

<https://doi.org/10.33003/jaat.2026.1202.18>**MORPHOMETRIC ANALYSIS AND SOCIO-ECONOMIC STATUS OF FISHERFOLKS IN ABDALLAWA RESERVOIR, KAITA LOCAL GOVERNMENT AREA OF KATSINA STATE****Abdulhadi, A.Y., Dauda A.B.* and Oladele A.H.**

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*Corresponding author: tdabak@gmail.com; +2348062085120**ABSTRACT**

This study assessed the morphometric characteristics of Abdallawa Reservoir and the socio-economic characteristics of artisanal fisherfolks on the reservoir. Bathymetric surveys, GPS shoreline mapping, and geospatial analysis using ArcGIS and satellite imagery were used to determine the morphometric features of the reservoir, while structured questionnaires were administered to 50 fishermen on the reservoir to evaluate their socio-economic characteristics and the constraints faced in exploring the fishery stock in the reservoir. Descriptive statistics were used to analyse the data obtained from the administered questionnaire. The results showed that the reservoir covers about 2.15 km² with a shoreline length of 8.46 km and a maximum depth of 12.19 m, indicating a moderately irregular elongated basin. Water transparency ranged from 13–28 cm, reflecting a moderate turbidity. Most fishermen landing fish from the reservoir were within the economically active age group between 21 – 50 years (64%), predominantly married (92%), and mainly had Islamic education (58%). Fishing served as the main occupation for the majority (68%) of the respondents, while none of them had formal training or belonged to fishermen associations. The major constraints limiting the activities of these fishermen include limited access to credit (96%), high cost of fishing gears (94%), and lack of policy support (62%). Abdallawa Reservoir is small-medium natural crater lake with an elongated basin, moderate transparency and sufficient depth for its inland fisheries. The reservoir has fishermen who are of youthful age but constrained mainly by limited access to credit and expensive fishing gears. The findings provide baseline information on the morphometry of Abdallawa reservoir for sustainable fisheries management as well as the condition of artisanal fishermen utilising the water for socio-economic purposes.

Keywords: Reservoir morphometry, inland waters, artisanal fishing, Abdallawa Reservoir, Policy constraints**INTRODUCTION**

Fresh waters play critical role in shaping human settlements in major parts of the world through its socio-economic importance. Besides the provision of water for domestic, industrial and agricultural functions, freshwater bodies, (notably inland waters), have supported man with the provision of fish species captured to support human wellbeing. In Africa, most inland reservoirs are frequently built for irrigation, domestic water supply, flood control, and other water-security functions. However, the significant function of inland reservoirs in contributing to local food security and livelihoods (Abobi et al., 2023) is changing the focal use(s) of inland water bodies. In Nigeria, fish remains a major source of animal protein obtained from small-scale fisheries scattered in all parts of the country, in addition to supply from local aquaculture production and fish importation. In fact, inland fisheries account for a large share of the national fisheries catch and are entirely small scale in character (Tiri et al., 2025).

Despite the crucial role played by inland fisheries in Nigeria's domestic fish supply, the sector is frequently overlooked in data systems and policy formulation (Dauda et al., 2021; Byrd et al., 2022). Even in circumstances when physical productivity is high, the dependence of man on inland fisheries for social and economic benefits is dependent on many factors which include the fisheries resources of a reservoir, how fishing is organized, how fish are handled and sold, and how regulations are viewed and followed. Demographic composition, dependence on

fishing in comparison to farming and other occupations, access to fishing equipment (boats, gear), financial capital, market access and price setting, exposure to shocks (seasonality, drought, conflict), and involvement in collective action (associations/co-management) are all examples of socio-economic factors which affect reservoir fishing communities (Dauda et al., 2021). Fishing pressure, compliance, investments in improved handling and processing, and the viability of adopting aquaculture as a supplemental or alternative livelihood source are all directly influenced by these factors (Akintola & Fakoya, 2017; Byrd et al., 2022).

