishing experience increases. Of individuals with 40 years or more of experience, 72.2% stated that climate change will have negative effects. In contrast, the rate is 38.6% among those with 0–10 years of experience. Similarly, 48.7% of individuals with 40 years or more of experience emphasized the pressure of invasive species on endemic species, while the "no comment" rate among those with less experience reached 35.2%.

There are significant differences between age groups in terms of environmental awareness and species knowledge. Of the 61–75 age group, 69.8% believe that climate change will have negative effects. This rate is 42.1% in the 25–40 age group, with 31.6% saying "no comment." Additionally, 59.3% of the 41–60 age group reported catching the invasive silver carp, while this rate is 36.8% in the 25–40 age group. These data indicate that environmental awareness, species knowledge, and fishing skills increase with age.

4. DISCUSSION

Most studies on amateur angling in inland waters in Turkey have focused on socio-economic characteristics, catch composition, and fishing techniques [3 and 25]. However, the direct and long-term interactions of climate change on inland water ecosystems and recreational fishing activities are a critical area that has not yet been sufficiently researched. Future studies focusing on issues such as the effects of rising water temperatures on fish stocks, changes in species distribution, the spread of invasive species, and how amateur fishing behavior adapts to these environmental changes are of great importance for the sustainable management of amateur fishing in our inland waters and the conservation of natural resources.

This study evaluated the perceptions of climate change, fishing habits, and experiences related to invasive species among individuals engaged in recreational fishing around the Keban Dam Lake. The findings indicate that the effects of climate change on freshwater ecosystems directly impact recreational fishing activities.

Nearly all participants (86%) stated that climate change would negatively affect fishing activities. This perception is consistent with the literature findings. For example, studies conducted in Europe have reported that rising water temperatures are reducing the habitats of cold-water species, lowering oxygen levels, and disrupting fish reproduction cycles. This situation threatens the populations of species with high sporting value and causes shifts in the target species of amateur fishing [26].

The study found that *C. gibelio*, an invasive species, has become widespread in Keban Dam Lake, with 48.9% of participants reporting that they had caught this species. The spread of this species is accelerating with climate change and is thought to put pressure on native species. Of the participants, 32.9% indicated that this species could have negative effects on the ecosystem in the future. This finding is consistent with the finding that *C. gibelio* has reduced the biological diversity of native species in freshwater systems in Europe and Canada [27].

Fluctuations in water levels caused by climate change also affect fish migration and reproductive behavior, leading to shorter amateur fishing seasons and lower catch yields [28]. 73.8% of participants reported a decrease in fish abundance, highlighting the combined effects of climatic stressors and biological invasions.

5. CONCLUSIONS

This study revealed the effects of climate change and invasive species on recreational fishing in Keban Dam Lake. Climate change negatively affects fish populations and fishing productivity through water temperature and water level changes. Invasive species such as *Carassius gibelio* and *Oncorhynchus mykiss* disrupt ecosystem balance by competing with native species and altering the target species of recreational fishing. This study provides an important contribution to the understanding of the effects of climate change and biological invasions on recreational fishing and lays the groundwork for future research.

Nearly all participants believe that climate change will negatively affect fishing activities and are aware of this issue. Therefore, the following recommendations can be developed for the sustainable management of amateur fishing:

- Fishing policies compatible with climate change should be developed.
- The spread of invasive species should be monitored and controlled.
- Education and awareness-raising activities for amateur fishermen should be increased.
- Long-term monitoring programs in freshwater ecosystems should be established.

NOTICE

This study was supported by the Fırat University Scientific Research Project SÜF.23.02. This study is based on part of the second author's master's thesis 'Investigation of the Current Status of Amateur Angling in Keban Dam Lake (Elazığ-Türkiye) and Fishermen's

Catch Yields'. We also thank the amateur anglers and association presidents who participated in the survey in Keban Dam Lake.

CONFLICT OF INTEREST DECLARATION

The authors declare that they have no known financial interests or personal relationships that could have influenced this work.

AUTHOR CONTRIBUTIONS

The study design, literature review, and data analysis were jointly done by Orhan Fulin and Tuncay Ateşşahin. Both authors approve the final version of the manuscript.

