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REVIEW OF FISHERIES AND AQUACULTURE DEVELOPMENT POTENTIALS IN ARMENIA

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REVIEW OF FISHERIES AND AQUACULTURE DEVELOPMENT POTENTIALS IN ARMENIA

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PREPARATION OF THIS DOCUMENT

This document was prepared in order to update and present those natural, economic and social resources that determine the development potentials of the fishery and aquaculture sector in Armenia. The present review was carried out by a team of national and international experts under the technical and administrative supervision of the FAO Subregional Office for Central and Eastern Europe (SEUR), Budapest, Hungary.

Data and information were provided by Mr Ashot Hovhannisyan, Head of Department and Mr Tigran Alexanyan, Chief Specialist of Stock Breeding and Pedigree Department of the Ministry of Agriculture, Yerevan, Armenia. Information was also collected through consultations with fish farmers and investors.

National data and information, together with information from relevant international literature, were consulted, grouped and presented by Mr Thomas Moth-Poulsen, Fishery Officer, SEUR and Mr Andras Woynarovich, FAO Consultant. In the preparation of this document, FAO guidelines on the elaboration of similar fisheries and aquaculture country reviews were observed and followed. The review has been endorsed by the Ministry of Agriculture of the Republic of Armenia, which is the responsible ministerial authority for the fisheries and aquaculture sector.

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ABSTRACT

The present document is an update and presentation of the natural, economic and social resources for sustainable development and management of the fishery and aquaculture sector in Armenia. It aims to call attention to, and provide evidence of, the fact that fisheries and aquaculture have substantial development potentials in Armenia. The country is rich in inland water resources, but the potentials of the fishery and aquaculture sector are far from being exploited. Better utilization of water resources could be achieved through improved coordination and administration, including the implementation of rules and regulations of inland fisheries together with the enlargement of national and international markets.

The review recommends better fisheries utilization of natural and artificial water bodies, as well as suggesting coordinated joint action of government authorities and fish producers, regarding the certification of fish and fishery products to European Union markets.

The most obvious entry points for the development of inland fisheries and aquaculture are: planned fisheries management of natural waters, better utilization of underground water resources, improved governmental support through improved administration and more intensive backing of the fisheries and aquaculture sector.

The review also presents a wide range of available data and information in order to facilitate the identification and utilization of further areas of fisheries and aquaculture development in the country. For this reason, detailed lists of actual and potential natural and social resources are presented and discussed, together with important determining factors of sector administration, management and business performance.

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The authors also express their gratitude for the valuable editorial assistance and publication support of Ms Tina Farmer (FAO).

FOREWORD

Although Armenia is a landlocked country, it has great potential in the field of fisheries and aquaculture owing to its rivers, canals, lakes, reservoirs and, most of all, its underground waters. However, much of this potential is underexploited at present.

This review has been developed by the FAO Subregional Office for Central and Eastern Europe as a part of a general review of the Caucasus to provide new, updated statistical data about fishery and aquaculture issues in Armenia. The data presented will assist in the development of recommendations for the improvement of fish capture and fish production and also for necessary actions and collaborations to enable Armenia to access European Union markets.

Finally, the document not only drafts actions required to reform Armenia's fish and aquaculture sector but also makes attempts to accommodate these actions to the present socio-economic situation of the country.

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EXECUTIVE SUMMARY

The limited agricultural land resources of Armenia drive the need to increase the use of other natural resources. It is why fish culture should be important in the country. In general, climatic conditions are sufficiently favourable for fish culture in surface waters. The use of underground waters facilitates year-round industrial production of different trout and sturgeon species. Surface and underground waters are resources that are significantly underexploited in Armenia. The development of the fish culture industry in recent years shows that a wide range of experience has been accumulated and successfully applied by the private sector. It makes the industry a promising one, which may ensure a better sustainable utilization of the available resources.

At present the total annual fish production is 5 000–5 500 tonnes, in which trout species represent a high proportion. Potentials for fish culture development are much higher than the existing volumes. Fisheries and fish culture in Armenia also have a strategic value as they are important not only in the plains but also in the foothills and even mountainous regions, especially in the near-boundary villages (where fisheries and fish culture are considered the only profitable activity, as no favourable conditions for other types of agricultural production are available). As prospects for the development of fish culture are promising, the sector should receive special attention from the Government and concerned authorities of Armenia.

The present document aims to provide a reliable inventory of the most important natural and social resources of the fisheries and aquaculture sector of Armenia. These consists of about 2 400 km of rivers, 310 km of principal irrigation canals, 126 270 ha of lakes and nearly 10 500 ha of water reservoirs. Irrigation is very important for Armenian agriculture; hence, water used for this purpose (about 250–300 m^3/s) could also be utilized in fish culture.

A concise sector diagnosis and set of recommendations show that fisheries and aquaculture could have a much more significant role both among other agricultural activities and also in the mitigation of rural poverty, especially in the more remote regions of the country.

1. INTRODUCTION

FAO already had some basic information about the recent state of the fishery and aquaculture sector of Armenia. However, its updating and supplementation with new data and information has become important to prove that the large water resources would be able to support a large fish culture industry of valuable fish species such as trout and sturgeon. The update could also support rehabilitation of pond-fish culture in general and mass production of carps and predator fish species in particular.

Similarly to many landlocked, formerly socialist countries, fisheries and aquaculture have been less prioritized than other agricultural branches. In spite of less governmental interest, the aquaculture industry has developed rapidly and a situation has emerged where fish producers, who have practically saturated the national market with trout and sturgeon, have called for intensive support from FAO among others in order to reach European Union (EU) markets.

2. HISTORICAL BACKGROUND

In the last 90 years, extensive experience of fish culture has been accumulated in Armenia, mainly on the artificial propagation of Sevan trout. Work started in the 1920s to support the industrial fishery of Lake Sevan. Fish farms were established at Gavar, Karchakhpyur, Sevan and Lichk. These fish farms ensured the yearly stocking of about 7 million advanced fry of Sevan trout, about 100 million larvae of Sevan khramuli and 20 million larvae of Sevan whitefish.

The next significant developmental stage of fish breeding began in the 1970s, when attention was focused on the development of industrial fish farming. In these years, the Government supported the utilization of the available water resources. Hence, nine large carp farms of several hundred hectares were established, producing mainly common carp and Chinese major carps. In addition, one commercial farm of rainbow trout and river trout was also established, which used underground artesian water resources.

In the 1980s, the total area of fish farms was already about 6 000 ha and the annual production of table fish varied between 4 000 and 5 000 tonnes, out of which commercial trout production never exceeded 300 tonnes.

According to an FAO survey on the inland capture fisheries in the then Soviet Union, the Lake Sevan fishery was the only one large enough in Armenia to warrant consideration. Its annual production varied between 970 and 1 430 tonnes (Table 1). However, the national statistics recorded much higher production of captured fish in Armenia of between 2 500 and 3 300 tonnes per year in the period 1975–1991 (see Table A3.1 in Annex 3).

Table 1: Total fish production in the natural waters of Armenia, 1965–1980

Type of waters	1965	1970	1975	1976	1977	1978	1979	1980
Lakes (tonnes)	1 050	970	1 430	1 300	1 100	1 170	1 280	1 270
Lakes (kg/ha)	7.5	6.9	10.2	9.3	8.4	8.4	9.2	9.1

Source: Berka, 1989.

3. ACTUAL AND POTENTIAL RESOURCES

3.1 People

In 2001, the population of Armenia was about 3.2 million. However, it is estimated that the population of the country had fallen to 2 968 586 inhabitants by 2008. At present, the average population density is about 100 inhabitants/km^2. In 2007, agriculture employed 46.2 percent of the labour force (18.7 percent of the population) and its contribution to gross domestic product was 17.2 percent (CIA, 2008).

3.2 Geography and climate

The total area of Armenia is 29 800 km^2. It is located south of the Caucasus Mountains. The average altitude of the country is 1 800 m above sea level. More than 90 percent of the country lies above 1 000 m and 72 percent above 1 500 m. The lowest point is 380 m, while the highest point, Mount Aragat, is 4 090 m above sea level.

Armenia is a landlocked country with limited natural resources. The Black Sea cannot be reached without crossing the territory of Georgia or Turkey. Access to the Mediterranean Sea is only possible through Turkey. Towards the east, Armenia's route to the Caspian Sea passes through Azerbaijan. The country lies in two major catchments, the Araks (also written Arax) basin in the southwest and the Kura basin in the northeast (FAO, 2008a).

The landform in the centre and north of the country comprises high rocky mountain ranges separating narrow fertile valleys. Towards the south is the flat and fertile Ararat Valley along the left bank of the Araks River, which forms the border with Turkey in the region. To the west and north of Mount Aragat and around Lake Sevan in the east, the surface is generally rolling with rocky outcrops. In the southeast, a few small irregular-shaped valleys are surrounded by high mountain ranges (FAO, 2008a).

Climate conditions vary according to altitude. The Ararat Valley is characterized by hot, dry summers and cold, dry winters, with a total annual precipitation of 200–300 mm. Precipitation increases towards the mountains up to 1 000 mm on Mount Aragat. The average precipitation for the country is estimated at 526 mm/year (FAO, 2008a).

Armenia is divided into ten provinces (marz) plus the Yerevan municipality, which is the capital (Table 2).

