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CHALLENGES FACING FISHERMEN IN BARDAWIL LAKE, NORTH SINAI, EGYPT

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ABSTRACT

Bardawil Lake is considered one of the most important and purest Egyptian lakes. However, in recent years, a relative decrease in the quantity and value of production and a qualitative change has been observed in the fish produced by the lake. Hence, this study aimed to identify the most important problems facing the fishermen in Bardawil Lake and their suggestions to overcome them. This study was conducted in North Sinai Governorate, Data were collected using a focus group discussion method with 90.6% of the board's members of fishing associations (58 respondents). in addition, A random sample of 346 fishermen through a personal interview from May to December 2020. The results indicated the high age levels of fishermen ($\bar{X}$ = 50.44) and the high illiteracy rate among them (58.57%) despite their high experience in the fishing profession, but unfortunately, it was not based on a training background as 69.65% of the respondent fishermen did not receive any training courses. only 13.45% of them depended on the agricultural extension as the main source of technical information, which indicates a clear absence of the agricultural extension role with the fishermen in the lake. The most important obstacles facing the respondent fishermen were the weak income from the fishing profession 89.88%, the weak role of agricultural extension 86.42%, the insufficiency of the role of fishing cooperatives 83.82%, While their most important suggestions were to activate the laws regulating the fishing process 90.17% and to prevent illegal fishing 84.68%. The study recommends developing fish extension and providing it with specialists in the fields of fisheries development to play a more effective role in this field.

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INTRODUCTION

The fisheries sector is one of the most important agricultural sectors that contribute to the development of the national economy and represents 4% of the value of Egyptian agricultural production and 15% of the total value of animal production, as it employs about 220,000 workers (EMA, 2019). This sector contributes to reducing the food gap by providing one of the best and cheapest types of animal protein (FAO, 2016) after the high prices of red meat and poultry in light of the high prices of feed due to the limited agricultural area and attention to major crops more than fodder crops. Reports indicate that the average share of the Egyptian citizen of fish is much less than the average

recommended by the World Health Organization, as the individual in Egypt consumes only 13.6 kg of fish annually, while the annual average in Japan is 50 kg and in some European countries 22 kg while in China it reaches 27 kg annually (FAO, 2019). The development of fish production is one of the pillars of animal protein sources development in the world, where the global production of fish reached 178 million tons in 2018 with a value of 410 billion dollars, and production is expected to reach 204 million tons in 2030. with an increase of 15% (United Nations, 2020) in Egypt, there was a jump in the value of fish production from 10.8 billion pounds in 2007 to 61.1 billion Egyptian pounds in 2018, and the Egyptian fish production increased from about 648.9 thousand tons in 2008 to about 1.93 million tons in 2018, (including 780,000 tons of Nile tilapia that is difficult to export), with an increase of about 141.4%. However, the fish self-sufficiency rate declined from 87.7% in 2008 to 79.6% in 2019 (CAPMAS, 2020). This is due to the increased demand in light of a continuous population increase, as the population of Egypt is expected to reach 130 million by 2030 (El-Ezaby and Azaz, 2020). However, it is possible to achieve self-sufficiency in fish in Egypt, which has the necessary ingredients to achieve this goal, such as diversifying sources of fish production with an area of 13 million feddan (Azaz, 2021). The sources of fish production in Egypt include two main tributaries, The first source is the natural resources which include marine fisheries (the White Sea and the Red Sea), and freshwater fisheries such as the Nile River and its branches, lake fisheries, which are represented in internal lakes, coastal depressions, and northern lakes in the northern Nile Delta, with an estimated area of about 11 million feddans.

The second source is fish farming, represented in governmental and private fish farms, floating cages, and rice fields (Ministry of Agriculture, 2019). The sustainable agricultural development strategy, within the framework of Egypt's Vision 2030, aims to strengthen food security by developing fish production from its natural sources and from fish farming (Ministry of Planning, 2020). With regard to natural resources, the production of these sources decreased from 422.66 thousand tons in 2008 to 373.28 thousand tons in 2018 as a result of overfishing, the increase in pollution to which these sources are exposed, and the weak investments directed to these sources. This prompted Egypt to import more than 245,000 tons of fish annually (CAPMAS, 2020). While the contribution of fish farming production increased from 226 thousand tons, representing about 34.9 % of fish production in 2008, to 1.56 million tons, representing about 80.7% of the total fish production in 2018 (Table No. 1) as a result of the increase of fish farming units and the increase in the productivity of these units (CAPMAS, 2020).

Table 1. Egyptian Fish production development from different sources in tons 2008-2018.

Source/Year	Natural resources			Fish farming	Total
	Seas	Lakes	The nile river		
2008	172343	186338	63981	226276	648938
2009	111000	177000	105000	472000	865000
2010	122303	163339	89712	986820	1362174
2011	114198	173416	66623	1017738	1371975
2012	106661	182525	67671	1097544	1454401
2013	107799	170932	66060	1137091	1481882
2014	128000	172000	87000	706000	1093000
2015	103654	158475	73484	1370660	1706273
2016	179827	251237	123742	1391330	1946137
2017	109764	183463	77732	1451841	1822800
2018	104695	194851	73739	1561457	1934742

Source: Ministry of Agriculture and Land Reclamation, General Authority for Fisheries Development, Fish Production Statistics, Cairo, various issues.