ETHICAL APPROVAL STATEMENT

The survey study was approved by the Fırat University Social and Human Sciences Research Ethics Committee 2022/12.

DATA AVAILABILITY DECLARATION

The data used in this study are available upon reasonable request from the corresponding author.

REFERENCES

[1] Ateşşahin, T., Aslan, E. ve Özmen, M.M., (2014). Elazığ ilindeki amatör balıkçıların sosyo-demografik özellikleri üzerine bir ön araştırma. Yunus Araştırma Bülteni, 2014(1):41–50. doi: 10.17693/yunusae.vi.235404.

[2] Ateşşahin, T. ve Cilbiz, M., (2023). Keban Baraj Gölü sportif olta balıkçılığı alabalık turnuvası değerlendirmesi: av kompozisyonu ve verimi. Acta Aquatica Turcica, 19(3):257–265. doi: 10.22392/actaquatr.1212438.

[3] Ateşşahin, T. ve Cilbiz, M., (2019). Amatör iç su balıkçılarının sosyo-demografik özellikleri: Türkiye örneği. Turkish Journal of Agriculture-Food Science and Technology, 7(1):134–141. doi: 10.24925/turjaf.v7i1.134-141.2326.

[4] Ateşşahin, T. ve Cilbiz, M., (2018). Türkiye iç su amatör balıkçılığında 'amatör balıkçı belgesi'. Journal of Limnology and Freshwater Fisheries Research, 4(2):103–111. doi: 10.17216/limnofish.374113.

[5] Cooke, S.J. and Cowx, I.G., (2006). Contrasting recreational and commercial fishing: Searching for common issues to promote unified conservation of fisheries resources and aquatic environments. Biological Conservation, 128(1):93–108. doi: 10.1016/j.biocon.2005.09.019.

[6] Cooke, S.J., Suski, C.D. Arlinghaus, R., and Danylchuk, A.J., (2013). Voluntary institutions and behaviours as alternatives to formal regulations in recreational fisheries management. Fish and Fisheries, 14(4):439–457. doi: 10.1111/j.1467-2979.2012.00477.x.

[7] Cooke, S.J., Lennox, R.J., Cantrell, B., and Danylchuk, A.J., (2020). Micro-Fishing as an Emerging Form of Recreational Angling: Research Gaps and Policy Considerations. Fisheries, 45(10):517–521, doi: 10.1002/fsh.10487.

[8] Donaldson, L.A. and Cooke, S.J., (2016). The effectiveness of non-native fish eradication techniques in freshwater ecosystems: a systematic review protocol. Environmental Evidence, 5(1):12. doi: 10.1186/s13750-016-0063-x.

[9] Ateşşahin, T. ve Cilbiz, M., (2019). The effect of hook size, spinner colour and fishing season on catching efficiency in angling for rainbow trout, oncorhynchus mykiss (Walbaum, 1792). Pakistan Journal of Zoology, 51(5):1937–1942.

doi: 10.17582/JOURNAL.PJZ/2019.51.5.1937.1942.

[10] Çapkın, K. and Cilbiz, M., (2023). Investigating Relationships Between Catch Per Unit Effort (CPUE) and some angler characteristics in the Turkish Inland recreational fisheries: A Case Study from Uluabat Lake. Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi, 26(6):1387-1396. doi: 10.18016/ksutarimdoga.vi.1193781.

[11] Akkuş, S. ve Bozaoğlu, M., (2020). Van Gölü havzasındaki amatör balıkçılığın sosyo ekonomik analizi. Journal of Anatolian Environmental and Animal Sciences, 5(5):205-211. https://doi.org/10.35229/jaes.688481

[12] M. ve Karapiçak, A.M. ve Tez, S., (2015). Doğu Karadeniz Bölgesi'ndeki amatör balıkçılığın sosyo ekonomik analizi. Ordu Üniversitesi, 2015.