Table 2: Administrative regions of Armenia

Province	Capital of province	Area (km^2)	Population	Number of rural households	Geography	Climate
Aragatsotn	Ashtarak	2 753	124 848	37 125	Foothill, mountain	Continental
Ararat	Artashat	2 096	249 803	53 107	Ararat Valley	Continental
Armavir	Armavir	1 242	252 963	50 349	Ararat Valley	Arid
Geghark'unik	Gavar	5 348	212 932	51 351	Foothill, mountain	Moderate humid
Kotayk	Hrazdan	2 089	238 604	37 620	Foothill	Middle
Lorri	Vanadzor	3 789	250 481	32 558	Foothill	Humid
Shirak	Gyumri	2 681	254 328	28 162	Foothill	Continental arid
Syunik	Kapan	4 506	132 543	12 958	Valley	Humid
Tavush	Ijevan	2 704	120 582	21 953	Valley	Humid
Vayots Dzor	Yeghegnadzor	2 308	52 627	12 844	Foothill	Moderate humid
Yerevan	–	227	1 078 875	–	Ararat Valley	Arid
Total		**29 743**	**2 968 586**	**338 037**		

3.3 Agriculture

Agriculture in Armenia is influenced by the topography. Most of the cultivated lands are found within an altitude range of 600–2 500 m. The total area of agricultural land is 533 600 ha, of which 477 040 ha (89.4 percent) is arable land and 56 560 ha (10.6 percent) is permanent cropland (CIA, 2008). In 1988, the area of irrigated land was about 316 000 ha (59.2 percent).

Figure 1: Map of water bodies of Armenia

Source: FAO.

At present, only 53.6 percent of the total agricultural land, about 286 000 ha has remained equipped for irrigation, of which 90 percent is still usable (CIA, 2008).

The irrigation potential is about 653 651 ha. It was estimated in 1995 that about 10–12 percent of the irrigated land (about 33 700 ha) was salinized by irrigation (FAO, 2008a).

About 87 percent of agricultural land had been privatized among rural families by the end of 1993. Since this time, individual private family farms have become a dominant form of farming. At the end of 1994, there were nearly 300 000 private farms, with an average holding of less than 2 ha (FAO, 2008; Kaneff, 2008). Land privatization was done on the basis of the size of rural families and the quality and location of lands. Therefore, the sizes of family lands in mountainous regions are larger than in the fertile valleys near to the markets.

3.4 Water resources

The entire country lies within the Araks and Kura water basins. In Armenia, about 6.27 km^3/year of surface water and 4.2 km^3/year of groundwater are produced internally, and the total yearly renewable water resource is 10.47 km^3 (FAO, 2008a).

Water resources in Armenia are all property of the State and disposed, possessed and used in the manner as established by legislation. The following laws serve as the basis for the management of water resources:

- The Water Code of the Republic of Armenia (National Assembly of the Republic of Armenia, 2002);
- The Law on Water Users Unions and Associations of Water Users Unions.

Pursuant to enacted laws, water systems of State significance established by the National Water Programme are State property and not subject to privatization.

The most important document of sustainable management of water resources of the country is the new Water Code, which was adopted in June 2002 by the National Assembly of the Republic of Armenia. This document is a direct improvement on an earlier one and stipulates basic principles of management, utilization and protection of the water resources of the country.

The new Water Code contains a wide range of information that is important for starting and practising fisheries and fish culture:

- list of water resource management bodies (Chapter 2 of the Water Code);
- concept of strategic water use, protection and information systems (Chapter 3);
- criteria and process of obtaining and possessing Water Use Permits (Chapter 4);
- criteria and process of obtaining and possessing Water System Use Permits (Chapter 5);
- use and management of State-owned water systems (Chapter 6);
- water quality standards (Chapter 8);
- recording of legal documents relating to water (Chapter 10);
- economic incentives and the system of payment in relation to water (Chapter 11);
- safety of hydrotechnical structures (Chapter 12);
- prevention and eradication of harmful impacts of waters (Chapter 13);
- protection and State supervision of water resources (Chapter 15).

In October 2002, the Commission on Transboundary Water Resources of the Republic of Armenia was established in order to promote the improvement of transboundary water resource protection and management.

In 2003, five water basin management bodies were established in Armenia. These were the first such bodies in the South Caucasus region. The establishment of the basin management bodies promoted rational use and integrated management of water resources.

The National Water Board, chaired by the Prime Minister, is the supreme advisory body of the management of water resources of Armenia.

For effective management and protection of water resources, as well as for implementation of the new Water Code, about 30 norms and methodological acts have been developed and adopted by the Government. They systematize the registry process of water resources, issuing and renewing permits for water use, and the protection and use of water bodies.

Management of water resources is carried out by the Water Agency (the Agency), as authorized by the Government. The Agency is responsible for the organization of water supply and sewerage, management of water systems and assurance of their safety and protection.

In the rural communities of Armenia, the water users unions and, in certain regions, the associations of water users unions are the water resources management bodies, which act pursuant to their charters.

Activities of associations of unions of water users are regulated by the regulatory board adjacent to the Government.

3.4.1 Surface waters

Out of the several hundred natural and artificial water bodies of Armenia, the most important ones are listed in Table 3.

Table 3: Main water bodies of Armenia

Type of waterbody	Number of water bodies	Length (km)	Area (ha)
Rivers	41	2 383	–
Canals	10	314	–
Lakes	18	–	126 269
Reservoirs	16	–	10 494
Total		**2 697**	**136 763**

3.4.1.1 Rivers

The rivers of Armenia are tributaries of the Araks and Kur Rivers, which are principal rivers of the South Caucasus region. There are about 9 480 small and large rivers in the country. However, approximately only 380 (about 4 percent) of them are longer than 10 km. The total length of the rivers is about 23 000 km. The distribution of water resources in Armenia is rather unequal. The density of the network of rivers varies from 0 to 2.5 km/km^2, while the average density is approximately 0.8 km/km^2 (UNECE, 2008). Table A2.4 in Annex 2 lists the most important rivers, while their key data are summarized in Table 4.

Table 4: Larger rivers in Armenia

	10–25 km	26–50 km	51–100 km	> 100 km	Total
Number of rivers	14	6	16	5	41
Total length (km)	242	230	1 094	797	2 383
Average length (km)	20	38	68	159	58

3.4.1.2 Lakes

There are more than 100 lakes in Armenia, some of which dry out during the dry season. By size and economic importance, Lake Sevan and Lake Arpi are the most significant ones. The Hrazdan and Akhuryan Rivers originate from these lakes. There are nine other larger lakes, but they are much smaller and their economic importance has only local significance (UNESCO, 2008). Tables 5 and 6 summarize some important parameters of the larger lakes of Armenia (see Table A2.5 in Annex 2 for more details).

Table 5: Larger lakes in Armenia, by region

Region	No.	Area (ha)
Aragacotn	2	50
Ararat	3	120
Armavir	1	30
Ashtarak	1	1
Dilijan	1	1
Echmiadzin	1	12
Goris	1	60
Kapan	1	10
Kotayk	1	80
Lori	1	13
Sevan	1	125 600
Sisian	1	200
Syunik	2	60
Vaiq	1	32
Total	**18**	**126 269**

Table 6: Altitude of larger lakes in Armenia

Altitude	No.	Area (ha)
< 1 000 m	2	42
1 000–2 000 m	4	125 646
2 000–3 000 m	5	380
> 3 000 m	7	201
Total	**18**	**126 269**

3.4.1.3 Canals

Irrigation is very important for Armenian agriculture because the major agricultural areas receive very little rainfall, an annual average of about 200 mm. As a result, irrigation facilitates the production of wheat, grapes, barley, fruits and a large variety of vegetables.

The main irrigation techniques applied are furrow (29.4 percent) and border-strip (10.5 percent) irrigations, flooding (40.5 percent) and irrigation equipped with hydrants (9.9 percent), sprinklers (9.6 percent) and flexible-hose/microirrigation systems (0.1 percent). The sources of irrigated waters are groundwater (12 percent), reservoirs (30 percent), river diversion (32 percent) and pumping (26 percent) (FAO, 2008a).

There is contradictory information about the actual state of irrigation systems. After 1991, the complex irrigation systems that had been developed earlier suffered intensely. In 1996, an experimental effort started to encourage farmer organizations to take over management of tertiary canals. In recent years, the Government has been formulating a programme to transfer irrigation management on several levels (Brewer, 2008).

Further information about the main canals of Armenia can be found in Table 7 (see Annex 2, Table A2.6 for more details).

Table 7: Water canals in Armenia

Name of main irrigation canal	No.	Total length (km)	Total avg. (m^3/s)	Total of irrigated area (ha)
Artashat Canal	1	54.1	12.1	11 475
Arzni-Shamiram Canal	2	79.2	16.4	10 010
Lower Hrazdan Canal	2	50.0	9.1	5 270
Armavir Canal	1	43.9	51.4	8 618
Talin Canal	1	46.3	25.1	13 800
Shirak Canal	1	18.6	5.6	3 010
Lori Canal	1	11.4	4.3	2 717
Vorotan Canal	1	10.3	5.8	3 100
Total	**10**	**313.8**	**129.8**	**58 000**

3.4.1.4 Water reservoirs

Reservoirs were built for a better utilization of river water resources, which also included their regulated flow. According to FAO (2008a), the total water volume of rivers is about 1 155 million m^3, while government sources (Annex 2, Table A2.7) estimate their medium water volume is 34 percent higher (1 545 million m^3). The most important parameters of water reservoirs are summarized in Tables 8 and 9 (Annex 2, Table A2.7 for more details).