Hence, attention must be focused on the development of natural resources in parallel with the effort exerted in fish farming to bridge the gap between production and consumption, as one of the goals of sustainable agricultural development 2030 (Al-Hamouli and El-Etreby, 2021). Bardawil Lake is considered one of the

most important high-quality fisheries, as it occupies second place among the lakes in terms of area. Lake Bardawil is located on the northern coast of the North Sinai Governorate. The fish of Bardawil Lake are of high quality and have a global reputation, and high-end hotels in Egypt depend on them. It is also considered one of the vital protein sources for the North Sinai citizens, whose number reaches 453,000 people, (CAPMAS, 2020). about 3,488 fishermen work in the lake, registered in the lake management records, 70% of them are residents of Bir al-Abed district, and the remaining 30% are residents of Al-Arish and Sheikh Zuweid. The lake is considered the source of income for these fishermen, as well as the livelihood of another group of people who deal with fishermen, including traders, fishing delegates, brokers, motor repair workshops, yarn and net dealers, snow factories, and boat construction and repair workshops (Bardawil Lake Administration, 2018). Therefore, it is necessary to work on the development and advancement of this region and to work on the application of the latest technological methods to serve the fish production sector in the Arab Republic of Egypt, in an effort to reduce the gap between production and consumption. To achieve this, it is possible to rely on the agricultural extension system, as it is one of the most important devices that can play a pivotal role in educating workers in the field of fishing (Al-Habal *et al.*, 2018). It is possible to start from studying the problems and needs of fishermen, which is the real starting point for the development of the fishing community in the lake, through the participation of researchers in universities, research centers, and concerned parties to find appropriate solutions to these problems.

Research Problem

Bardawil Lake is considered one of the most important Egyptian fisheries in general. It is also considered one of the purest lakes in the world. It is famous for producing the finest types of luxury fish such as bream, sea bass, moose fish, mullet, grouper, lotus, and shrimp, which meet global demand, especially in European countries. The lake also provides a job opportunity for about 20,000 people from North Sinai and other governorates. Despite the state's interest in this important source of fish production, it has been observed in recent years that production from the lake suffers from a relative decline in the quantity and value of production, as production declined from 5,392 tons in 2008 to 2,330 tons in 2018, (Ministry of Agriculture, 2019) Likewise, a qualitative change occurred in the fish produced by the lake, which negatively affected the means of production, and methods of fishing, which affected the conditions, incomes, and standard of living of fishermen, Here, agricultural extension, as one of the most important developmental devices in the agricultural community, must intervene through planned training programs based on the needs of the targeted audience (Saleh, 2020). Which necessitated identifying the current situation of the lake and its production capacity, and standing up to the most important obstacles and problems facing the fishermen in the lake and their proposals to solve them in order to plan development extension programs aimed at advancing the fishing community in Lake, reaching the highest productivity and contributing to bridging the fish gap in Egypt.

Objectives of the study

The objectives of this study are to:

- Assess the lake in terms of its geographical scope, depth, degree of salinity, the condition of the bogases, and fishing technics
- Study the current situation of the productive capacity of the Lake.
- Identify social and economic characteristics of the respondents.
- Identify sources of information for fishermen about technical information related to the fishing field.
- Identify the problems faced by the fishing associations from the point of view of the members of their boards of directors and their suggestions for solving them.
- Identify the problems faced by the fishermen of Bardawil Lake and their suggestions for solution.

METHODOLOGY

This study relied on Descriptive Research, which is considered one of the most appropriate and most widely used methods in studying human and social phenomena, which is based on describing a phenomenon to identify it, reach its causes and the factors that control it (Mubarak, 2006).

We relied on published and unpublished secondary data from the General Authority for Fisheries Development, the unpublished data for the management of Bardawil Lake in North Sinai Governorate, and the Information

Center in North Sinai Governorate, in addition to the preliminary data collected through those who attended the focus discussions from members of the boards of directors of fishing associations which were 90.6% of the board's members of fishing associations (58 respondents). personal interview with a random sample of 346 the fishermen in the lake representing 9.9% of the total fishermen registered in the lake management records following Krejcie and Morgan equation (1970), Data were collected from May to December 2020.

Data collection and Data analysis

Data were collected using focus group discussion method with the 58 members of the board of directors of the six cooperative societies for fishermen in the lake during six focused discussion sessions, one session every week at the headquarters of these associations. Each session lasted for about 90 minutes and aimed to answer two main questions: 1- What are the most important problems facing cooperative societies for fishing in the lake? And 2- What are the proposals of the participating board members to face these problems? The responses of the participants in the discussion were recorded, A questionnaire was also used through a personal interview with a random sample of the fishermen's community in the lake, after evaluating it by specialists from the agricultural extension professors and conducting a pre-test, before putting it in its final form. The questionnaire form included 4 main sections. The first section dealt with questions related to the characteristics of the fishermen surveyed, the second part dealt with the most important problems facing the fishermen, and the third part dealt with the most important proposals of the fishermen to overcome these problems. Several statistical methods were used to describe and analyze the study data such as the tabular display with frequencies and ratios. percentages, means, and standard deviations, Data were analyzed using IBM SPSS statistics software version 20.0.