There is dearth of scientific data connecting the physical architecture of many reservoirs to their fish production and the welfare of fishermen (Abobi & Wolff, 2020; Byrd et al., 2022). The inland reservoirs in Nigeria have not been spared of this neglect in the planning, and administration of water infrastructure. The shape and size characteristics of an impoundment such as surface area, shoreline length and complexity, maximum and mean depth, basin slope, area – depth relationships, volume and parameters of littoral habitat availability and basin permanence, are indices of a reservoir's morphology (Wetzel, 2001). In addition to being descriptive, these metrics have impacts on habitat diversity, hydrodynamics, mixing/stratification tendencies, and the distribution of primary and secondary productivity; all of which eventually affects fish biomass and yields (Rodgers, 2017). Information on the reservoir morphometry of Abdallawa reservoir, an inland reservoir located in

Northern part of Nigeria, will not only provide baseline information on the reservoir's morphometric parameters but also provide basis for substantiating the water quality and the fisheries stock composition of the reservoir.

The complementary evidence required to preserve and enhance human well-being, especially the fishermen on Abdallawa Reservoir, is provided by an understanding of the reservoir's morphology and the socio-economic conditions of the fishermen. Morphometry clarifies the reservoir's productive capacity, habitat constraints, and susceptibility to sedimentation-driven loss, while socioeconomic analysis clarifies how benefits, risks, and incentives are distributed across households and value chains, including nutrition outcomes and post-harvest losses (Tiri et al., 2025). Integrating morphology and socio-economic evidence will provide a shift from what the reservoir could produce to what the reservoir can sustainably provide to people, supporting food security, decent livelihoods, and responsible stewardship of a multi-purpose water resource. Therefore, the study evaluated the morphometric characteristics of Abdallawa Reservoir and the socio-economic status of artisanal fisherfolks in Kaita Local Government Area of Katsina State, Nigeria.

RESEARCH METHODOLOGY

Study Area

Abdallawa Reservoir (Tafkin Sauri) is a natural reservoir located in Kaita Local Government Area, North-Eastern part of Katsina State, Northern Nigeria. It serves as a vital water body for neighbouring communities which has long been central to their livelihoods, supporting agriculture, fishing, and animal husbandry among others. It is situated approximately 40 kilometres to the North of Katsina town. The reservoir has historical significance dating back to before 1600, when a person named Sauri was said to have used the area for hunting, hence the local name *Tafkin Sauri* (Anonymous, 2025). The reservoir is impounded by water from several rivers notably; Muduru river, Ajiwa river, Katsina river, and Yan-Hoho rivers with the reservoir receiving substantial inflow during the rainy season.

Data collection

Data collection was conducted in two phases; reservoir morphology assessment and socio-economic survey. Bathymetric data were collected using sonar technology to

generate a three-dimensional depth profile of Abdallawa Reservoir with systematic transects ensuring adequate spatial coverage. Shoreline features were mapped using GPS at key points around the reservoir, and water transparency was measured using a Secchi disc. For the socio-economic component, a questionnaire survey was employed. The structured questionnaire was divided into two sections; the socio-economic characteristics, and the constraints faced by the fishers of Abdallawa Reservoir. The respondents for the questionnaire were sourced from two landing sites on the reservoir; a total of 50 respondents were sampled, representing 25% of the estimated number fishers' population, ensuring reliable and representative data for analysis.

Data Analysis

The data for lake morphology was processed at the Geographic Information System (GIS) laboratory of the Federal University Dutsin-Ma, using Arcgis 10.8 adapted Pro-Google earth imagery and Landsat 8.0 imagery to generate 3D bathymetric models and calculate the lake's surface area and volume. Morphological features were analysed in relation to the water depth, and turbidity. The data on socio-economic status and fishing activities was analysed using descriptive statistics; frequency counts and percentages.