Table 8: Water reservoirs of Armenia

Region	No.	Water surface area (ha)
Akhurian	2	4 414
Amasia	1	2 247
Aparan	1	735
Ararat	1	285
Artik	1	76
Hrazdan	1	80
Kotayk	1	170
Lori	1	330
Sisian	4	1 671
Tavush	1	230
Vaiq	1	136
Vayotz Dzor	1	120
Total	**16**	**10 494**

Table 9: Altitude of water reservoirs in Armenia

Altitude	No.	Area (ha)
< 1000 m	1	285
1000–2000 m	11	6 803
2000–3000 m	3	3 326
> 3000 m	1	80
Total	**16**	**10 494**

3.4.2 Underground waters

In Armenia, groundwater resources play a very important role in agriculture, as well as in fish culture. Underground water is very clean in Armenia. In most parts of the country, it is possible to use groundwater for drinking without any additional treatment (Plate 1).

In the Ararat Valley, groundwater is used for irrigation and aquaculture. The artesian water arrives under pressure from a depth of about 100–180 m and, depending on the actual depth, its temperature varies between 13 °C and 15 °C.

Plate 1
Artesian water used for fish culture in the Ararat Valley
Photo credit: A. Woynarovich.

The quality of groundwater resources in Ararat valley is very high, which makes it especially suitable for producing excellent quality fish.

Fish farms, which use groundwater, produce trout or trout and sturgeon together. All these fish farms have their own wells (with a capacity of 50–100 litres/s), through which water arrives under pressure.

Farmers should obtain permission for drilling wells. The cost of drilling a well about 100 m deep is about AMD9 000 000 (US$25 000). As soon as the well is ready, a licence is granted in order to be able to use its water officially. This licence is given for a period of three years and then it has to be renewed. The cost of water is about AMD0.05/m^3, while the pollution fee (Box 1), charged on the basis of the water discharged, is about AMD 15/m^3.

Table 10: Percentage breakdown of the different types of springs in Armenia

Water quality	**Pure cold water**	**4–20 °C**	**20–37 °C**	**37–42 °C**	**Total**
			(%)		
Carbonated calcium	–	19	6	–	**25**
Carbonated calcium–sodium–sulphur	–	2	–	–	**2**
Carbonated multi	–	1	–	–	**1**
Carbonated pure	–	15	2	–	**17**
Carbonated sodium	–	15	6	–	**21**
Carbonated sulphur	–	7	1	1	**10**
Multiple springs	13	1	–	–	**14**
Sodium–calcium	–	–	1	–	**1**
Treated (chlorinated) carbonated sodium	–	5	2	–	**7**
Carbonated calcium, sulphur	–	1	–	–	**1**
Total	**13**	**67**	**19**	**1**	**100**

Source: Nature Armenia, 2008.

According to Nature Armenia (2008), about 25 percent of the country's springs have high concentrations of nitrites, nitrates and fluorine compounds. Table 10 summarizes the information published by Nature Armenia on the springs of Armenia.

Box 1
Water pollution issues in Armenia

Untreated or insufficiently treated sewage is the main cause of pollution in water bodies. In Soviet times, the level of pollution in Armenia's rivers was rather high, which led to a decrease in water quality.

At present, data on the pollution levels of surface waters of Armenia are not precise. The analysis of the available scarce data shows some improvement in the water quality of rivers in recent years. This may be the result of the decrease in the volume of irrigation water and also owing to the fact that the majority of industrial enterprises have stopped operating. Hence, within the framework of the limited monitoring activities implemented, it can be assumed that the quality of surface water is sufficient, except for the flows from Yerevan and other large cities.

However, without proper attention during the large-scale recovery of industrial activity, water quality could deteriorate again. The problem is aggravated by the fact that none of the 19 existing wastewater treatment plants in Armenia functions properly. This is partly due to the earthquake in 1998 and also due to the energy crisis at the beginning of the 1990s. According to technical and economic calculations, of the 19 plants, only 6 or 7 are suitable for restoration. The others need to be reconstructed using modern treatment technologies.

In Armenia, all of the cities and about 20 percent of rural settlements have a sewage system. All wastewater treatment plants in the country were constructed before 1990. The technologies applied in the plants are not efficient and do not meet modern requirements. Moreover, the applied treatment technologies were based on practically free energy (both natural gas and electricity). Under present conditions, their operation would be extremely expensive and the use of existing water treatment facilities could not be justified.

There is a need for major investments to restore water treatment facilities or construct new ones. The Environmental Monitoring Centre of the Ministry of Nature Protection monitors the quality of water bodies in Armenia. The monitoring of surface water pollution includes regular observations made by hydrological and hydrochemical stations, study of the chemical composition of water in rivers, lakes and reservoirs, considering pollution from industrial, household and other sources, as well as analysis and assessment of pollution levels.

Until 1990, monitoring was carried out in 54 water bodies and there were 111 observation sites. Since 1994, the number of observation sites has increased to 131; however, surface water monitoring is not systematic. Thus, in 2002, observations were carried out only in 34 water bodies at 81 observation sites.

Source: UNECE, 2008.

3.4.3 Fish farms

Before 1991, there were 9 carp farms, 1 trout farm and 4 fish hatcheries in Armenia. The first hatchery was built in the 1920s for Sevan trout. The ponds of carp farms were built on salty soil, which was not suitable for plant production.

At present, the total number of fish farms is 233. Table 11 and Table A2.8 in Annex 2 show that most of the fish farms, both by number and area, are located in Ararat and Armavir Provinces.

Table 11: Number and area of fish farms of Armenia, 2009

Province	Region	Farms		Area	
		no.	*%*	*ha*	*%*
Aragacotn	Ashtarak	1	0.4	0.4	0.0
Ararat	Masis	79	33.9	1 873.7	68.9
	Armavir	8	3.4	689.6	25.4
Armavir	Echmiatsin	107	45.9	77.0	2.8
	Total	***115***	***49.4***	***766.6***	***28.2***
	Gavar	4	1.7	30.7	1.1
	Karchaxbjur	1	0.4	13.0	0.5
Gexarqunik	Martuny	1	0.4	8.0	0.3
	Sevan	2	0.9	8.6	0.3
	Vardenis	1	0.4	0.9	0.0
	Total	***9***	***3.9***	***61.1***	***2.2***
	Abovyan	6	2.6	1.6	0.1
Kotayk	Hrazdan	2	0.9	0.3	0.0
	Nairy	2	0.9	0.1	0.0
	Total	***10***	***4.3***	***2.0***	***0.1***
	Gugarq	1	0.4	0.3	0.0
	Spitak	1	0.4	0.4	0.0
Lory	Tashir	1	0.4	0.5	0.0
	Vanathor	1	0.4	0.2	0.0
	Total	***4***	***1.7***	***1.4***	***0.1***
	Akhuryan	5	2.1	1.2	0.0
	Amasia	2	0.9	1.7	0.1
Shirak	Artik	1	0.4	0.2	0.0
	Ashocq	3	1.3	1.6	0.1
	Total	***11***	***4.7***	***4.6***	***0.2***
Sunik	Sisian	1	0.4	0.6	0.0
Tavush	Dilijan	1	0.4	0.1	0.0
Vayoc-Thzor	Vayq	2	0.9	9.6	0.4
Overall total		**233**	**100**	**2 720**	**100**

3.5 Fishes of Armenia

There are 42 fish species in the waters of Armenia, which are listed in Annex 2 (Table A2.10) and summarized in Table 12. Of these species, 2 are endemic, 23 are native, 16 are introduced and 1 is hybrid (H. Roubenyan, personal communication).

The Armenian long-hand crayfish (*Astacus leptodactylus*) from Lake Sevan (Plate 2) should also be mentioned as an important aquatic animal, as it is a valuable export item to EU markets.


Plate 2
Sevan trout (*Salmo ischachan*) and long-hand crayfish (*Astacus leptodactilus*) captured in Lake Sevan and sold at Yerevan market
Photo credit: A. Woynarovich.

Table 12: Fishes in Armenia

Family	Status	Total
Acipenseridae	Introduced	3
	Native	1
Cyprinidae	Introduced	6
	Native	19
Gobiidae	Native	2
Poeciliidae	Introduced	2
Polyodontidae	Introduced	1
Salmonidae	Endemic	2
	Hybrid	1
	Introduced	4
Siluridae	Native	1
Total		**42**

4. STATUS OF FISHERIES AND AQUACULTURE PRODUCTION

4.1 Capture fisheries and aquaculture

4.1.1 Capture fisheries

Catch from natural water bodies, canals and water reservoirs is an important element in the food supply of rural people. It is widely believed that most of the poorer segments of rural population fish regularly for own consumption.

However, Lake, Sevan is the only lake on which planned and controlled fishing is practised. Fisheries of other natural and artificial public water bodies are uncontrolled. Fish catches in these waters entirely depend on natural propagation. Neither planned stocking nor closed seasons help the recovery or development of their fish populations. They are continuously overfished by local people. Most visible fish species from different water bodies are crucian carp (*Carassius auratus*), common carp and grass carp. At market, the very cheap crucian carp is the most widely sold out of them.