RESULTS AND DISCUSSION

First, a quick look at the lake

Lake Bardawil is located on the northern coast of North Sinai Governorate, between longitudes 32.40 to 33.30 North and latitudes 31.03 to 31.14 East. It is separated from the Mediterranean by a coastal strip of no more It is 18 km west of the city of El-.than one kilometer Arish. The length of the lake on the Mediterranean coast is 95 km, and its maximum width is about 22 km. The lake's water surface is about 165,000 feddan or 693 km^2. The lake consists of three regions: the central region, with an estimated area of about 106 thousand feddan, the western farmland of 48.1 thousand acres, and Lake Zaraneq 10.2 thousand feddan. Lake production represents 2.77% of lake fisheries production, or about 0.33% of the total Egyptian fisheries (Azazy *et al.*, 2013). Lake Bardawil is a natural depression with a depth of 1-3 meters, separated from the Mediterranean Sea by an arc-shaped sandy strip with a width of 300-800 meters in most areas. And the main connection between the Mediterranean Sea and the lake is through two industrial openings: Bogas No. (1) - the western hole, Bogas No. (2) - the eastern hole, There is a third natural opening (Zaraniq Bogaz) at the end of the eastern part of the lake and it opens by the force of nature and has a weak effect on the water flow of the lake and the degree of salinity in it due to the fact that this part is shallow and separated from the rest of the lake through small islands (Bardawil Lake Administration, 2019). Most of the lake bottom is covered with seagrass, and the two artificial holes (bogases) are necessary for the exchange of water between the sea and the lake, and these openings are kept open by dredging the deposited sand, The lake did not reach its current area until after the construction of the industrial bogas holes, as there were no artificial openings connecting the Mediterranean and the lake, but the water entered the lake through natural openings caused by the tidal sea currents that caused a fracture in a small part of the sand bridge separating the sea and the lake, then these openings are soon blocked by the amounts of sand carried by the waves, causing silting and closing of these openings (Bardawil Lake Administration, 2019).

Lake water sources

Lake Bardawil connects to the sea through 4 openings called "Bogas". These openings are not fixed. The bogas are the vital artery in the development of the lake. During which water exchange processes take place between the sea and the lake, which reduces the degree of salinity to a degree that is compatible with the growth of the basic fish in the lake. Also, the economic fish (bream - the mullet family) migrate and go out to the sea through the bogas to breed in places not far from the lake, then the mothers and the large part of the pretext

return to Lake Bardawil, where there is natural food suitable for the growth of these types of fish (Bardawil Lake Administration, 2018). The degree of salinity in the lake ranges between 45-55 ppm. In the years 1926 and 1927 the lake dried up completely and no water from the sea reached it, so an industrial hole was made in the sandy strip separating the lake and the sea in the East Al-Qallus region. Then the sand soon closed the hole and became dry again, and between 1927 - 1935, 8 openings were opened, and this affected the lake's production of fish, as during the periods when the openings were closed, the lake's production was completely absent. In the years 1926, 1927, 1929, and 1934, the lake's production was zero, which indicates that these openings are necessary for the exchange of water between the sea and the lake. Therefore, these openings must be kept open constantly by dredging the deposited sand in them (Bardawil Lake Administration, 2019).

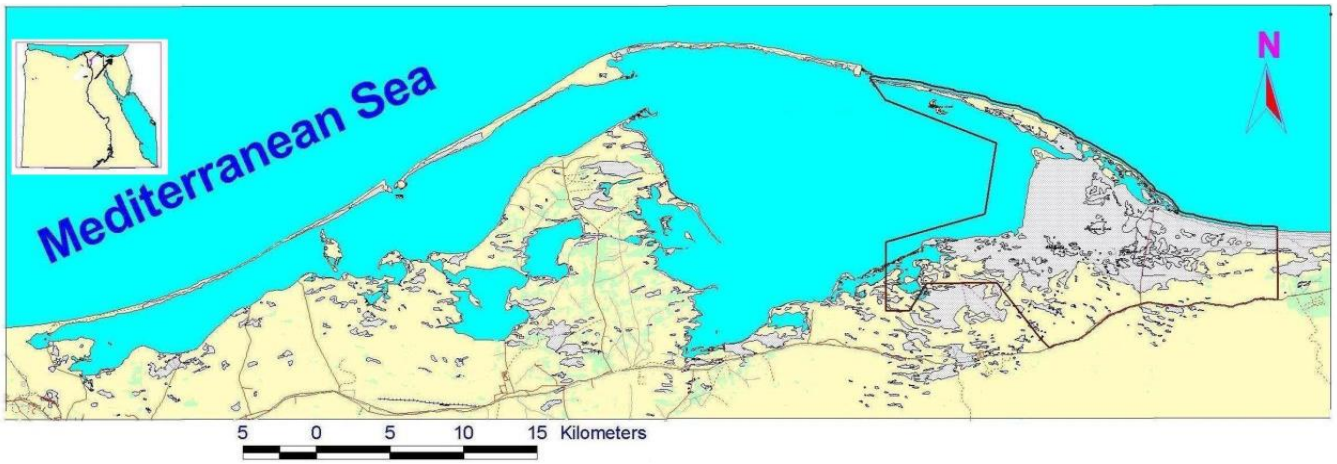

Figure 1. A map of Bardawil Lake Source: https://moa.gov.eg/

Depths of the lake

The deepest areas of the lake are located in the northern part of the lake and close to the holes of the Bogas, where they reach 3 meters and are shallower in the southern regions of the lake, where it reaches half a meter. The depths depend on the state of the bogas , and in general, most of the lake's areas reach a depth of 1.25 meters (Bardawil Lake Administration, 2019).