RESULTS

Morphometric Features of Abdallawa Reservoir

The morphometric features of Abdallawa Reservoir are presented in Table 1. The table revealed that the reservoir is located at 13°59'N – 7°46'E, Abdallawa ward of Kaita Local Government Area of Katsina State. The lake covers an area of about 2.15 km² and has a shoreline that stretches to about 8.46 km. Its longest straight-line distance across the lake is range to 1.87 km. The shape of the shoreline is assessed by a shoreline-development index of about 1.63. The lake has a form factor of approximately 0.61. The basin of the lake slopes gently, with an average drop of about 2.3 metres for every horizontal kilometre. The deepest part of the lake is located near its centre, with a maximum depth of 12.19 m. Near the lake's outlet, the depth is about 2.13 metres, while the depth is very shallow, with about 0.46 metres, near the inlet of the reservoir. The lake's turbidity ranges from 13.00cm to 28.0cm, indicating relatively low transparency and moderate turbidity.

Table 1: Morphometry of Abdallawa reservoir

Parameter	Value
Location	13°59'N, 7°46'E, Abdallawa Ward, Kaita LGA, Katsina State
Lake Area	2.15 km ²
Shoreline Length	8.46 km
Maximum Straight-Line Distance	1.87 km
Shoreline Development Index	1.63
Form Factor	0.61
Average Basin Slope	2.3 m per km
Maximum Depth (Central)	12.19 m
Depth at Outlet	2.13 m
Depth at Inlet	0.46 m
Turbidity	Secchi depth 13–28.0 cm

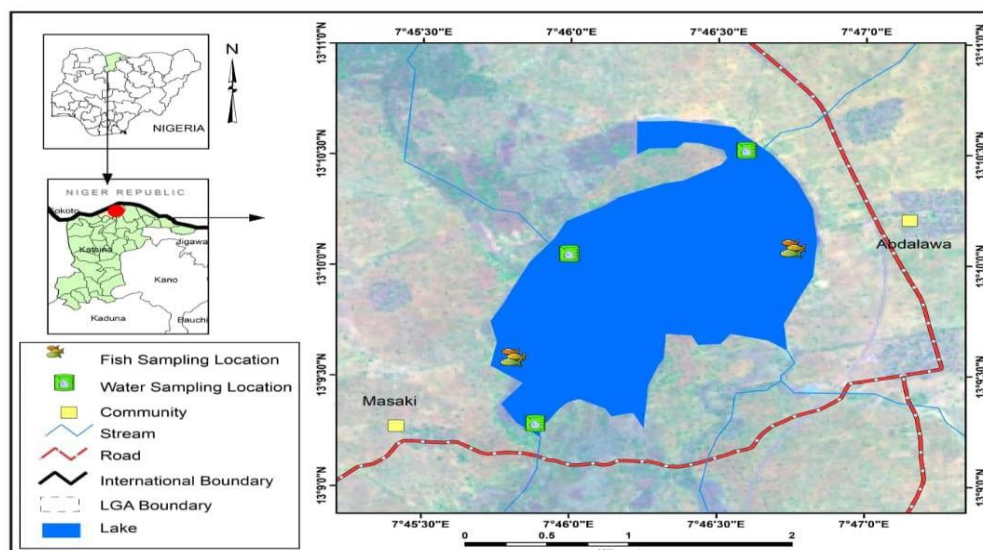


Figure1: Map of Abdallawa Reservoir

Socio-Economic Characteristics of the Artisanal Fisher-Folks in the Study Area

The socio-economic characteristics of the respondents, presented in Table 2, showed that the dominant age groups among the respondents were 31–40 years and 41–50 years, each constituting 24% of the respondents' population, followed by the 21–30 years (20.0%) and 51–60 years (20.0%) age categories. Most respondents (92%) were married; Islamic education was the most common educational background (58%), followed by primary education (30%), while secondary and tertiary education accounted for 8% and 4%, respectively. The predominant household sizes were within 16–30 persons (52%), with 34% having 1–15 persons. Fishing experience varied among the respondents, with the 32%, 26% and 22% respondents' population having 21–30 years, 1–10 years