During the Soviet period, the endemic fish fauna[1] of Lake Sevan was complemented with introduced fish species in order to increase fish catches. These introduced species were the Ladoga whitefish (*Coregonus lavaretus ladoga*) and Lake Chud whitefish (*Coregonus lavaretus maraenoides*). Both species were introduced in 1924, became established and also crossbred and produced a new hybrid – the *Coregonus lavaretus sevanicus* Dadikjan (Petr, 1999). Introduction of crucian carp in Lake Sevan in the 1970s reduced the number of endemic Sevan khramulya. Crucian carp have proved to be a very efficient food competitor of this endemic species (Grigoryan, 2006).

Table 13: Recorded fish catches in Lake Sevan

Period	Sevan trout	Whitefish	Koghak	Sevan barbel	Crucian carp	Crayfish[1]	Total
				(tonnes/year)			
1926–1930	511.3	2.5	310.9	6.2	0	–	831.0
1931–1935	574.0	1.4	343.8	14.7	0	–	933.9
1936–1940	577.9	2.2	526.2	18.0	0	–	1 124.3
1941–1945	345.9	1.8	534.9	8.9	0	–	891.5
1946–1950	305.0	9.4	536.1	8.6	0	–	859.1
1951–1955	401.8	41.9	558.3	20.4	0	–	1 022.5
1956–1960	300.0	112.8	509.6	17.9	0	–	940.3
1961–1965	236.6	255.0	433.3	6.7	0	–	958.5
1966–1970	175.8	541.4	271.2	5.0	0	–	993.5
1971–1975	73.4	761.5	154.7	2.0	0	–	991.5
1976–1980	10.0	964.0	276.3	0	0	–	1 250.3
1981	0.8	1 134.1	266.8	0	0	–	1 401.7
1982	0.1	996.3	271.4	0	0	–	1 268.7
1983	0.8	1 034.5	267.8	0	0	–	1 302.9
1984	0	1 606.9	209.6	0	0	–	1 818.6
1985	0	1 387.9	256.5	0	4	–	1 644.8
1986	0	1 403.4	244.7	0	1.4	–	1 649.5
1987	0	1 627.1	239.9	0	8.7	–	1 875.6
1988	0	1 764.0	159.2	0	2.7	–	1 926.0
1989	0	1 895.5	199.1	0	22.5	–	2 109.1
1990	0	1 983.9	110.4	0	51.6	–	2 145.8
1991	0	1 798.0	66.3	0	68.2	–	1 932.5
1992–2003				Estimated: 140			
2009				Estimated: 700			

[1] There is no information.
Source: Babayan *et al*., 2003.

While Sevan trout and Sevan khramulya were common in the lake before the water level started to decline, their stocks later fell drastically. In 1984, both species were listed in the Red Book of the USSR. Stocks of Sevan barbel also declined and the species is now listed in the Red Book of Armenia. However, stocks of whitefish have increased significantly.

[1] Sevan trout or Ishkhan (*Salmo ischchan* Kessler), Sevan khramulya or koghak (*Varicorhinus capoeta sevangi*) and Sevan barbel (*Barbus lacerta goktchaicus* Kessler).

Table 13, which summarizes fishing results since 1926, cannot present data for the period after 1992 owing to the great discrepancy between legal and illegal fishing on Lake Sevan. Therefore, the total quantity and quality of fish captured in the lake is unknown (Babayan *et al*., 2003). According to different sources, legal catches vary between 50 and 300 tonnes/year. These results might represent only one-third or even one-quarter of total catches. The situation is rather complicated as fishing in Sevan Lake has always been part of the food security of local families around the lake. This tradition and mentality still exist. The exact number of fishers on Lake Sevan is not known. They are not organized and officially they are without work, as fishing on Lake Sevan is prohibited. Given to the lack of alternatives in the current poor economic situation, they fish although it is illegal. However, household poaching (poaching for personal consumption) itself would not be able to worsen the state of the fishery in the lake. It is believed that professional and/or commercial poaching is responsible for the drastic deterioration of fisheries on Lake Sevan.

In addition to the changing proportions of highly and less valued species and the quantitative reduction in catches, the size of captured fishes has also decreased. For example, the average weight of whitefish in the spring of 1997 was 222 g, while 20 years earlier it had been about 904 g (Babayan *et al*., 2003).

Crayfish production in Armenia is about 1 000 tonnes/year, of which 600 tonnes are exported to, among others, the EU. It is estimated that most of the crayfish, about 80 percent, is from Lake Sevan, which suggests that this source will become depleted in the coming years owing to overfishing.

For the preservation, sensible use and reproduction of natural resources of Lake Sevan, the Sevan National Park was established in 1978, and the area has also been a Ramsar site since 1993 (Jenderedjian, 2004).

At present, there are different measures in place that aim to reverse the unfavourable qualitative and quantitative changes and restore the fish fauna of Lake Sevan. Of these, the ban on fishing and the planned restocking of valuable fish species of the lake should be mentioned.

4.2.2 Aquaculture

According to the Armenian National Statistical Department, 142 legal entities were registered as being involved in fishing and fish breeding businesses in 2002. Various sources indicate that the number of farms was about 200, of which some 70 were active. Disparity with official statistics is caused by the shadow economy, where a number of fish farms are not registered as fish farms in order to avoid taxes (FAO, 2008b).

At present there are about 233 fish farms (categorized by size in Table 14) that are on the list of the Ministry of Agriculture.

Table 14: Size of fish farms in Armenia, 2009

Category	**Fish farms**		**Average size (ha)**	**Total area**	
	no.	*%*		*ha*	*%*
< 1 ha	158	67.8	0.3	47.0	1.7
1–5 ha	36	15.5	1.8	66.3	2.4
5–10 ha	10	4.3	7.2	72.4	2.7
10–20 ha	6	2.6	14.9	89.2	3.3
20–50 ha	12	5.2	32.1	385.4	14.2
50–100 ha	3	1.3	75.4	226.3	8.3
100–150 ha	4	1.7	303.7	522.9	19.2
150–200 ha	1	0.4	196.1	196.1	7.2
200–300 ha	1	0.4	209.6	209.6	7.7
> 300 ha	2	0.9	452.5	905.0	33.3
Overall total	**233**	**100.0**	**11.7**	**2 720.0**	**100.0**

The climate and natural resources of Armenia are favourable for different types of aquaculture activities. These are pond cultures of carps and intensive tank cultures of trout and sturgeons. Of the different species cultured in Armenia, trout represents the highest proportion (67 percent) while cyprinids, sturgeons and European catfish are produced in much smaller quantities, about 15, 13 and 5 percent, respectively.

Before independence, pond farms in Armenia used to produce 5 000–6 000 tonnes/year (FAO, 2008b). Although the same large pond farms still exist, their production is invisible on the markets. All the fish species (carps) present on the markets, which may have been reared in a fish pond, are reported as being captured in natural waters and reservoirs. Although the price of large carps weighing several kilograms is very high, the unpopularity of pond fish culture can be deduced by the fact that no new pond farms were built after the declaration of independence and the ones that had been built earlier are now abandoned and used for producing melons.

Plate 3
Different types of trout ponds and tanks, and a typical carp pond around a trout farm (bottom right)
Photo credit: A. Woynarovich.

Both the proportion and total weight of produced rainbow trout and brown trout indicate that they are the most frequently and widely produced fish species. Their production is based on the high-quality artesian water and high-quality feed imported from Europe. The 13–14 ^{o}C artesian water from positive wells facilitates continuous profitable production all year round.

Production per cubic metre varies from a few to several tens of kilograms. Some tanks are made out of earth, while others are made from concrete. Almost all of the leading trout-farming enterprises use concrete tanks (FAO, 2008b).

In order to utilize the effluent water of trout farms, carp are also produced in ponds attached to trout or/and sturgeon farms. These fish are not fed and are kept in the water drained from ponds with more valuable fish (FAO, 2008b). Although the growth of carp is slow in these ponds, such ponds also help to protect the

property against poachers, because in most cases these ponds surround the entire fish farm (Plate 3). Moreover, management of these ponds costs virtually nothing.

Plate 4
Sorting trout, and growing fish in a sturgeon nursery
Photo credit: A. Woynarovich.

Armenian trout farms have no mechanized fish sorting systems. The sorting (Plate 4) is done manually (FAO, 2008b).

Rainbow trout is the most widely produced trout species, although many of the farms also deal with brook trout and Sevan trout. In addition to the introduced trout species, the production of the indigenous Sevan trout is also increasing (Box 2), as it is more popular and its price is high.

A general opinion of Armenian trout producers is that the only constraint on their production is market access.

Box 2
Sevan trout production under controlled farm conditions

"Probably more than 90 percent of the imported fish feed is used to produce rainbow trout in Armenia, but culture of the indigenous Sevan trout is gaining popularity. Although annual production is still limited to some tens of tonnes, production capacity is expanding. In the past two years, culture of Sevan trout under controlled conditions has provided sufficient knowledge to sustain a small industry. Considerable progress can be expected through improved management practices, development of species-specific fish feed and selection of fish with good genetic potential. Although the average temperature in its natural habitat is much lower, the optimal temperature for growth of Sevan trout is 14 to 18 °C."

"In the Ararat Valley, Sevan trout grows much faster than in Lake Sevan, but Sevan trout has a slower growth rate than rainbow trout. Also, differences in growth rate among fish of the same batch are much higher than in rainbow trout. Grading every 3 to 4 months is necessary to prevent aggressive behaviour. Sevan trout is less domesticated than rainbow trout and easily excited. A net to cover rearing tanks is required to avoid them jumping out. However, while rainbow trout dies within minutes outside the water, Sevan trout can easily survive ten minutes in the air. Sevan trout is very strong and diseases in them are less frequently reported than in rainbow trout."

