ASSESSMENT OF FISH STRUCTURE COMMUNITY AT GREATER ZAB RIVER NEAR ASKI-KALAK CITY,ERBIL

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ABSTRACT

The structure of fish community was evaluated before and after Aski-Kalak City at Greater Zab River, Erbil Province, Iraq during the period from November 2020 to October 2021. A total of 1582 specimens belonged to 25 fish species were collected and reached to 570 Kg of total weights. These fish were mostly belonging to Cyprinidae family and one for each Mugilidae, Siluridae, Bargridae, Sisoridae and Mastacembelidae. According to fish occurrence in (S1), there were five fish species be as resident, 8 and 10 species as seasonal and rare respectively. The annual values of fish species, weight and catches effort 10.7, 184 and 33.25 Kg/hour respectively, and in (S2) fish species of 6, 6 and 11 as resident, seasonal and rare respectively.The annual values of fish species, its weight and catches were 10.7, 210 and 38.59 Kg/hour respectively. The present study concluded that section of Greater Zab River (S2) was suitable for fish composition more than(S1).

Keywords: freshwater fishes, composition, distribution, biodiversity, life below water

تقييم تركيب مجتمع الأسماك في نهر الزاب الكبير بالقرب من مدينة أسكي – كلك، أربيل

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المستخلص

تم تقييم تركيب المجتمع السمكي قبل وبعد مدينة أسكي–كلك على نهر الزاب الكبير ، محافظة أربيل ، العراق خلال الفترة من تشرين الثاني 2020 إلى تشرين الأول 2021. تم جمع 1582 نموذجاً تنتمي إلى 25 نوعًا وبلغ الوزن الكلي 570 كغم. تنتمي معظمها إلى عائلة Cyprinidae وواحدة لكل Mugilidae وSiluridae وBargridae وSisoridae وMastacembelidae. وفقًا لوجود الأسماك في (S1) ، كان هناك خمسة أنواع من الأسماك مقيمة و 8 و 10 أنواع موسمية ونادرة على التوالي. كانت القيم السنوية لعدد انواع الأسماك ووزنها وجهد الصيد 10.7 و 184 و 33.25 كغم/ساعة على التوالي، وفي أنواع الأسماك في (S2) وجد ان 6 و 6 و 11 نوعا مقيمة وموسمي ونادر على التوالي. بلغ عدد انواع الأسماك والوزن وجهد الصيد 10.7 و 210 و 38.59 كغم/ساعة على التوالي. أظهرت نتائج الدراسة الحالية أن محطة (S2) على نهر الزاب الكبير كان ملائماً لمجتمع الأسماك وتوزيعها أكثر من محطة (S1).

الكلمات المفتاحية: أسماك المياه العذبة، التركيب، التوزيع، التنوع الاحيائي، الحياة تحت الماء

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INTRODUCTION

Aquatic resources play an important role in developing countries, because, as in Southeast Asia, they not only contribute to the daily livelihood of the population, but also provide significant nutrition for local communities (27).In the Mesotomopeca, Iraq, people occupy an area of about 750000he as freshwater local bodies, represented by rivers, lakes,marshes, natural and man- made aquatic systems (12). As a result, this community is strongly reliant on aquatic resources, which play an important role in the population's income and food (13).A total of 68 fish species which were recorded in the Iraq freshwater ecosystems; most of these belonged to fish family of Cyprinidae, which illustratedas first class from its species and number (12, 30). In a comparative study of the parasites that infect some types of fish in the Greater Zab River indicated the presence of 25 species of fish(5).While indicated in study that conducted of the Greater Zab River in Aski-Kalak City, presence of 27 species of fish (7). Whereas in a study conducted of Greater Zab River in Deralok Hydropower Plant indicated the presence of 11 species of fish (16) All studies on fish distribution, abundance, composition and population dynamics are critical for providing a very clear picture on ecological and nature of fish structure in every environment(1).These studies were gave information's on fish stock assessments, commercial and non-commercial fishes, as well as, this information which support us to take care of fishes as rich national resources and to be as a basic for our planning for future to reserve this fortune (21).The local studies were characterized by their limitations, those that dealt with evidence of diversity to assess the composition of fish communities. The objective of the study is to upgrade the knowledge of fish comportments, focused on fish structural composition and distribution in order to gain basic information necessary for further studies involved in fishery management and Study of environmental factors and their impact on fish life before and after Aski-Kalak City at Greater Zab River.