[13] Tunca, S., Aydin, M., Karapiçak, M., and Lindroos, M., (2018). Recreational fishing along the middle and eastern black sea Turkish coasts: Biological, social and economic aspects. Acta Adriatica, 59(2):191-205. doi: 10.32582/aa.59.2.4.

[14] Ateşşahin, T., (2022). The effect of artificial lure type and environment conditions on the short-time post-release mortality of two recreational fished Luciobarbus species. Journal of Applied Ichthyology, 38(1):53-62. doi: 10.1111/jai.14278.

[15] Zengin, M., (2014). An overview of the status of recreational fisheries in Turkey: Samples of Galata Bridge, the Dardanelles, and Lake Abant. Yunus Araştırma Bülteni, 2:51-65. doi: 10.17693/yunusae.v2013i21905.235423.

[16] Taylan, B., Sayğı, H. ve Kutlu, B., (2018). Tunceli İl'indeki amatör olta balıkçılığının genel durumu. Turkish Journal of Agriculture - Food Science and Technology, 6(10):1479-1484. doi: 10.24925/turjaf.v6i10.1479-1484.2099.

[17] Ateşşahin, T., (2019). Amatör olta balıkçılığında yasaklanan tırıvırı (paraşüt) av aletinin sucul ve karasal canlılara vermiş olduğu zararlar. Ecological Life Sciences, 14(3):43-48. doi: 10.12739/NWSA.2019.14.3.5A0115.

[18] Rahel, F.J. and Olden, J.D., (2008). Assessing the effects of climate change on aquatic invasive species. Conservation Biology, 22(3):521-533. doi: 10.1111/j.1523-1739.2008.00950.x.

[19] Jeanson, A.L., vd., (2021). A bright spot analysis of inland recreational fisheries in the face of climate change: learning about adaptation from small successes. Reviews in Fish Biology and Fisheries, 31(2):181-200. doi: 10.1007/s11160-021-09638-y.

[20] Williams, J.E., Haak, A.L., Neville, H.M., and Colyer, W.T., (2009). Potential Consequences of Climate Change to Persistence of Cutthroat Trout Populations. North American Journal of Fisheries Management, 29(3):533-544. doi: 10.1577/M08-072.1.

[21] Embke, H.S., vd., (2022). Global dataset of species-specific inland recreational fisheries harvest for consumption. Scientific Data, 9(1). doi: 10.1038/s41597-022-01604-y.

[22] Lynch, A.J., etl., (2016). The social, economic, and environmental importance of inland fish and fisheries. Environmental Reviews, 24(2):115-121. doi: 10.1139/er-2015-0064.

[23] Cooke, S.J., Arlinghaus, R., Johnson, B.M., and Cowx, I.G., (2015). Recreational fisheries in inland waters. Freshwater Fisheries Ecology, 449-465. doi: 10.1002/9781118394380.ch36.

[24] Sarkar, U.K. and Das, B.K., (2021). Research advances in climate and environmental change impacts on inland fisheries of India: status, vulnerability and mitigation strategies. Aquatic Ecosystem Health & Management, 24(3):7-17. doi: 10.14321/aehm.024.03.03.

[25] Yücel, Ş. ve Yördem, A., (2021). Rekreasyon/Sportif Olta Balıkçılığı; Ankara İli Örneği. Turkish Journal of Agriculture - Food Science and Technology, 9(3):542–548. doi: 10.24925/turjaf.v9i3.542-548.4013.

[26] Lynch, A.J., etl., (2024). Inland recreational fisheries contribute nutritional benefits and economic value but are vulnerable to climate change. Nature Food, 5(5):433–443. doi: 10.1038/s43016-024-00961-8.

[27] Pentyliuk, N., Schmidt, B., Poesch, M.S., and Green, S.J., (2023). Recreational angler reporting as a tool for tracking the distribution of invasive Prussian carp (Carassius gibelio). Conservation Science and Practice, 5(1). doi: 10.1111/csp2.12850.

[28] Ficke, A.D., Myrick, C.A., and Hansen, L.J., (2007). Potential impacts of global climate change on freshwater fisheries. Reviews in Fish Biology and Fisheries, 17(4):581–613. doi: 10.1007/s11160-007-9059-5.