Source: FAO, 2008b.

Plate 5
Fish mongers and crayfish sellers at a central market in Yerevan (top), a typical fish shop in Yerevan and the fish section of a supermarket in Yerevan (bottom).
Photo credit: A. Woynarovich.

Production of sturgeon species is increasing in Armenia. Some of the farms keep them in the effluent water of trout-rearing tanks, while others keep and rear them separately. They are fed with high-quality feeds imported from Europe.

4.2 Recreational fisheries

Although fishing in rivers, lakes, reservoirs and canals is a popular activity among the rural population of Armenia, a recreational fishery as such does not exist. About 20 percent of village people fish regularly but they fish for food. There is neither licensing nor an inspection system for fishing activities of the public.

4.3 Facilitating industries

Before 1990, all fish feed used in Armenia came from the then Soviet Union. These pellet feeds were cheap but they were only as efficient as could be expected in those years. Their feed conversion ratio was about 2.5. After Armenia became independent, the rapidly expanding trout industry was supplied with high-quality fish feeds. Owing to the rapid development of the European fish-feed-producing industry, the feed conversion ratio of applied feeds now varies between 0.75 and 1.25. This is the reason why this section of the facilitating industry has not developed in Armenia.

The different equipment and instruments used in trout farming are also imported, either new or second-hand.

5. STATUS OF PROCESSING AND TRADE OF FISH AND FISH PRODUCTS

5.1 Fish processing and storage

In general, fish storage and processing facilities available in Armenia are 15–20 years old. There are two such cold stores in Yerevan with a total storage capacity of about 6 000 tonnes. The largest cold store dating back to Soviet times holds about 5 000 tonnes but is poorly insulated and furnished with outdated equipment. Its running costs are very high and, in summer, its temperature cannot be maintained properly. The store operates at only 30–50 percent capacity (FAO, 2008b).

There used to be four old fish-processing plants with both smoking facilities and canning lines. For different reasons, the operation of these plants was not economically viable so they were closed down (FAO, 2008b).

In the past, there was a view that smoking facilities were primitive and had problems with hygiene, small farm units were inefficient for smoking and freezing was often done in old unsuitable freeze-store facilities. However, these opinions should be revised. Currently, there are companies that are able to process and store fish and fishery products (smoked and canned fish, caviar) to very high standards. Although these products are not allowed to enter European markets, they are sold within the Caucasus region and in the Near East.

5.2 Distribution, marketing and trade

There is no wholesale structure for fish in Armenia. Fish are sold live or freshly killed. Each fish farm has its own marketing channel or even its own fish shop (or shops) in the major and/or nearby towns. The larger farms have their own transport facilities for distributing fish.

In addition to supplying local markets, fish is also sold in some neighbouring countries. There is even a company that sells live fish in Moscow.

Trout produced for the domestic market usually weigh about half a kilogram but many shops sell trout weighing more than 1 kg. In the case of sturgeon, the average weight of marketed fish is about 2 kg, while for carps (common carp, grass carp and silver carp) the preferred size starts at about 3 kg.

As far as the price of fish is concerned (see Annex 3, Table A3.4), trout is the cheapest fish and large carps are the most expensive (because of their scarcity on the market). Among carps, crucian carp is the cheapest.

Before 1991, Armenia exported about 400 tonnes/year of rainbow trout to the Russian Federation – about 40 percent of the total production volume. Total export volumes (all species) decreased in the period of 1991–95 but started to increase again in 1996, reaching about 300 tonnes in 1999.

Increased exports are the result of live crayfish exports, mainly to European markets. In 1998, fishery products were exported to Belgium, Estonia, France, Germany and the Islamic Republic of Iran. Since then, the situation has not changed. In case of EU countries, crayfish from Armenian natural waters is the only fishery product that has an EU number. Its main export markets are France (35 percent), Germany (12 percent), Georgia (28 percent) and the Russian Federation (20 percent) and 5 percent goes to other European countries (FAO, 2008b). For more information about exports and imports of fish and fishery products, see Tables A3.2 and A3.3 in Annex 3.

It is a general opinion among leading fish farmers of Armenia that there are extensive capacities and potentials for increasing trout and sturgeon production if they could export to EU markets (Box 3). Therefore, obtaining EU numbers for trout and sturgeon is one of the main priorities of the sector. In order to export fish and fishery products to the EU, Regulation (EC) No. 854/2004 of the European Parliament and of the Council of 29 April 2004 is applicable.[2]

[2] eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:226:0083:0127:EN:PDF

In addition, in order to increase sturgeon exports, the industry needs to resolve problems in obtaining a certificate from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Box 3
Selected aspects of exporting fish and fishery products to the EU

It is important to be aware that exporting to European Union (EU) markets needs close cooperation between, and joint efforts from, all governmental and private stakeholders. It is essential to understand and comply with the system of official assurances, because EU bases its system on government-to-government assurance. This means that the government of the exporting country should assume the responsibility of giving the EU the required official guarantees. It is because imports of fish and fishery products into the EU are subject to official certification. The logic is that the official certification is done by the competent authority (CA) of the exporting country, which should be formally recognized by the European Commission (EC).

As soon as there is an accepted and recognized CA, it becomes responsible for carrying out inspections and certifying that the health rules on production and the health safety standards set in EU legislation are correctly applied and checked. Hence, for all fish and fishery products, the country of origin must have the recognized CA, via which all interested parties, including private businesses, should contact and communicate with the EU.

The steps to access EU markets are as follows:

- The national authority of a third country must submit a formal request to the Directorate-General for Health and Consumer Protection of the EC to export fish and fishery products to the EU. The request should contain confirmation that the authority can fulfil all relevant legal provisions to satisfy EU requirements.
- The Directorate-General for Health and Consumer Protection sends out a questionnaire, which should be completed and returned. Information on relevant legislation, competent authorities, hygiene and many other elements are requested.
- For aquaculture products, a residue monitoring plan of the exporting country must also be submitted and approved at this stage.
- After the evaluation of the paper submission, a Food and Veterinary Office inspection may be carried out to assess the situation on the spot. Such an inspection is mandatory for high-risk products such as shellfish.
- Based on the results of the evaluation and inspection, and the guarantees given by the exporting country, the Directorate-General for Health and Consumer Protection proposes the listing of the country, the specific conditions under which imports from the country will be authorized and the list of approved establishments in the country. These are then discussed with representatives of all EU member States.
- If the member States have a favourable opinion on the proposal, the EC adopts the specific import conditions. Lists of eligible establishments can be amended at the request of the exporting country and are made available for the public on the Internet at: ec.europa.eu/food/food/biosafety/establishments/third_country/.

Source: Blaha, 2008.

5.3 Fish demand and consumption

The presence of fish shops in and around Yerevan indicates that fish forms part of the daily diet. However, fish and fishery products in Armenia are considered a special food rather than an everyday food. It is only at Christmas and New Year that fish is consumed by all Armenian families.

Estimations based on the reported quantity of produced fish per year in Armenia (Table A3.1) indicate that between 2005 and 2008 annual per capita consumption increased sharply from 0.3 kg to 1.8 kg. If national production and export and import items are calculated together, annual per capita consumption of fish and fishery products was about 2.25 kg in 2008.

6. GOVERNANCE AND INSTITUTIONAL FRAMEWORKS IN USE

6.1 Administration

In Armenia, institutions involved and directly or indirectly related to fisheries and aquaculture, including water resource development and management, are the Ministry of Agriculture and the Ministry of Nature Protection.

At the Ministry of Agriculture, the Stock Breeding and Pedigree Department is responsible for:

- situation assessment of production;
- monitoring of all fields of fisheries related to development plans and programmes;
- monthly collection and summary of fish-production-related data;
- provision of coordination of stakeholders of the sector, which includes recommendations on the updating of the university curriculum.

At the Ministry of Agriculture, the Food Safety and Veterinary State Inspectorate is responsible for fish-health-related issues.

At the Ministry of Nature Protection, the Department of Geology and Geological Engineering is in charge of exploring groundwater resources, while the Department of Water Resources Utilization is in charge of the conservation and effective utilization of surface water resources.

The Environment Agency is the issuing body of licences for the drilling and utilization of artesian water. Of all the water resource management bodies, the National Water Council is the highest advisory body. The Dispute Resolution Commission resolves disagreements through mediation relating to water-use permits.

The Water Resources Management and Protection Body:

- coordinates preparation of policy issues, implements water resource management and protection, and develops principles and norms;
- classifies water resources by function and status of utilization, participates in the development of water standards, and oversees implementation;
- approves allowed quantities of surface water and groundwater extraction, and provides for the development of water basin management plans and their implementation;
- issues water-use permits and participates in the development of norms for losses during utilization, wastewater disposal and water systems – including the facilitation of monitoring water resources and the coordination, development and implementation of projects related to water resource management and protection.

Water Basin Management Authorities implement water basin management plans. Among other activities, they:

- develop water management plans;
- serve as a link between the Water Resources Management and Protection Body and the community served by the basin;
- record water-use permits issued by the Water Resources Management and Protection Body;
- ensure that water use does not exceed limits allowed by water-use permits, and submit reports on that to the Water Resources Management and Protection Body;
- establish extraction quantities and regimes upon the approval of the Water Resources Management and Protection Body as well as implement and monitor measurements on water extraction;
- participates in the development of plans for prospective water allocation among users;
- develop water supply marginal quantities and water supply regimes;
- develop drafts of prospective projects for the management, utilization and protection of water resources within the basin.