MATERIALS AND METHODS

Study area: Greater Zab River is located to the east Tigris River at the north part of Iraq (Kurdistan Region). It is situated between 36˚-37˚north latitudes and 43˚- 44˚ east longitude (Fig.1). This river is originated from a location between the mountain area of Urmea in Iran and Wan Lake in Turkey and then directed to the western south and near to Amedi, it passes the Iraqi border then extends through Duhok and Erbil governorates. The length of Greater Zab River from the sink to the point of pouring into Tigris River in Guer sub district is 392 km.The mean depth and width of river in this site is about 3m and 60m respectively (29).During this study samples were collected in two sites; the first was Girdarasha located on the Greater Zab River, next to Ifraz village in the Kawrgosk district, about 15 km away from Aski-kalak. Domestic effluents from Kawrgosk village are discharged straight into the river and second site wasthe village of chamadbz is near to the Greater Zab River, about 10 km away from Aski-kalak City. Generally, the width, and depth of river near studied sites was 40 to 60m and 2-4m respectively.

Collection of fishes: A total of 1582 specimens were collected monthly from two sites that were chosen of Greater Zab River at Aski-Kalak City near Khabat subdistrict. Samples of fishes were collected using gill nets and cast net. using gill and casting nets with mesh dimensions 5*5 mm.

Ecological and biological index: Chemo-physical parameters of water such as temperature , pH, dissolved oxygen (DO, salinity and transparency were recorded during the period of study. The groups of fish species were divided depending upon Tyler (26) method as (l) Resident fish group: fish species was appeared through 9 to 12 months, (ll) Seasonal fish group: fish species was appeared through 5 to 8 months and (lll) Rare fish group: fish species was appeared through 1 to 4 months. The Values of fish biodiversity were calculated according to the equation of Fu (14). Diversity Index (H) = - $\sum$ Pi Log Pi Whereas Pi: number or weight ratio of species from catches.