Fishing crafts in the lake: There are two kinds of fishing crafts (techniques) in Bardawil Lake, between legal or illegal methods, according to the standard of using "magha" or spinning according to the conditions set by the lake administration and the General Authority for Fisheries:

1. Al-Daba craft: This fishing method is considered the least stressful fishing craft for the lake, and it is dedicated to fishing bottom fish such as bream, bass, grouper, crab, shrimp and Moses fish, representing about 92.8% of the actual operating boats, which amounted to 1229 boats, where the fishermen throw spinning in the lake before Sunset, and collect the spinning early morning and then take them to the dock belonging to it to deliver their production of these fish, as well. (Lake Bardawil Administration, 2019)
2. The reed craft (elbouss): This craft is dedicated to fishing the mullet family. In Bardawil Lake there are 88 fishing boats working with reed craft, representing 7.2% of the boats operating in the lake. Where the boats are allowed to go out for fishing in the early morning every day, and work during the day until the last light and return to deliver the fish to the dock belonging to each boat (Bardawil Lake Administration, 2019).

Production sites in Lake Bardawil: Lake Bardawil has five fishing sites:

1. Al-Tilul: It contains the headquarters of the Bardawil Lake Administration, where the employees reside permanently, and Daba craft work only, on 400 Daba boats.
2. Egziwan: 600 Daba boats.
3. Al-Nasr: 140 Daba boats.

4. Negela: 88 reed craft (elbouss)
5. Zaraniq: It is considered the least important anchor due to the scarcity of boats operating in it (a natural reserve). (Bardawil Lake Administration, 2018).

Second: the productive situation of the lake

The fish production of Bardawil Lake decreased from 5392 tons in 2008 to 2330 tons in 2018, and there was no increase in the number of fishing boats during the same period, which was 1228 boats. While the number of fishermen decreased by 9.2% during the same period from 3,841 to 3,488 fishermen, and the productivity of the fishing boat decreased from 4.4 tons in 2008 to only 3 tons in 2018 (Bardawil Lake Administration, 2019). Mustafa and Abdel-Aziz (2020) indicated that the fish production in the lake has taken a general statistically significant decreasing trend, amounting to about 12.74 tons annually, with an annual decrease rate estimated at 0.36% of the average lake production in the period 2000-2018, which amounts to 3490 tons. Lake Bardawil is characterized by high-quality fish with high local and international demand for it due to the purity of its water as it is the only lake in Egypt that is devoid of industrial, agricultural, or health drainage.

Therefore, the demand for lake fish from the local and foreign market increases, despite the high prices. The lake's fish varied, with the crab in the first place with 37.94% of the total fish production of the lake in 2018, and the mullet family in the second place with 33.68%, while the bream ranked third for the first time during the study period with 13.68% of the total fish production (Table, 2).

Table 2. Evolution of the lake's fish production during the period (2008-2018) for different species in tons.

Year	Bream	sea bass	moose	mullet family	hamour/ meagre	crab	Shrimp	other	total	Total value of fish production in thousand pounds
2008	336,20	90,30	342,50	1297,90	32,50	1610,60	1424,60	258,20	5392,80	118221
%	6,23	1,67	6,35	24,07	0,60	29,87	26,42	4,79	100	
2009	314,60	80,60	231,60	1131,70	31,80	2053,10	1354,90	211,80	5410,10	25129
%	5,82	1,49	4,28	20,92	0,59	37,95	25,04	3,91	100	
2010	304,05	45,66	123,40	1132,18	29,96	1456,57	1220,74	420,27	4732,83	105613
%	6,42	0,96	2,61	23,92	0,63	30,78	25,79	8,88	100	
2011	213,59	28,40	194,40	1190,86	6,50	1201,09	1175,56	518,14	4528,53	103877
%	4,72	0,63	4,29	26,30	0,14	26,52	25,96	11,44	100	
2012	256,43	45,14	159,21	1085,70	13,57	927,12	1100,28	257,76	3845,20	98296
%	6,67	1,17	4,14	28,24	0,35	24,11	28,61	6,70	100	
2013	239,82	40,41	121,65	733,72	16,86	734,29	1148,82	201,25	3236,83	89297
%	7,41	1,25	3,76	22,67	0,52	22,69	35,49	6,22	100	
2014	230,00	46,60	147,20	926,70	26,03	518,70	623,90	238,50	2757,63	116387
%	8,34	1,69	5,34	33,60	0,94	18,81	22,62	8,65	100	
2015	238,90	57,50	168,60	1592,60	30,30	1973,40	301,90	343,30	4706,50	143477
%	5,08	1,22	3,58	33,84	0,64	41,93	6,41	7,29	100	
2016	300,3	123,2	160,9	1548	41,6	315,9	1213,1	388,6	4092,3	129932
%	7,34	3,01	3,93	37,84	1,02	7,72	29,64	9,50	100	
2017	208	123	107	970	16	947	248	-	2619	132377
%	7.94	4.69	4.08	37.04	0.6	36.15	9.4		100	
2018	323	122	148	789	21	884	43	-	2330	144002
%	13.86	5.24	6.35	33.68	0.9	37.94	1.85	-	100	

Source: General Authority for Fisheries, Bardawil Lake Administration, February 2019

Table 2 shows that shrimp declined from 1,424 tons in 2008, representing 26.4 % of the total fish production of the lake, reaching only 43 tons in 2018, representing about 1.85% of the lake's production. While some species such as bream and seabass increased from 6.2 and 1.67% in 2008 to 13.86 and 5.24% in 2018. It is worth studying by specialists to find out the reasons for the change in type of lakes to find the change either it is due to climatic changes or a disruption in the ecosystems or due to fishing methods and human errors or other reasons, and work to increase the production of luxury fish that increases demand It has to be exported, such as bream, Hamour, sea bass, and Moses

Cooperative Societies of Fishermen in Bardawi

There are 6 cooperative societies representing fishermen in Lake Bardawil, namely Al-Arish and Al-Salam, which represent the fishermen from the city of Al-Arish and Sheikh Zuweid, while the 6th of October, Al-Sahel, Bardawil, and Sinai societies represent the fishermen in Bir Al-Abed District and Rummana Department (Bardawil Lake Administration,2019). These associations work to provide production requirements such as fishing nets and motors at nominal prices with installments, and to market fish for the benefit of their members. They also provide health and social care for members and their families.