The Water Systems Management Body is responsible for the management and safe use of State-owned hydrotechnical structures. It participates in the preparation of the Draft National Water Programme, provides for the implementation of the National Water Programme and participates in annual and prospective activities of demand assessment of usable water resources.

The Regulatory Commission is an independent organization that fulfils the functions of a State management body. It defines tariff policy in water relations and will issue water-system-use permits to non-competitive water suppliers, which means the development and running of the tariff policy.

6.2 Education, training, extension and research

Armenia has ten agricultural colleges; two of which provide education for fisheries. Higher fisheries and aquaculture education is at an advanced stage at the Agrarian State University. It started in 2001 and has already educated about 50 specialized fish farmers in the last two years. However, after the initial high interest has peaked, it is expected that at least 10–15 fish farmers will graduate each year.

The Ministry of Agriculture has a State organization of Extension Services, which cooperates with 176 field extension officers in all of the provinces. All officers have their own location of command (selected villages), where they provide expertise and support agricultural activities. This well-developed extension service is free of charge. To date, fisheries management and fish culture have not been included in their services.

There is no State-organized or coordinated research on fisheries and aquaculture.

6.3 Statistics

The National Statistical Department is the organization responsible for all types of statistics, including fisheries and fish culture. The organization receives monthly production data from the responsible departments of different ministries and processes them.

6.4 Institutions

There is one association of fish farmers in Armenia. It has 45 members, which account for 80 percent of total fish production of the country. The main fields of cooperation are legal representation of members and the purchasing of production materials (feeds, drugs, etc.), fish seed and equipment. Some of the larger members of the association cooperate with smaller-scale fish farmers, whom they supply with fish seed and feed under specific contracts, which often include payment in kind when reared fish reach market size.

6.5 International cooperation

At present, Armenia is not involved in any international cooperation in fisheries and aquaculture development and management.

7. POLICY, REGULATORY AND MANAGEMENT FRAMEWORKS IN USE

7.1 Policies and planning

As yet, there is no officially approved policy and planning document on fisheries and aquaculture in Armenia. However, there is a draft version that sets out the principles of the objectives of policies and planning. These are:

- Support and contribute to the introduction of modern technologies of intensive fish production to support an improved and more economic utilization of water resources. Collaborate with international organizations and recognized leading international fish producers on the introduction of new technologies.
- Support and contribute to the economic utilization of fish fauna of natural waters and the creation of new fish farms.
- Simplify the existing complicated process of import and export, including the trade in trout eggs and fish fry. Foster initiatives of importing brood fish for reproduction.

- Support specialists and their technical updating with grants and seminars in order to increase their competences.

Two subsequent stages of development are planned to be completed. The first stage, between 2009 and 2011, will improve the existing parts of a complex legal framework of the sector and elaborate the missing parts thereof. During this period, changes in the industry-related legal regulation will be introduced as a result of the adoption of a new juridical system. It will regulate operational aspects of aquaculture activities in correspondence with international agreements, including the process of imports and exports. It will also include government incentives and controls though appropriate support and taxation processes to operate old fish farms and create new ones, with sustainable use of resources.

Table 15: International agreements

Title of text	Date of text	Entry into force	Countries
CIS Agreement on rational management and protection of transboundary water bodies	09/11/1998	The Agreement entered into force for Belarus, Tajikistan and the Russian Federation on 6 June 2002.	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Law on fixed charges (1998)	07/07/1998	The Law entered into force on 1 August 1998.	–
Law No. ZR-29 on immovables	22/01/1996	The Law enters into force from the date of its official publication.	–
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)		Accession 23/10/2008; entry into force 21/01/2009.	–

Source: FAO, 2008c.

The second stage will be the period 2012–15. In this period, a new regulatory framework for the aquaculture industry will be completed in order to ensure a favourable environment for a profitable operation of aquaculture enterprises. This will guarantee that the aquaculture industry will remain attractive for long-term investments. In the second stage, the role of government will increase. At first, will support fish-production joint ventures and will also stimulate the establishment of fish producers associations. Governmental support will also be expected in the form of specialized studies in different fields of fish production. This is expected to lead to increased production through an improvement in preparation, processing and making corresponding decisions. This stage will also include the training of highly professional fisheries and aquaculture specialists at colleges of the Ministry of Agriculture.

The prepared draft document concludes that the implementation of the phases outlined above will ensure improved exploitation of existing resources and will increase fish production fivefold in Armenia.

7.2 Legal and regulatory framework

At present, the legal and regulatory framework as it relates to fisheries and aquaculture focuses on the exploitation and use of water resources. Only the Lake Sevan fishery is regulated under the legal framework of environment protection and nature conservation. Existing sector-related agreements (listed in Table 15) support this statement.

8. SOCIAL AND ECONOMIC ASPECTS

8.1 Employment

There are about 234 people registered as being engaged in the aquaculture sector. However, the true figure is probably ten times higher and may include as many as 2 500 people. There is a general opinion among fish farmers that the production of each 10 tonnes of fish requires one worker.

8.2 Economics

There is no reliable information available for this section.

8.3 Credit and investment

Credit from commercial banks is very expensive. Credit without collateral is provided by the government at interest rates of 12–14 percent, which is half that charged by commercial banks.

8.4 Food security and poverty alleviation

The role of natural waters in food security seems to be significant, as poorer segments of rural societies rely on regular fishing in natural waters. Considering the size of natural and artificial water bodies, their role could be much more significant in the field of poverty reduction.

Although the fisheries and aquaculture sector is not large, it does provide direct and indirect employment for people involved in production, distribution and processing.

9. SECTOR DIAGNOSIS

Strengths

- Armenia is rich in water resources.
- Natural and artificial water bodies (rivers, lakes, irrigation canals and reservoirs) are State-owned.
- Fish farms are owned by private enterprises.

Weaknesses

- The fisheries and aquaculture sector is not among the prioritized ones in Armenia.
- Aquaculture is administered done together with cattle breeding.
- Administration of the fisheries and aquaculture sector falls under the responsibility of different ministries.
- There are no extension services to support fisheries exploitation of natural waters.
- There are no applicable rules and regulations regarding the exploitation of water bodies. Hence, fisheries of these waters are not managed at all.

Opportunities

- Fisheries and aquaculture utilization of water resources is underexploited.
- Water resources of the country could facilitate a severalfold increase in fish production both in natural and artificial water bodies and in fish farms. Secondary utilization of irrigation water could also contribute to this increase.

Threats

- A lack of significant interest on the part of the Government in terms of administrative and financial support for the sector could slow or even reduce utilization of the development potentials of the fisheries and aquaculture sector.

10. DEVELOPMENT POTENTIALS

10.1 Capture fisheries

At present, the fish production of capture fisheries is about 300–350 tonnes/year. Should only the former fish production figure of 2 500–3 000 tonnes/year be re-established, the increase would be between sevenfold and tenfold. Thus, capture fisheries in Armenia have significant development potential.

Proper, overall fisheries management of Lake Sevan itself could considerably increase the present few hundred tonnes of fish production per year. To reach this goal, among others, the following steps should be taken:

- planned, controlled and supervised stocking and fishing of the lake;
- enforcement of relevant regulation;
- introduction of fish culture activities among communities in order to reduce fishing pressure on the lake.

As far as the fisheries exploitation of other natural and artificial water bodies is concerned, there is potential for a minimum production of 500–750 tonnes/year, which is more than two times the reported present production of capture fisheries. To achieve such results, the following steps should be taken:

- inventory of present fisheries utilization of natural and artificial water bodies;
- active involvement of existing agricultural extension services;
- mobilization of communities that live near to water bodies and may have access to them;
- implementation of aquaculture and fishery management of natural and artificial water bodies to generate employment and income in remote regions of the country.

10.2 Aquaculture

According to sources at the Ministry of Agriculture, analysis shows that effective utilization of existing water resources of the country would by itself make it possible to increase fish production five times up to 25 000 tonnes/year (Hovhannisyan, 2009).

11. CONCLUSIONS AND RECOMMENDATIONS

The entire fisheries and aquaculture sector needs overall governmental support in order to increase fisheries and aquaculture utilization of the available water resources of Armenia. The most important challenge should be the finalization of the strategic plan for the sector. Parallel to this work, the following actions should be completed:

- increased utilization of natural and artificial water bodies in sustainable fisheries;
- improvement of fisheries and aquaculture statistics;
- establishment of preconditions for obtaining EU numbers for fish and fishery products.

Increased utilization of natural and man-made water bodies in sustainable fisheries

It is believed, hence often emphasized, that the fishery potentials of Armenia are mainly determined by the Lake Sevan fishery. Although that may be true, the management of other natural and artificial water bodies is still very important. Organization, restocking and controlled use of these waters, supported by coordinated extension services within the framework of existing agricultural extension services, should be prioritized by governmental authorities.

Existing fish hatcheries and pond-fish cultures could play a leading role in the support system of fisheries of suitable rivers, lakes, reservoirs and canals. However, at present no such interaction exists.

For the above-mentioned reasons, it is recommended that an overall plan be developed for coordinated, sustainable fisheries utilization of natural and artificial water bodies in Armenia. This could be part of a national rural-poverty-alleviation policy.

Improvement of fisheries and aquaculture statistics

Aside from data on Lake Parz and Lake Sevan, there are no available statistical data about fish production in Armenia. In addition, the fisheries and aquaculture production data and information that are provided are considered unreliable. Therefore, the improvement of fisheries and aquaculture statistical system would be advantageous.