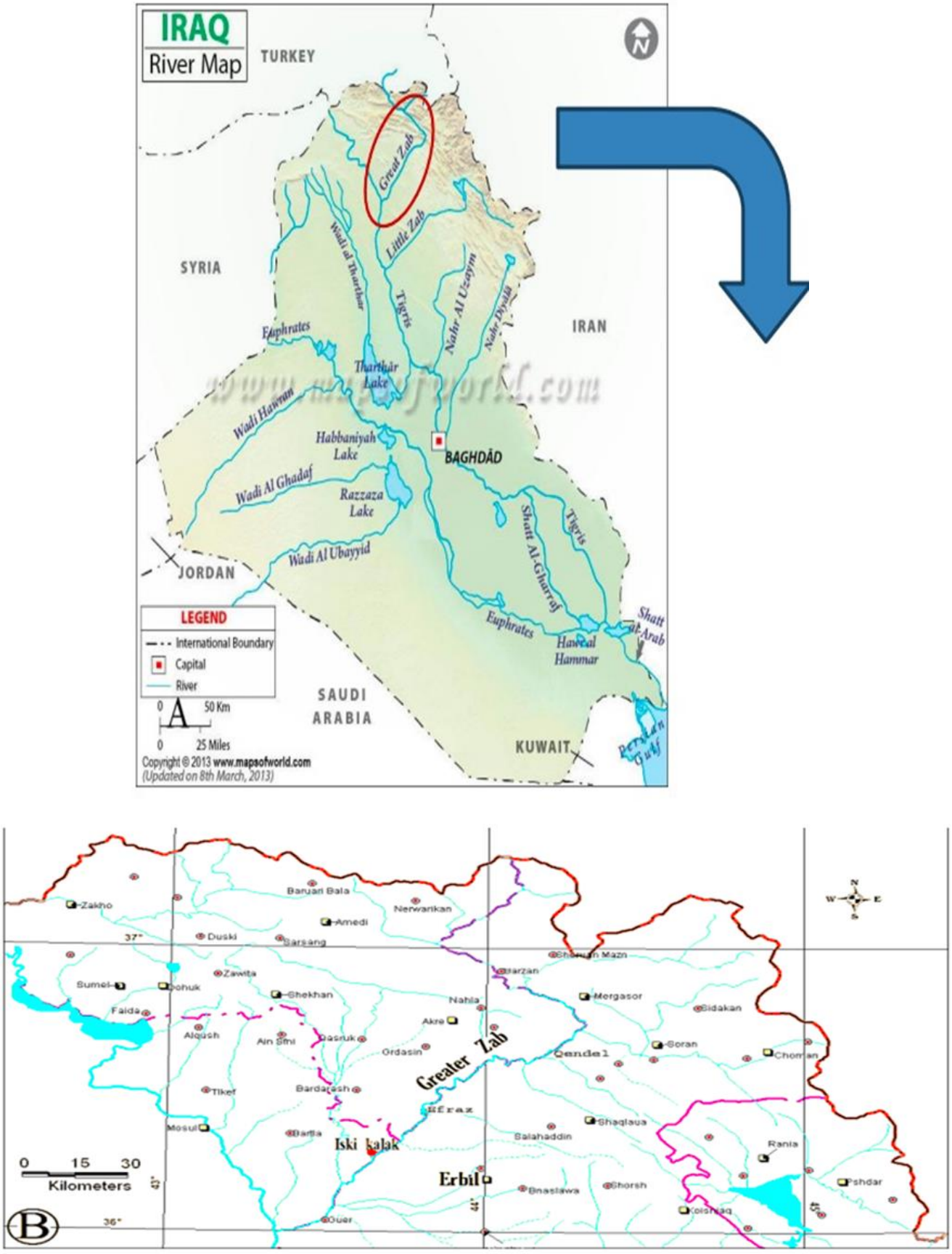

Figure 1. A-Map showing the lakes and revire routes in Iraq
B- Map of Geater Zab River with main branches

RESULTS AND DISCUSSION

Water temperature is an important factor in any aquatic environments affecting on biological processes. In this study it was ranged between 9.2 to 29.6 ºC. This variations may be due to changes in air temperature and

this result was similar to previous studies done by Ali (8) and Abdullah and Mhaisen (6).The pH values of Greater Zab River in study sites during of most studied period was alkaline, was ranged between 6.6 to 9.5 this result agreed Ali (10), the results are agree with the finding that recorded by Ali (9) and Shekha (24) in the same river, who both claimed that Iraqi interior water is thought to be on the alkaline side of neutrality and represent local geological formations. Salinity used as an indicator of water quality based on total dissolved salts (20). Generally, salinity value was showed very slight changes period in both sites, recorded the highest value 0.21g/l and lowest value 0.46 g/l, the results came in accordance with the known EC value for Iraqi inland water(8). Oxygen content of water is one of the important factors, and it is very necessary for all living organisms (28). Dissolved oxygen content of studied river was ranged between 6.5 to12.5 mg/l in two sites period study, were reported during the August month which coincided with a high water temperature and low DO. These results were slightly higher than that reported at the same river (1).On the other hand, lower level of transparency was 17cm recorded in March, while the higher level was 57cm observed during July which may be due to the large rainfall and the presence of many gravel and sand extraction plants, as well as the existence of water purification projects for the city of Erbil, where this river is the largest source of it (6).The total number of cached fish was 1582 specimens belonged to 25 fish species and their abundance in the river, belonged to six families, 20 species to Cyprinidae and one species for each Mugilidae, Siluridae, Bagridae, Sisoridae and Mastacembelidae. The highest numbers of fishes recorded were represented by *Chondrostoma regium* reached 11.8 % from total fish cached, followed by *Capoeta trutta* which recorded 11.4 % from total number. Lowest ratio were recorded by *Barbus lacerta* and represented by 0.8% from total fish number. The results of present study, agree with research occured of same river by Abdullah and Mhaisen(5), same species registered and Cyprinidae family was dominant, In the study which was conducted in Greater Zab River, 27 species of fish were recorded(7). The present results agree with some of past local research that found Cyprinidae fish species were the dominant(3).However, the absence of fish numbers and species may be influenced by changes in temperature, which occur as a direct result of climate change, as well as reductions in the quality and quantity of available food and river sediment structure. According to Tyler(26) fish species occurrence were shown in tables (1 and 2). These fish species were divided for three groups. From station S1, fishes of resident group were represented by five species (*Luciobarbusbarbulus, Capoeta trutta, Chondrostomaregium, Acanthobrama marmid* and *Luciobarbus kersin*), fishes of seasonal and rare groups by seven species (*Cyprinionkais, Luciobarbus esocinus, Silurus triostegus, Carasobarbus luteus, Arbibarbus grypus, Leuciscus vorax, Carassius auratus* and *Carassius carassius*) and (*Barbus lacerta, Carasobarbu skossigi, Luciobarbus subquincunciatus, Mystuspelusius, Cyprinion macrostomum, Planiliz aabu, Capoeta damascina, Squalius cephalus, Cyprinus carpio* and *Mastacembelus mastacembelus*) respectively. Whereas, fish species from station S2 were represented by six species as resident group (*Capoetatrutta, Luciobarbusesocinus,Chondrostomaregium,Acanthobrama marmid, Arbibarbus grypus* and *Luciobarbus kersin*), six species as seasonal group (*Cyprinion kais, Luciobarbus barbulus, caraso barbus luteu, Leuciscusvorax, Cyprinus carpio* and *Carassius auratus*) and finally, eleven species as rare group (*Carasobarbus kossigi, Mystus pelusius, Cyprinion macrostomum, Silurus triostegus, Planiliz aabu, Capoeta damascina, Squalius cephalus, Carassius carassius, Mastacembelus mastacembelus, Glyptothorax kurdistanicus* and *Ctenopharyngodon idella*).Fu *et al*.(14) indicated that the absence and presence of fish numbers and species varied from place to place in China's Yangtze River basin, and that fish species occurrence were influenced Upper of dams compare with the basin river after it. Also found that changes in fish number and species in the Amazon basin river in Bolivia were influenced by decrease of water velocity, river regression, and increase water