and 11–20 years of fishing experience, respectively. All the respondents reported having no formal fishing-related training. Fishing was the main occupation for 68% of the respondents, the others (32%) engaged in other occupations. Most of the respondents (48%) preferred to use both active and passive gears, while 28% and 24% population of the respondents preferred only active and passive gears respectively. Majority of the respondents (44%) have lived in the vicinity of the reservoir for 16–30 years, followed by 31–45 years (24%) and 1–15 years (22%). The income distribution revealed that 34% of the respondents earned above ₦2,000,000 annually, while 28% earned within the ₦800,001–₦1,200,000 range, with other income categories reflecting smaller proportions. Finally, none of the respondents belonged to any fishermen association.

Table 2: Socio-economic characteristics of artisanal fisherfolks in Abdallawa Reservoir, Katsina state

Parameter	Frequency	Percentage (%)
Age Group (Years)		
10 – 20	4	8.0
21 – 30	10	20.0
31 – 40	12	24.0
41 – 50	12	24.0
51 – 60	10	20.0
61 and above	2	4.0
Marital Status		
Married	46	92.0
Single	4	8.0
Separated	0	0.0
Widow/Widower	0	0.0
Educational Status		
Primary	15	30.0
Secondary	4	8.0
Tertiary	2	4.0
Islamic	29	58.0
Household Size		
1 – 15	17	34.0
16 – 30	26	52.0
31 – 45	6	12.0
46 – 60	2	4.0
Years of Fishing Experience		
1 – 10	13	26.0
11 – 20	11	22.0
21 – 30	16	32.0
31 – 40	7	14.0
41 – 50	3	6.0
Formal Fishing-related Training		
Yes	0	0.0
No	50	100.0
Fish as Main Occupation		
Yes	34	68.0
No	16	32.0
Gear Preference		
Active	14	28.0
Passive	12	24.0
Both Active & Passive	24	48.0
Years Spent in Locality		
1 – 15	11	22.0

Parameter	Frequency	Percentage (%)
16 – 30	22	44.0
31 – 45	12	24.0
46 – 60	5	10.0
Average Annual Income (₦)		
0 – 400,000	4	8.0
400,001 – 800,000	5	10.0
800,001 – 1,200,000	14	28.0
1,200,001 – 1,600,000	1	2.0
1,600,001 – 2,000,000	2	4.0
> 2,000,000	17	34.0
Membership in Fishermen Association		
Yes	0	0.0
No	50	100.0

Constraints Faced by Fishermen in Kaita Local Government Area, Katsina State

As shown in Table 3, the constraints faced by artisanal fishermen in Abdallawa Reservoir varied in severity among the factors assessed. Inaccessibility to credit was rated as very severe by almost all the respondents (96%), with only 4% rating it as severe. Similarly, high cost of fishing gears was considered very severe by 94% of the fishermen, while 6% rated it as severe. Scarcity and high cost of fishing nets had a mixed distribution, with 54% rating it as severe and 30% as very severe. Variation in weather conditions was mostly rated as not severe (48%), followed by severe (26%) and very severe (18%). The distance to markets for fishing inputs was rated severe (32%) and not severe (28%) by some respondents while 24% of them considered it as not a constraint. The cost of maintaining gears and crafts showed equal ratings of very severe and not severe (34% each),

while 28% rated it as severe. Infestation by aquatic weeds was largely seen as not severe (56%) or not a constraint (44%). Inadequate fishing technology received varied responses, with 28% and 22% rating it very severe and severe, respectively, while 32% considered it not a constraint. Poor storage and transportation facilities were mainly rated not severe (62%), followed by 16% who rated it as very severe. Poor market access was also mostly rated not severe (56%) and not a constraint (34%). Lack of policy support was predominantly rated very severe (62%), followed by 16% severe. Low levels of education were considered very severe by 40% and severe by 36% of respondents. Insecurity was overwhelmingly rated as not a constraint (84%), while only 2% rated it severe. Finally, poor rural infrastructure was mostly considered among the respondents as not a constraint (52%), with 36% rating it very severe.