Table 3. A statement of the cooperative societies in Lake Bardawil.

District	Association name	Number of boats	The number of board members
Al-Arish	Al-Arish	148	11
	Al-Salam	118	11
Bir Al-Abed	Al-Sahel	501	9
	6th of October	220	11
	Bardawil	187	11
	Sinai	54	11
Total	6	1228	64

Source: North Sinai Fisheries Region, February 2019

Personal and social factors of fishermen

Table 4 indicates that 56.36% of respondents were over 45 years old, with an average age of 50.44 years, which indicates a higher age level for fishermen. Similar results by Al-Qattan (2018) in his study of the problems facing fishermen in Manzala Lake in Dakahlia Governorate, where the average age of the respondents was 53 years. As well Abdullah *et al.* (2019) about the extension needs of fish farmers in Kafr El-Sheikh Governorate, where the average age of the respondents was 50.5 years, this indicates the youth's abandonment of this profession, which no longer provides an adequate and sustainable return for fishermen (Ismail, 2014; Al-Habal *et al.*, 2018), 58.57% of the respondents were illiterate and only 25% had an average or high qualification. Around 52% of the respondents do not own a fishing boat, but rather work for others. The average experience in the fishing profession reached 31 years, which is a great experience, but unfortunately, it is not based on training background, as 69.65% of the respondents did not receive any training courses during this period, despite the participation of 75.77% of them in fishing cooperatives. This indicates the weak role of these associations in providing training services to fishermen, as well as the decline in the role of agricultural extension, which 74.86% of respondents had a negative attitude towards. Around 61.27% of the respondents indicated that they do not dedicate themselves to the fishing profession, perhaps due to the low income obtained from this profession and the presence of many problems that we will discuss in this study, which led to the fact that 50.29% of the respondents are not satisfied with working in the fishing profession, and to make the vast majority of the respondents' families do not work in fishing for more than one individual, as indicated by 61.56% of the respondents. , These results are in line with what Al-Qattan (2018) mentioned, that more than half of the respondents are in the age group 46-63 years and that 57% of them have practical experience in fishing between 30-51 years and that 97.9% of them did not attend Any training courses in fishing and that 71.4% participate in fishing cooperatives, This indicates the great similarity between the fishermen in Bardawil Lake and their colleagues in Manzala Lake in many personal characteristics despite the difference in many environmental conditions between the two regions.

Table 4. Distribution of the respondents according to their studied characteristics (N=346).

Variables	N	%	Mean	SD
Age				
< 30 years	88	25.43		
Years 45 -30	63	18.21	50.44	11.23
> 35 years	195	56.36		
Education				
illiterate	203	58.57		
Reads and writes	56	16.18		
Intermediate education	59	17.05		
high education	28	8.09		
Possession of a fishing boat				
Not possessed	139	51.57		
Participant	81	30.11		
owns a boat	49	18.22		
Experience in fishing a boat				
< 15 years	93	26.88		
Years -3015	121	34.97	31	14.09
> 30 years	132	38.15		
Participation in a cooperative society				
participant	269	75.77		
not participating	77	22.25		
Dedication in a fishing profession				
full time	134	38.73		
Not dedicated	212	61.27		
Attending training courses				
Did not attend	241	69.65		
1 course	89	25.72	0.76	0.83
1-2 training course	11	3.18		
> 2 courses	5	1.45		
Number of family members who practice fishing				
one person	213	61.56		
persons 2	89	25.72		
> 2 persons	44	12.72		
Satisfied with working in fishing				
Not satisfied	174	50.29		
somewhat satisfied	115	33.24	1.7	1.9
satisfied	57	16.47		
Attitude towards agricultural extension				
Negative < 4 degrees	259	74.86		
Neutral 4-6 degrees	64	18.50	3.8	1.81
Positive > 6 degrees	23	6.65		

Source: field study 2020

Fishermen's information sources for information related to the fishing field

Table 5 indicates that the majority of respondents (79.84%) depended on neighbors and friends as the main source of technical information related to the fishing field. Traders and owners of fishing supplies companies came in second place with 39.31%, while the internet came in third place with 26.59%, Which indicates a clear absence of the agricultural extension role with the fishermen in the lake. The extension sources came in a late rank as a source of the respondents' information related to the fishing field, as only 13.45% of the respondents depended on the agricultural extension as a source of information. Similar results were mentioned by Ragab *et al.* (2018) in their study on the knowledge and practices of fish farming

workers for recommendations related to the sustainable development of fish farming in Sharkia Governorate, where they indicated that fish companies, neighbors, and friends were the most important sources of respondents. The same thing was confirmed by the studies of Elwan *et al*. 2019, and (Ibrahim *et al.*, 2020), where personal experience, neighbors, and colleagues were top ranked information sources, while the extension sources came late, which necessitates officials to develop fisheries extension to play a more effective role in this field.

Table 5. Distribution of respondents according to their sources of information related to the fishing field (n = 346).