temperature (19). The present results are nearest to Al-Temimy(11) who noticed that fish community structure depending on fish migration for feeding or productivity, and fishes species were always moved upper of Al-Mussaib power station at Euphrates river escaping from increasing in water temperature during autumn and summer seasons, also results are nearest of Mohamed *et al.* (17), fish assemblage in the Shatt Al-Arab River was clearly shifted in the fish number and species. The composition of the fish community in Dukan Lake varies in different months that study has reached (22).So, it can see that resident fish species were founded at S2, while, most of species were be as seasonal and rare. These results supported continued efforts to check species loss but, in many cases, urged adoption of a compromise stance of management for ecosystem functioning and resilience, human livelihoods, to supply a viable long-term foundation for freshwater preservation(18).Tables (3 and 4) showed that fishes were raised in number and species in its community nearest Aski-kalak City at Greater River during summer at stations S1 (12 and 258 respectively) and S2 (12 and 271 respectively). Whereas, the reduction was founded during winter at the same study stations. As well as, fishes of total cached was 38.59 Kg\h. At station S2 that is more than station S1 which recorded 33.25 kg/h. These, certainly may due to the changes of climate and differences in the water temperature between seasons. Fishes always run away and try to find comfortable deep zoon or places which not affected by water heating during warm months (25). Also it were saw that the total cached of fishes in station S1 less than S2,fish species up of aquatic reservoir were confined and may exposed for fishing or escaping from this location toward north of this water restriction (15), which may support results of this study. Table (5) showed, that weights values of fish's biodiversity at S2 reached for fish number of 2.0, fish weight of 1.9 and for species of 1.5 during summer season. A fish biodiversity value has always changed depending on river hydrology, water temperature and available food of any aquatic ecosystems (19).The present results showed that fishes of S2 was improved and a best case from fishes at S1. Theses fishes may restricted and depending on water depth of river, which may exposed to fishing by fisherman cached or removing toward north of river (2) .The present study was indicated that fish distribution and composition were affected by environmental factor, methods of fishing and nutrition. However, fishes in its community were best and within suitable at station S2 in comparison with station S1. The data of our results will help the efficiency of development fish ways against a series of determine performance criteria.

Table1.Monthly occurrence concerning fish species collected from Greater Zab River before Aski-Kalak City from November 2020 to October 2021

Fish species	Nov	Dec	-Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Group
Acanthobra mamarmid	-	+	+	+	+	+	+	+	+	-	-	+	*
Arbibarbus grypus	+	-	-	-	-	+	+	+	+	+	+	+	**
Barbus lacerta	-	-	+	+	+	-	-	-	-	-	-	-	***
Capoeta damascina	-	-	-	-	-	-	-	-	-	+	-	+	***
Capoeta trutta	+	+	+	+	+	+	+	+	+	+	+	+	*
Carassius auratus	+	+	-	-	+	-	-	-	+	+	+	-	**
Carassius carassius	-	+	-	-	-	-	+	+	+	+	-	+	**
Carasobarbus kossigi	-	-	+	+	-	+	-	-	-	-	-	-	***
Carasobarbus luteus	+	+	-	-	+	-	+	+	-	-	-	-	**
Chondrostoma regium	+	+	+	+	-	-	+	+	+	+	+	+	*
Cyprinion kais	-	-	-	-	-	+	-	+	+	+	+		**
Cyprinion macrostomum	-	-	-	-	+	-	+	-	-	-	-	-	***
Cyprinus carpio	+	-	+	-	-	-	-	-	-	-	+	+	***
Leuciscus vorax	+	-	-	-	-	+	-	-	+	+	+	+	**
Luciobarbus barbulus	+	+	+	-	+	+	+	+	+	+	+	+	*
Luciobarbus esocinus	+	-	-	+	+	+	+	+	+	-	-	+	**
Luciobarbus kersin	+	+	+	+	+	-	+	+	+	+	+	+	*
Luciobarbus subquincunciatus	-	-	-	-	+	+	-	-	+	-	-	-	***
Squalius cephalus	-	-	-	+	+	-	-	-	-	-	-	-	***
Silurus triostegus	+	+	-	-	-	+	-	-	-	+	+	-	**
Mystus pelusius	-	-	+	-	-	-	-	-	-	+	-	-	***
Planiliza abu	-	-	-	-	-	-	-	+	-	-	-	+	***
Mastacembelus mastacembelus	-	-	-	-	-	-	+	+	-	-	-	-	***