Table 3: Constrains faced by Artisanal fishermen in Abdallwa Reservoir, Katsina state.

S/N	Constraint	Very (%)	Severe	Severe (%)	Not (%)	Severe	Not Constraint (%)	a
1	Inaccessibility to credit	96.0%		4.0%	0.0%		0.0%	
2	High cost of fishing gears	94.0%		6.0%	0.0%		0.0%	
3	Scarcity and high cost of fishing nets	30.0%		54.0%	16.0%		0.0%	
4	Variation in weather condition	18.0%		26.0%	48.0%		8.0%	
5	Distance to market for inputs	16.0%		32.0%	28.0%		24.0%	
6	Cost of maintaining gears & crafts	34.0%		28.0%	34.0%		4.0%	
7	Infestation by aquatic weeds	0.0%		0.0%	56.0%		44.0%	
8	Inadequate fishing technology	28.0%		22.0%	12.0%		32.0%	
9	Poor storage & transportation facilities	16.0%		8.0%	62.0%		14.0%	
10	Poor market access	0.0%		10.0%	56.0%		34.0%	
11	Lack of policy support	62.0%		16.0%	2.0%		20.0%	
12	Low level of education	40.0%		36.0%	6.0%		18.0%	
13	Insecurity	0.0%		2.0%	10.0%		84.0%	
14	Poor rural infrastructure	36.0%		8.0%	4.0%		52.0%	

Key: Freq: Frequency

DISCUSSION

Morphometric Features of Abdallawa Reservoir

A clear understanding of water dynamics is fundamental because reservoir morphology exerts primary control over hydrological behaviour, sediment transport, and water quality dynamics. Basin shape, shoreline complexity, and depth configuration collectively influence circulation patterns, residence time, sediment deposition, and nutrient redistribution within inland water bodies (Wetzel, 2001; Thornton et al., 1990; Kalff, 2002). In semi-arid regions, where rainfall is seasonal and catchment erosion is intense, these morphological controls become particularly critical in determining reservoir functioning (Parkman, 1996; Yonnana et al., 2019).

Abdallawa Reservoir shows characteristics similar to small and medium natural reservoirs in Northern Nigeria, such as Sabke, Dan-Nakola, Ajiwa, Jibiya, and Kafin Zaki Reservoirs (Ahmad et al., 2014; Yusuf & Yusuf, 2013; Yonnana et al., 2019; Amangabara et al. 2021). Its enclosed basin and limited wind mixing promote sediment retention (Wetzel, 2001; Kalff, 2002). The shoreline length of 8.46 km indicates a moderately irregular shoreline similar to Sabke and Jibia reservoirs, where erosion and sedimentation influence shoreline changes (Ladan & Tukur, 2024; Yusuf & Yusuf, 2013). However, it differs from larger and engineered reservoirs such as Zobe and Ajiwa Reservoirs (Thornton et al., 1990; Yaro et al., 2018).

The elongated basin shape reflects natural drainage and geomorphological controls, consistent with previous

findings in Ajiwa, Sabke, and Kafin Zaki Reservoirs (Håkanson, 1995; Kalff, 2002; Yaro et al., 2018). Unlike Zobe Reservoir, whose basin was shaped mainly by engineering activities, Abdallawa Reservoir appears naturally formed (Ibrahim & Abdulkarim, 2017). High turbidity observed in the reservoir indicates strong sediment inflow and poor water transparency, a condition common in small reservoirs exposed to catchment erosion (Kareem et al., 2018). According to Wetzel (2001), high turbidity reduces light penetration and biological productivity. Larger reservoirs, such as Zobe and Ajiwa, often show clearer water because sediments settle more easily before spreading across the basin (Yaro et al., 2018). The bathymetric observations revealed shallower depths around inflow and outlet zones which may be attributed to sediment deposition from seasonal overland runoffs (Morris & Fan, 1998). Similar sedimentation problems have been reported in Jibia, Mairuwa, Zobe, Kubanni, and Goronyo Reservoirs, where continuous sediment accumulation has reduced water depth and storage capacity over time (Yusuf & Yusuf, 2013; Ibrahim et al., 2023; Abdulkadir, 2024).