Fishing related information sources	F	%	Rank
Agricultural or fisheries extension agent	47	13.45	7
Agricultural programs on radio and television	53	15.32	6
Extension bulletins and magazines	29	8.38	8
Research stations	72	20.81	5
Fishermen's Cooperatives	88	25.43	4
Traders and owners of private companies	136	39.31	2
Internet	92	26.59	3
Neighbors and friends	275	79.84	1

Sources: Field Survey, 2020 * Multiple response

Third: The most important problems facing the fishermen's community in Lake Bardawil

Webster's Dictionary of Behavioral Sciences defines a problem as something that is difficult to deal with or something that becomes a source of trouble or anxiety (Webster's Dictionary of Behavioral Sciences, 2022). This part discusses the most important problems facing the fishing community in Lake Bardawil from the point of view of each of the board members of the fishermen's associations, as well as a random sample of fishermen in the lake. The results of the Focus Group Discussion of the members of the board of directors of the fishermen's associations revealed that the most frequent problems were the weakness of the financial resources of the fishing associations by 89.66%, Then the weak participation of the concerned authorities and coordination with the association by 82.76%, followed by the absence of training and rehabilitation centers for fishermen 81.3%, Then the weakness of control over the violating fishing activities, especially the fishing of small fish (72.41%), then the lack of respect by the fishermen for the decisions issued by the associations (97.68%), While problems such as the discrepancy in decisions between the associations each other (39.66%), and the monopoly of fish merchants on production (32.76%) were in the lower ranks of the problems from the point of view of the members of the associations' boards of directors (Table 6).

These results are in line with the results of studies (Al-Habal *et al.*, 2018) and (Mustafa and Abdel-Aziz, 2020), where the most important problems facing fishermen are weak government support for fishermen's associations, The control of intermediaries over the process of sorting and selling fish, lack of insurance for fishermen, the insufficient role of fish cooperatives and negative practices in the fishing process, the weak role of supervisory bodies, and absence of an extension advisory role.

Table 6. Problems facing the work of associations in the lake from the point of view of members of their boards of directors (N=58).

Sr. No	Problems	N	%	Ranking
1	Weak participation of the concerned authorities and coordination with the association	48	82.76	2
2	The inability of the current legislation of the fisheries cooperatives law to keep pace with the current economic and social changes	39	67.24	6
3	Conflicts in decisions between the associations to each other	23	39.66	10
4	The fishermen's lack of respect for the decisions of the fishing associations	40	97.68	5
5	Fishmongers' monopoly on fish production	19	32.76	11

6	Weak control over illegal fishing activities, especially fishing for small fish	42	72.41	4
7	Lack of training and rehabilitation centers for fishermen	47	81.3	3
8	Stability of the commissions received by the association in return for marketing fish	28	48.28	9
9	Weak financial resources for fishing associations	52	89.66	1
10	Absence of the Egyptian Fish Marketing Company	39	67.24	6
11	The inability to provide workshops for maintenance and repair of boats	33	56.90	8
12	Poor ability to provide modern fishing methods that protect fish stocks	38	65.52	7

Sources: Field Survey, 2020 * Multiple response

Suggestions of members of the board of directors of the fish production development associations in the lake

The most Suggestions that would activate the role of associations from the point of view of the members of their boards of directors was the establishment of a fund to face the risks of the fishing profession, as mentioned by 98.28% of the respondents, and the increase of the association's resources through fees and commissions allocated to the association from marketing fish, as indicated by 93.10% of the respondents, Then hiring specialists in the fields of fisheries development by 91.38% of the respondents, implementing training courses on fishing methods and sustainable production techniques 87.93%, suggestions such as providing reasonable unemployment support to fishermen during the ban period, establishing suitable headquarters for fish marketing circles within the production sites, and creating a fund for fishermen from which the fishermen will be disbursed during the ban period at late ranks as proposals for members of cooperative societies' boards of directors at rates of 48.28%, 46.55%, 32.76% respectively, Any development plan targeting cooperative societies in the lake must take these proposals into consideration and work to overcome the aforementioned obstacles.

Table 7. Board members' Suggestions to activate the association's role in serving fishermen (N=58).

Sr. No.	Suggestions	N	%	Ranking
1	Increasing the association's resources through fees and commissions allocated to the association from marketing fish	54	93.10	2
2	Making a fund for fishermen to spend on the fisherman during the ban period	19	32.76	12
3	Establishing suitable headquarters for fish marketing rings inside the production sites	27	46.55	11
4	Lifting customs duties on fishing tools and equipment necessary for fishermen's work	49	84.48	6
5	Recruitment of specialists in the fields of fisheries development	53	91.38	3
6	Implementation of training courses on fishing methods and sustainable production techniques	51	87.93	4
7	Awareness of fishermen about the dangers of nets with narrow openings to fish larvae	47	81.03	5
8	Establishment of workshops for the maintenance of motors and fishing boats	43	74.14	7
9	Making health insurance for fishermen	41	70.69	8
10	Establishment of a fund to face the risks of the fishing profession.	57	98.28	1
11	Provide reasonable unemployment support to fishermen during the ban period.	28	48.28	10
12	Providing the necessary funds to periodically cleanse the lake	38	65.52	9

Sources: Field Survey, 2020 * Multiple response

With regard to the problems facing the fishermen in Bardawil Lake and their suggestions to overcome them

The problems facing fishermen have been classified into five qualitative areas, namely (economic and financial obstacles, marketing obstacles, institutional obstacles, regulatory obstacles, and Extension obstacles). The results indicated that the most important obstacles were the weak income from the fishing profession 89.88% and the weak role of agricultural extension in supporting the fishermen of the lake 86.42%, the insufficiency of the role of cooperatives in promoting fisheries in the lake

83.82% and silting industrial bogas holes and not purifying them 83.24%.