Establishment of preconditions for obtaining EU numbers for fish and fishery products

Entry to EU markets is one of the top priorities of most fish farmers of Armenia. For this reason, an overall certification system should be established in close cooperation with the governmental authorities and private businesses concerned.

For this reason, it is recommended that a survey be conducted on the present state of the eligibility of existing governmental authorities and fish producing and processing enterprises. This process could identify gaps in the system and determine the steps necessary to obtain EU numbers for fish and fishery products of Armenia.

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Tables of key geographical, economic and social data of Armenia

Table A1.1: Area of Armenia

Country/region	Total area			
	Total (km^2)	% of Caucasus countries	% of Central Asia countries	% of Caucasus and Central Asia countries
Armenia	29 800	16.0	0.7	0.7
Total of Caucasus	**186 100**	**100**	**4.7**	**4.5**
Total of Central Asia	**3 994 400**	**2 146.4**	**100**	**95.5**
Total of Caucasus and Central Asia	**4 180 500**	**2 246.4**	**104.7**	**100**

Source: Central Intelligence Agency (CIA). 2008. *The world factboo*k.

Table A1.2: Population of Armenia

Country/region	Population (2008 estimation)				Density of population (2008 estimation)				Agriculture population density (FAO AQUASTAT)		
	Persons	% of Caucasus countries	% of Central Asia countries	% of Caucasus and Central Asia countries	Persons per km^2	% of Caucasus countries	% of Central Asia countries	% of Caucasus and Central Asia countries	1993–95 (persons per ha)	2001–03 (persons per ha)	Change (%)
Armenia	2 968 586	18.8	4.8	3.8	99.6	117.5	648.5	539.9	0.90	0.70	(22.2)
World	–	–	–	–	–	–	–	–	1.60	1.70	6.3
Total of Caucasus	**15 777 144**	**100.0**	**25.7**	**20.5**	**84.8**	**100.0**	**551.9**	**459.5**	–	–	–
Total of Central Asia	**61 357 297**	**388.9**	**100.0**	**79.5**	**15.4**	**18.1**	**100.0**	**83.3**	–	–	–
Total of Caucasus and Central Asia	**77 134 441**	**488.9**	**125.7**	**100.0**	**18.5**	**21.8**	**120.1**	**100.0**	–	–	–

Sources: Central Intelligence Agency (CIA). 2008. *The world factbook*; FAO AQUASTAT, 2008.

Table A1.3: Demographic data of Armenia

Country/region	Population (2008 estimation)							
	Persons				Age structure (%)			Growth (%)
	Total	Under 14	15–64	Above 65	Under 14	15–64	Above 65	
Armenia	2 968 586	555 126	2 086 916	326 544	18.7	70.3	11.0	(0.077)
Total of Caucasus	**15 777 144**	**3 321 671**	**10 804 124**	**1 651 349**	**21.1**	**68.5**	**10.5**	–
Total of Central Asia	**61 357 297**	**18 332 856**	**39 634 498**	**3 374 602**	**29.9**	**64.6**	**5.5**	–
Total of Caucasus and Central Asia	**77 134 441**	**21 654 527**	**50 438 622**	**5 025 951**	**28.1**	**65.4**	**6.5**	–

Source: Central Intelligence Agency (CIA). 2008. *The world factbook*.

Table A1.4: Labour force and poverty in Armenia

Country/region	Labour force (2007)					Unemployment (%)	Population below poverty line (2004–06)
	Persons	% of Population	By occupation (%)				
			Agriculture	Industry	Services		
Armenia	1 200 000	40.4	46.2	15.6	38.2	7.1	26.5

Source: Central Intelligence Agency (CIA). 2008. *The world factbook*.

Table A1.5: Economic data of Armenia

Country/region	GDP (2007)								
	Amount (million US$)	Composition (million US$)			Composition (%)			Real growth rate (%)	Per capita (US$)
		Agriculture	Industry	Services	Agriculture	Industry	Services		
Armenia	7 974	1 372	2 903	3 700	17.2	36.4	46.4	13.8	2 686
Total of Caucasus	**49 584**	**4 661**	**25 743**	**19 180**	**9.4**	**51.9**	**38.7**	**49 584**	**3 143**
Total of Central Asia	**160 480**	**17 701**	**61 135**	**81 644**	**11.0**	**38.1**	**50.9**	**160 480**	**2 615**
Total of Caucasus and Central Asia	**210 064**	**22 362**	**86 878**	**100 823**	**10.6**	**41.4**	**48.0**	**210 064**	**2 723**

Source: Central Intelligence Agency (CIA). 2008. *The world factbook*.

Table A1.6: Gross domestic product comparison of Armenia

Country/region	GDP (2007 Purchasing Power Parity) – Absolute					GDP (2007 Purchasing Power Parity) – Relative				
	Million US$	% of world	% of Caucasus countries	% of Central Asia countries	% of grand total	US$ per capita	% of world	% of Caucasus countries	% of Central Asia countries	% of grand total
Armenia	17 150	0.026	16.6	6.1	4.5	5 777	58.8	88.4	126.2	116.1
World	**65 610 000**	**100**	–	–	–	**9 825**	**100**	**150.3**	**214.7**	**197.4**
Total of Caucasus	**103 120**	**0.157**	**100**	**36.7**	**26.9**	**6 536**	**66.5**	**100**	**142.8**	**131.3**
Total of Central Asia	**280 800**	**0.428**	**272.3**	**100**	**73.1**	**4 576**	**46.6**	**70.0**	**100**	**91.9**
Total of Caucasus and Central Asia	**383 920**	**0.585**	**372.3**	**136.7**	**100**	**4 977**	**50.7**	**76.2**	**108.8**	**100**

Source: Central Intelligence Agency (CIA). 2008. *The world factbook*.

Tables of fisheries and aquaculture resources of Armenia

Table A2.1: Water resources of Armenia

Average precipitation 1961–1990 (km^3/year)	Average precipitation 1961–1990 (mm/year)	Total internal renewable water resources(km^3/year)	Groundwater: produced internally (km^3/year)	Surface water: produced internally (km^3/year)	Overlap: surface and groundwater (km^3/year)	**Renewable water resources (natural) (km^3/year)**	**Renewable water resources (actual) (km^3/year)**	**Dependency ratio (%)**
16.8	564	9.1	4.2	6.3	1.4	10.5	10.5	14
Observation: Large discrepancies between national and IPCC data on rainfall average. In these cases, IPCC data modified to ensure consistency with water resources data.								

Source: FAO AQUASTAT 2008.

Table A2.2: Water resources per unit area of Armenia

Average precipitation 1961–1990 (m^3/km^2)	**Renewable water resources (actual) in 2000**	
	m^3 precipitation per year	m^3 per km^2 per year
563 758	2 780	276 935

Source: FAO AQUASTAT 2008.

Table A2.3: Freshwater withdrawal in Armenia

Total freshwater withdrawal			**Per capita freshwater withdrawal (m^3/year)**	**Composition of consumption (%)**		
km^3/year	Total renewable water resources	% of total renewable water resources		Domestic	Industrial	Agricultural
3.0	10.5	28.1	977	30	4	66

Sources: Central Intelligence Agency (CIA). 2008. *The world factbook*; FAO AQUASTAT, 2008.

Table A2.4: Larger rivers of Armenia

Name	Water system		Length of river (km)			Size (km)	Volume of water						
							at water level when entering Armenia (m^3/s)			at water level when leaving Armenia (m^3/s)			Total volume (1 000 m^3/year)
	River basin	River system	Total	in Armenia	%		Low	Medium	High	Low	Medium	High	
Akhurian	Arax	Akhurian	186	186	100	> 100	5.9	9.4	24.2	–	–	–	400 000
Arax	Arax	Arax	1 072	192	18	> 100	23.3	69.7	150.0	34.4	84.4	164.7	–
Arpa	Arax	Arax	90	90	100	51–100	14.1	31.3	51.7	–	–	–	764 000
Azat	Arax	Arax	56	56	100	51–100	5.8	10.1	33.1	–	–	–	232 000
Hrazdan	Arax	Arax	146	146	100	> 100	10.9	23.2	60.8	–	–	–	733 000
Meghri	Arax	Arax	36	36	100	26–50	1.1	3.1	8.0	–	–	–	–
Vedi	Arax	Arax	58	58	100	51–100	0.8	2.2	7.1	–	–	–	110 000
Voghji	Arax	Arax	56	56	100	51–100	2.2	7.1	17.6	–	–	–	502 000
Vorotan	Arax	Arax	178	119	67	> 100	13.1	22.2	58.3	15.2	24.4	61.1	725 000
Yeghegis	Arax	Arpa	54	54	100	51–100	1.3	4.2	12.3	–	–	–	–
Hrazdan	Arax	Hrazdan	70	70	100	51–100	10.9	23.2	60.8	–	–	–	740 000
Marmarik	Arax	Hrazdan	10	10	100	10–25	1.4	5.0	19.7	–	–	–	300 000
Kasakh	Arax	Mecamor	89	89	100	51–100	4.0	9.0	23.1	–	–	–	329 000
Vorotan	Arax	Vorotan	53	33	62	26–50	13.1	22.2	58.3	15.2	24.4	61.1	730 000
Chichkan	Kur	Debed	65	65	100	51–100	2.2	3.4	9.0	–	–	–	–
Debed	Kur	Debed	176	154	88	> 100	–	–	–	13.6	34.4	98.8	1 203 000 000
Dzoraget	Kur	Debed	57	57	100	51–100	6.8	13.0	41.0	–	–	–	–
Marts	Kur	Debed	25	25	100	10–25	1.2	4.4	13.0	–	–	–	–
Pambak	Kur	Debed	86	86	100	51–100	1.5	3.0	7.3	–	–	–	–
Aghstev	Kur	Kur	99	99	100	51–100	2.1	5.7	24.1	–	–	–	445 000
Hakhum	Kur	Kur	45	45	100	26–50	0.6	1.6	4.2	–	–	–	–
Tavush	Kur	Kur	43	43	100	26–50	0.3	1.0	2.2	–	–	–	–
Mantash	–	–	90	90	100	51–100	–	–	–	–	–	–	–
Aksipara	–	–	21	21	100	10–25	–	–	–	–	–	–	–
Boydara	–	–	16	16	100	10–25	–	–	–	–	–	–	–
Darb	–	–	20	20	100	10–25	–	–	–	–	–	–	–
Gegharkunik	–	–	51	51	100	51–100	–	–	–	–	–	–	–
Joghaz	–	–	57	57	100	51–100	–	–	–	–	–	–	–
Karadzi	–	–	22	22	100	10–25	–	–	–	–	–	–	–
Khndzorut	–	–	65	65	100	51–100	1.3	4.1	9.8	–	–	–	–
Koghb	–	–	25	25	100	10–25	–	–	–	–	–	–	–
Kukudzor	–	–	11	11	100	10–25	–	–	–	–	–	–	–