Socio-Economic Status of Artisanal Fishermen of Abdallawa Reservoir, Katsina State

Fishing is an important source of food, income, and employment worldwide, especially in developing countries where small-scale fishing is common (FAO, 2016; 2022). In Nigeria, artisanal fishing supports rural livelihoods and food security, particularly in Northern States where

reservoirs are the main fishing areas (Adams et al., 2021; Oyetade et al., 2025;). In Katsina State, reservoirs, such as Jibiya, Ajiwa, Zobe, and Sabke, support many fishing activities that provide income and protein for local communities (Dasuki et al., 2014; Tiri et al., 2025). The socioeconomic conditions observed in Abdallawa Reservoir, therefore, reflect the realities of inland fishing communities in the state.

Fishing activities in Abdallawa Reservoir are mainly carried out by economically active age groups because fishing requires physical strength and endurance for canoe paddling, setting nets, and hauling catches (Akpoko, 2004; Dauda et al., 2021; Ogunremi et al., 2023;). Similar findings have been reported in related studies conducted in Katsina State, where young and middle-aged fishers dominate artisanal fisheries due to their higher productivity and adaptability (Dauda et al., 2021; Tiri et al., 2025). However, studies in Southern Nigeria reported higher participation of older fishers because many youths migrate to urban areas and show less interest in fishing (Bawa et al., 2019; Arthur, 2024). The high number of married fishers reflects the importance of fishing in supporting family needs such as food, education, and healthcare (Dasuki et al., 2014; Oruonye et al., 2023). Similar findings have been reported around Jibiya and Dutsin-ma areas of Katsina State (Dauda et al., 2021; Tiri et al., 2025). Large household sizes are also common due to cultural and extended family systems in Northern Nigeria (Olaoye et al., 2012). While large families may provide labour for fishing and fish processing (Dauda et al., 2021), they may also increase financial pressure on fishing households (Akanni, 2008).

The educational characteristics of artisanal fisherfolks in Abdallawa Reservoir show low levels of western education and the dominance of Islamic education. Similar reports have been documented among artisanal fisherfolks in Northern Nigeria (Adams et al., 2021; Dauda et al., 2021). Formal education improves understanding of fisheries regulations, modern fishing methods, and participation in cooperatives (Egesi, 2016; FAO, 2016). However, indigenous knowledge and long fishing experience help fishers continue their activities successfully despite low formal education (Ibrahim, 2020; Sarch & Allison, 2000; Arthur, 2024). The absence of formal fishing training shows that fishing skills are mainly learned through family traditions, observation, and apprenticeship from childhood (Ibrahim, 2020; Dauda et al., 2021). Similar patterns were reported in Bakalori Reservoir, Zamfara State (Ibrahim, 2020). Although lack of formal training may reduce efficiency and innovation (FAO, 2016; Kasali et al., 2018), local knowledge remains important in managing small inland fisheries (Sarch & Allison, 2000; Arthur, 2024).