The lack of support for fishing production requirements 77.17%, and the increase in the prices of fishing supplies 48.84%, while obstacles such as the spread of narrow yarn were 27.75%, And flooding the markets with imported fish 26.88%, and allowing fishing trips on the industrial bogas holes 11.85%, and not combating the spiny snails that affect the nets 10.12% in the late ranks (Table 8).

Table 8. The most important problems facing the fishermen in Bardawil Lake (N=346).

Field	Problems	N	%	Ranking
Economic and financial obstacles	Lack of support for fishing production requirements	267	77.17	5
	High prices of nets and fishing supplies	169	48.84	17
	High prices of fuel and oil for boats	150	43.35	19
	Increase in licensing fees for fishing boats	138	39.88	20
	Low income from the fishing profession	311	89.88	1
Marketing obstacles	Absence of the role of associations in marketing fish and providing fishing supplies	231	66.76	9
	high cost of transportation	230	66.47	10
	authority and merchants' commissions were High	102	29.48	24
	the mediator control in the process of fish marketing	174	50.29	16
	There is no fish stock exchange similar to the poultry stock exchange	134	38.73	21
	The lack of stores equipped for preserving and processing fish	207	59.83	13
	Lack of equipped transportation for fish	111	32.08	22
	Lack of marketing price information	185	53.47	15
Institutional obstacles	The inadequacy of the role of cooperatives in promoting fisheries in the lake	290	83.82	3
	The weak role of the Hunters Guild	104	30.30	23
	Poor lake management	256	73.99	7
	Not including fishermen under the umbrella of health insurance	155	44.80	18
	silting industrial bogas holes and not purifying them	288	83.24	4
	The market is flooded with imported fish	93	26.88	26
	Failure to combat spiny snails that affect the nets	35	10.12	28
Regulatory Obstacles	The spread of prohibited crafts for hunting	238	68.79	8
	The negative effects of the salinities adjacent to the Lake	111	32.08	22
	Allow fishing during the ban period	210	60.69	12
	The spread of narrow spinning and the presence of the motor for the reed craft	96	27.75	25
	allowing fishing trips on the industrial bogas holes	41	11.85	27
Extension Obstacles	The weak role of agricultural extension	299	86.42	2
	Absence of an awareness-raising role for the General Authority for Fish Resources Development	215	62.14	11
	Lack of specialized agricultural Extension agents	203	58.67	14
	Absence of the Extension role for scientific research bodies	169	48.84	17
	Failure to hold an Extension meeting for fishermen	261	75.43	6

* Multiple response Sources: Field Survey, 2020

These results are in line with the results of Mustafa and Abdel-Aziz (2020), where the most important problems facing fishermen were Silting industrial bogas holes because it acts as a fish buffer (96.16%) , Lack of investments to cleanse the lake (86.72%) , Increased prices of oils and fuel used by boats (85.25%), The mediator's control over the process of sorting and selling fish (79%), the death of fry as a result of allowing the

traction tool to work during the first month of the lake opening, non-compliance with the fishing ban months from January to April 50%, allowing fishing trips during the ban period, which affects the fish stock (52 %(, As well as the study by Ibrahim *et al.* (2020), where the most important problems were, the high costs of production requirements (97.9%), lack of funding from official authorities (92.2%), the authority's failure to purify the sparks (88.8%), lack of marketing outlets (71.1%), and lack of fuel sources (86.6%). As well as the study by Al-Habal *et al.* (2018), where the most important problems facing fishermen were poor health care (97.6%), weak government support for fishermen's associations (98.2%), high prices of fishing tools and equipment (95.7%), poor income from the fishing (94.5%), lack of insurance for fishermen (93.7%), The inadequacy role of fish cooperatives (89%), negative practices in the fishing process (72%), and the weak role of supervisory bodies (81.7%). The matter is not much different in the study of Ragab *et al.* (2018), where the most important problems facing the respondents in the field of sustainable development of fish farming were ranked in descending order according to the weighted average, which were the exploitation of traders by 2.7 degrees, then the instability of selling prices and the rise in fuel prices of 2.6 degrees, then the lack of legislation supporting production Fishing and high transportation costs 2.4 degrees, and Lack of Extension services 2.3 degrees. Therefore, the concerned authorities must work to solve these problems, and the agricultural extension system should play a more effective role in transferring the fishermen's problems to the responsible authorities and transferring the latest technological methods related to fishing to the fishermen to promote fish production in the lake, as well as the fishermen and their families.