+ : Occurrence; - Not occurrence Fish Group: *= Resident, **= Seasonal and *= Rare**

Table2.Monthly occurrence concerning fish species collected from Greater Zab River after Aski-Kalak City from November 2020 to October 2021

Fish species	Nov	Dec	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Group
Acanthobra mamarmid	-	+	+	+	+	-	+	+	+	-	+	+	*
Arbibarbus grypus	+	-	-	-	+	+	+	+	+	+	+	+	*
Capoeta damascina	-	-	-	-	-	-	-	-	-	+	+	+	***
Capoeta trutta	+	+	+	+	+	+	+	+	+	-	+	+	*
Carassius auratus	-	+	-	+	+	-	+	+	+	-	-	-	**
Carassius carassius	-	-	-	-	-	+	-	-	+	-	+	+	***
Carasobarbus kossigi	-	-	+	+	+	-	-	-	-	-	-	-	***
Carasobarbus luteus	+	+	+	-	-	+	-	-	-	+	+	+	**
Chondrostoma regium	+	+	+	+	+	+	+	+	+	+	+	+	*
Ctenopharyngodon idella	-	-	-	-	-	-	-	-	-	+	+	+	***
Cyprinion kais	-	-	-	-	+	-	-	+	+	+	+	+	**
Cyprinion macrostomum	-	-	-	-	-	-	+	-	-	-	-	+	***
Cyprinus carpio	+	-	-	-	-	+	-	+	+	+	+	-	**
Leuciscus vorax	-	-	-	+	+	-	-	-	-	+	+	+	**
Luciobarbus barbulus	-	-	+	-	+	+	+	+	+	-	-	+	**
Luciobarbus esocinus	+	-	+	-	+	+	+	+	+	+	+	-	*
Luciobarbus kersin	+	-	+	+	+	+	+	+	+	+	-	+	*
Squalius cephalus	-	-	-	+	+	-	-	-	-	-	-	-	***
Glyptothorax kurdistanicus	-	+	-	+	-	-	+	+	-	-	-	-	***
Silurus triostegus	-	+	-	-	-	+	-	-	-	-	-	+	***
Mystus pelusius	-	-	-	-	-	-	-	-	+	+	+	-	***
Planiliza abu	-	+	-	-	-	-	-	-	-	+	+	-	***
Mastacembelus mastacembelus	-	-	-	-	+	+	-	-	-	-	-	-	***

+ : Occurrence; - Not occurrence Fish Group: *= Resident, **= Seasonal and *= Rare**

Table3.Seasonal changes in fish number, species and catches from Greater Zab River before Aski-Kalak City from November 2020 to October 2021

Season	Water Tem. (°C)	No. of Fish Species	No. of fish catches	Fish Catches (Kg /hour)
Winter 2020- 2021	10.4	9	132	16.99
Spring 2021	17.8	11	154	27.37
Summer 2021	26.5	12	258	46.62
Autumn2021	20.4	11	190	42.02
Annual value	18.8	10.7	184	33.25

Table4. Seasonal changes in fish number, species and catches from Greater Zab River after Aski-Kalak City from November 2020 to October 2021

Season	Water Tem. (°C)	No. of Fish Species	No. of fish catches	Fish Catches (Kg /hour)
Winter 2020- 2021	11	8	168	22.68
Spring 2021	18.4	11	184	30.84
Summer 2021	27	12	271	58.35
Autumn2021	20.9	12	217	42.51
Annual value	19.3	10.7	210	38.59

Table5. Biodiversity values of fish number, weight and species at Greater Zab River Aski-Kalak Arbil Province from November 2020 to October 2021

	Before Aski-Kalak (S1)			After Aski-Kalak (S2)		
Season	Fish No.	Fish Weight(gm)	Fish Species	Fish No.	Fish Weight(g)	Fish Species
Winter 2020- 2021	1.6	1.2	0.9	1.3	1.2	0.9
Spring 2021	1.7	1.4	1.1	1.6	1.5	1.3
Summer 2021	1.9	1.7	1.4	2.0	1.9	1.5
Autumn2021	1.8	1.5	1.1	1.8	1.7	1.5

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