Fishing in Abdallawa Reservoir mainly serves as a primary occupation because alternative jobs are limited in rural communities (Tiri et al., 2025; Oyetade et al., 2025). However, participation in fishermen associations is low, similar to findings in Katsina State where poor leadership, mistrust, and limited benefits discourage cooperative membership (Garba, 2021; Tiri et al., 2025). Even though cooperatives can improve access to credit, training, and governmental support (FAO, 2022; Oladapo & Ajani, 2024), weak associations often lead to reduction in participation (Allison & Ellis, 2001; Arthur, 2024). Income among artisanal fishers is often unstable due to seasonal fishing conditions, traditional methods, and limited investment (Garba, 2021; Oyetade et al., 2025; Tiri et al., 2025). Some studies (Akanni, 2008; Oladoja & Adeokun, 2009) suggested that these challenges keep many fishers in poverty, despite the availability of fish resources. However, better market access and institutional support can improve fisher income and livelihood conditions (FAO, 2022 Arthur, 2024). The fishing gears used in Abdallawa Reservoir show adaptation to local environmental and economic conditions. Passive gears such as gillnets and traps are common because they are affordable and suitable for shallow reservoirs (Dauda et al., 2021; Ogunremi et al., 2023). Although, some studies argued that passive gears may reduce catch quantity and fish diversity (Tagago et al., 2011), combining active and passive gears improves flexibility and helps fishers cope with seasonal environmental changes (Tafida & Galtima, 2016; FAO, 2016; Tiri et al., 2025).

Constraints Faced by Fisherfolks in Abdallawa Reservoir

The constraints faced by artisanal fishers in Abdallawa Reservoir are similar to those reported in many inland fisheries across Nigeria. Limited access to credit and high cost of fishing gear remain major challenges affecting fish production and fisher livelihoods (Garba, 2021; Oyetade et al., 2025; Tiri et al., 2025). Similar problems have been reported in other Nigerian fishing communities such as Dannakola, Ajiwa, Jibiya, and Dutsin-Ma, where poor access to loans, weak infrastructure, and limited institutional support reduce productivity (Ibrahim et al., 2015). These similarities show that financial and institutional constraints are common problems in artisanal fisheries. Another similarity is the dependence on traditional fishing methods and indigenous knowledge. Studies from Northern Nigeria reported that artisanal fishing is mostly family-based and relies on local experience because of weak extension services and limited government support (Omitoyin & Aderanti, 2020; Dauda et al., 2021). In addition, unstable income and poverty among fishers have also been widely reported in Katsina State such as Ajiwa, Zobe and Jibiya and other parts of Nigeria due to seasonal fishing, low investment, and poor

market systems (Akanni, 2008; Garba, 2021; Tiri et al., 2025).

Despite these similarities, some contrasts were observed. While many studies identified environmental problems such as overfishing and declining fish stocks as major fisheries challenges (Okeowo et al., 2015; Dauda et al., 2021), fishers in Abdallawa Reservoir appeared more affected by economic and institutional difficulties such as poverty, lack of credit, and expensive fishing inputs. This suggests that socio-economic problems are more immediate in the study area.

Studies from southwestern Nigeria showed that many fishers combine fishing with farming, trading, and other income-generating activities (Oladapo & Ajani, 2024; Oyetade et al., 2025). However, fishers in Abdallawa Reservoir depend mainly on fishing because of limited alternative employment opportunities. Although fishers' associations can improve access to loans, training, and government support (FAO, 2022), participation in among fishers of Abdallawa Reservoir remains low, and is similar to reports from Mairua Reservoir in Funtua Zone, Zobe Reservoir in Dutsin-Ma Zone, and Daberam Reservoir in Ajiwa Zone of Katsina State, where mistrust and poor leadership were identified as major factors discouraging membership in fishers' associations (Garba, 2021; Tiri et al., 2025).

Conclusion

Abdallawa Reservoir is a small-medium natural crater lake with an elongated basin, moderately irregular shoreline, and moderate turbidity influenced by sediment inflow. Fishing is mainly practiced by economically active individuals and serves as a primary means of livelihood for most households. However, the artisanal fishermen utilising the reservoir are characterized by low formal education, absence of training and fisher associations, whose fishing activities are majorly constrained by limited credit access, high gear costs, weak policy support, and low level of education. The study provides baseline information for improved fisheries management and sustainable livelihood development around the reservoir.

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