Fishermen's suggestions to improve the current situation of Bardawil Lake

The fishermen's suggestions were classified into four qualitative areas (legislative and supervisory, marketing, financing, institutional, extension), and as Table 9 shows that the most frequent proposals to improve the conditions of fishermen and the lake came as follows: Activating the laws regulating the fishing process and modernization of fishing legislative system (90.17%), amending and purifying the croquet of the industrial bogas holes and opening of the third industrial bogas spur east of elqls area (87.57%), and the prevention of the traction craft, and if declaration to be only 45 days (84.68%), Providing warehouses equipped for preserving and preparing fish (81.21%), and preventing fishing near the Bugas up to a distance of 2 km (78.32%), While suggestions such as closing the salinas or making nets on their openings so as not to take small fish (22.25%) and raising obstacles from the lake water so as not to impede the fishing process (17.53%) ranked late in relation to the respondents' suggestions. These suggestions came in the same context as the suggestions made by previous studies such as Mustafa and Abdel-Aziz (2020), where the most important suggestions were the engineering modification of the industrial bogas holes and the expansion of their openings to facilitate the entry of fish from the sea into the lake (92.3%), Establishing a fishermen's association (81.71%), modernizing fishing boats (59%), providing machinery and equipment to clear the lake of waste 83%, encouraging the establishment of repair and maintenance workshops for boats 84.66%, strengthening social safety nets for fishermen and their families (84.66%), increasing the penalty for violating fishing during the biological prohibition period (57.52 %). As well as the study of Al-Habal *et al.* (2018), in which respondents suggested supporting and revitalizing cooperative societies (94.5%), legalizing fishing methods (91.5%), activating deterrent violations of fishing violations (94.5%), and clearing the lake and bogas holes (91.5%), As well as the study by Ibrahim *et al*. (2018), which suggested the expansion of the establishment of cooperative societies to help fishermen and provide them with production requirements (97.7%), and interest in providing credit facilities with simple loans (97.7%), providing marketing information 83.3%. It is noted that despite the different context and circumstances in most of the previous studies that differ in terms of geographical location or the nature of the sources of fish production, the existing problems and solution proposals do not differ much, Which places the responsibility of those responsible for fish production in Egypt to seek to solve these problems using the latest technological methods, relying on research cadres in universities and research centers and workers in the ministries of agriculture, environment, irrigation, and water resources, And work to activate the vital role of agricultural extension to make a real leap in fish production, bridge the food gap, achieve self-sufficiency

in fish, and reduce the size of the import bill for fish in the Arab Republic of Egypt.

Table 9. Fisherman's suggestions to improve the current situation of Bardawil Lake (N=346).

Field	Suggestions	N	%	Ranking
legislative and oversight	Prohibiting Boats from anchoring anywhere other than the designated fishing anchors	96	27.75	16
	Increasing the penalty for illegal fishing	210	60.69	7
	Prevention of the traction craft and in the event of its declaration it is only 45 days	293	84.68	3
	Preventing fishing near the Bugas up to a distance of 2 km	271	78.32	5
	Activating the laws regulating the fishing process and modernization fishing legislative system	312	90.17	1
	Banning fishing in ponds in the lake because they are areas where small fish are located	82	23.70	20
Marketing	Work on the return of the Egyptian Fish Marketing Company	91	26.30	18
	Opening new marketing outlets	228	65.90	6
	Reducing the control of wholesalers to prevent their exploitation	201	58.09	8
	Providing warehouses equipped for preserving and preparing fish	281	81.21	4
	Providing timely marketing information	129	37.28	14
Financing	Supporting associations to carry out their duty to provide fishing supplies	161	46.53	12
	Production supplies support	145	41.90	13
	Unemployment support for fishermen during the lake ban period	198	57.23	9
Institutional	amending and purifying the croquet of the industrial bogas holes and opening of the third industrial bogas spur east of elqls area	303	87.57	2
	Establishment of workshops for maintenance and repair of boats	98	28.32	15
	raising obstacles from the lake water so as not to impede the fishing process	61	17.53	22
	closing the salinas or making nets on their openings so as not to take small fish	77	22.25	21
	Health insurance for fishermen and the strengthening of social safety nets	172	49.71	11
Extension	The need to hire professional Extension agents	86	24.86	19
	Organizing intensive training courses on the latest technological	93	26.88	17
	Planning and implementing extension programs based on the realistic needs of fishermen	184	53.18	10

* Multiple response Sources: Field Survey, 2020

CONCLUSION AND RECOMMENDATIONS

The Egyptian government attaches great importance to the fisheries sector, as it is one of the most important agricultural sectors that contribute to the development of the national economy. Despite a boom in fish production in Egypt, the fish self-sufficiency rate declined from 87.7% in 2008 to 79.6% in 2019. Bardawil Lake is considered one of the most important high-quality fisheries in Egypt, but it has been observed in recent years a relative decline in the quantity and value of production from the lake, which has negatively affected the fishermen's conditions, their income, and standard of living. The results indicated the high age levels of the fishermen, the high illiteracy rate, and the participation of the majority of them in fishing cooperative societies, but most of them did not receive any training in this field. The results indicated a clear absence of the role of agricultural extension with fishermen, and the most important obstacles facing the respondents were the weak income from the fishing profession, the weak role of agricultural extension, and the inadequacy of the role of cooperatives, while their

most important proposals were to activate the laws regulating the fishing process with updating the legislative system for fishing. and amending and purifying the croquet of the industrial bogas holes and opening of the third industrial bogas, Therefore, the concerned authorities must work to solve these problems in order to promote fish production, the fishermen, and their families. In the end, the study recommends the development of fish extension and providing it with sufficient preparation of specialists specialized in the fields of fisheries development to play a more effective role in this field, raise the technical level of fishermen through planned training programs based on their real needs and problems, increase the resources of existing cooperative societies and enhance their capabilities to provide tangible services to their members, Strengthening the social safety nets for fishermen and their families, providing unemployment support during the ban period, encouraging the establishment of workshops for repairing and maintaining boats, providing machinery and equipment to cleanse the lake, and increasing the penalty for violating fishing during the biological ban period. And coordination between agricultural extension and those responsible for fish production in Egypt while seeking to solve these problems to bring about a real boom in fish production, bridge the food gap, achieve self-sufficiency in fish and reduce the size of the import bill for fish in Egypt.

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Annex

Fishing crafts in the lake

Musa fish

bream fish

Sea bass fish

Mullet fish

Shrimp fish

Crab fish

Some species of fish in Lake Bardawil