Name	Water system		Length of river (km)			Size (km)	Volume of water						
							at water level when entering Armenia (m^3/s)			at water level when leaving Armenia (m^3/s)			Total volume (1 000 m^3/year)
	River basin	River system	Total	in Armenia	%		Low	Medium	High	Low	Medium	High	
Martuni	–	–	12	12	100	10–25	–	–	–	–	–	–	–
Sarnajur	–	–	23	23	100	10–25	–	–	–	–	–	–	–
Spitakjur	–	–	10	10	100	10–25	–	–	–	–	–	–	–
Tzakkar	–	–	23	23	100	10–25	–	–	–	–	–	–	–
Urtijur	–	–	19	19	100	10–25	–	–	–	–	–	–	–
Urut	–	–	25	25	100	10–25	–	–	–	–	–	–	–
Vardenis	–	–	28	28	100	26–50	–	–	–	–	–	–	–
Argichi	–	Lake Sevan	51	51	100	51–100	2.0	5.5	23.0	–	–	–	–
Masrik	–	Lake Sevan	45	45	100	26–50	2.5	4.0	5.7	–	–	–	166 000
Total			**3 364**	**2 383**									

Table A2.5: Larger lakes of Armenia and their recorded fish production

Name	Location				Water system		Dimensions of lake						
	Region	District	Altitude (m)		River basin	River system	Surface area		Length (km)	Width (km)	Depth (m)		Fluctuation of water level (m)
							ha	%			Average	Max.	
Akna	Kotayk	Hrazdan	3 032	> 3 000	Sevgur	Arax	80	0.06	0.9	0.9	6	15	–
Al	Syunik	Goris	2 990	2 000–3 000	Vorotan	Arax	60	0.05	0.8	0.8	3	5	–
Arnot	Ararat	Ararat	2 350	2 000–3 000	Vedi	Arax	40	0.03	0.2	0.2	5	13	–
Arpi	Vaiq	Vayots Dzor	1 700	1 000–2 000	Arpi	Arax	32	0.03	0.8	0.4	4.0	14.1	–
Aygehr	Armavir	Echmiadzin	850	< 1 000			12	0.01	0.4	0.3	9	25	–
Azat	Ararat	Ararat	2 620	2 000–3 000	Azat	Arax	30	0.02	3.1	1.0	2	3	–
Gazana	Syunik	Sisian	3 510	> 3 000	Vokhchi	Arax	25	0.02	0.6	0.4	4	10	–
Kaputan	Syunik	Kapan	3 300	> 3 000	Voghji	Arax	10	0.01	0.4	0.3	15	22	–
Kari	Aragacotn	Ashtarak	3 190	> 3 000	Qasakh		30	0.02	0.6	0.5	2.5	8.0	36
Lessing	Aragacotn	Aragac	3 200	> 3 000	Qasakh	Arax	1	0.00	0.1	0.1	2	3	–
Metsamor	Armavir	Hoktemberian	860	< 1 000	Metsamor	Arax	30	0.02	0.6	0.5	4	9	–
Miraqi	Aragacotn	Ararat	2 050	2 000–3 000	Qasakh	Arax	50	0.04	0.8	0.6	2	3	–
Novoselcovo	Lori	Tashir	1 450	1 000–2 000	Dzoraget		13	0.01	0.4	0.3	1	2	–
Parz	Tavush	Dilijan	1 334	1 000–2 000	Agstev	Qur	1	0.00	0.1	0.1	3	8	–
Sev	Syunik	Sisian	2 666	2 000–3 000	Vorotan	Arax	200	0.16	1.8	1.1	5	8	–
Sevan	Gegharquniq	Sevan	1 897	1 000–2 000	Massis	Gavaraget	125 600	99.47	69.6	48.1	25	90	2

Name	Location				Water system		Dimensions of lake						
	Region	District	Altitude (m)		River basin	River system	Surface area		Length (km)	Width (km)	Depth (m)		Fluctuation of water level (m)
							ha	%			Average	Max.	
Umroyi	Aragacotn	Aragac	3 060	> 3 000	Qasakh	Arax	20	0.02	0.5	0.4	2	4	–
Zalkha	Syunik	Goris	3 062	> 3 000	Vorotan	Arax	35	0.03	0.7	0.5	3	6	–
Total							**126 269**	**100**					

Name	Fish production (kg/year)						Owned by
	Registered			Estimated			
	Min.	Max.	At present	Min.	Max.	At present	
Akna	–	–	–	–	–	–	State
Aygehr	–	–	–	–	–	–	State
Kaputan	–	–	–	–	–	–	State
Karilich	–	–	–	–	–	–	State
Lessing	–	–	–	–	–	–	State
Parz	3 000	5 000	3 000	10 000	18 000	15 000	Private
Sevan	80 000	100 000	50 000	50 000	180 000	120 000	State
Sev	–	–	–	–	–	–	State
Al	–	–	–	–	–	–	State
Miraqi	–	–	–	–	–	–	State
Azat	–	–	–	–	–	–	State

Table A2.6: Main water canals of Armenia

Name of water source	Name of main irrigation canal	Number	Total length (km)	Estimated water area (ha)	Total average (m^3/s)	Total estimated covered area (ha)	Total irrigated area (ha)
R. H razdan (L. Sevan)	Artashat Canal	1	54.1	81.2	12.1	13 000	11 475
R. H razdan (L. Sevan)	Arzni-Shamiram Canal	2	79.2	118.8	16.4	11 500	10 010
R. H razdan (L. Sevan)	Lower Hrazdan Canal	2	50.0	75.0	9.1	7 000	5 270
R. Arax	Armavir Canal	1	43.9	65.9	51.4	10 500	8 618
R. Akhuryan	Talin Canal	1	46.3	69.5	25.1	16 500	13 800
R. Akhuryan	Shirak Canal	1	18.6	27.9	5.6	4 500	3 010
R. Dzoraget	Lori Canal	1	11.4	17.1	4.3	4 000	2 717
R. Vorotan	Vorotan Canal	1	10.3	15.5	5.8	4 500	3 100
Total		**10**	**313.8**	**470.7**	**129.8**	**71 500**	**58 000**

Table A2.7: Water reservoirs of Armenia

Name	Location				Water system			Primary use of reservoir*	Dimensions					Medium water volume (million m^3)
	Region	District	Altitude (m)		River basin	River system	Name of feeding water		Surface area (ha)	Length (km)	Width (km)	Depth (m)		
												Average	Max.	
Akhparayi	Kotayk	Hrazdan	1 980	1 000–2 000	Hrazdan	Arax		I	170	1.8	0.9	3.4	14.5	31.0
Akhurian	Shirak	Akhurian	1 500	1 000–2 000	Akhurian	Arax	Akhurian	I	4 180	10.2	4.1	12.0	59.1	53
Aknalichi	Kotayk	Hrazdan	3 030	> 3 000	Hrazdan	Arax		I	80	1.1	0.7	6.0	15.0	250
Angeghakot	Syunik	Sisian	2 100	2 000–3 000	Vorotan	Arax	Vorotan	I, E	54	1.4	0.4	7.0	35.0	0
Aparan	Aragacotn	Aparan	1 870	1 000–2 000	Qasax	Arax	Qasax	I	735	7.2	1.0	9.0	51.5	9
Arpilich	Shirak	Amasia	2 050	2 000–3 000	Akhurian	Arax	Akhurian	I, E	2 247	7.5	3.0	3.2	11.2	11
Azati	Ararat	Ararat	990	< 1000 m	Azati	Arax	Azati	I, E, F	285	2.6	1.1	21.0	76.0	7
Djoghar	Tavush	Noyemberyan	1 300	1 000–2 000	Agstev	Qur		I	230	2.1	0.9	20.0	60	23.7
Herher	Vayots Dzor	Yeghegnadzor	1 830	1 000–2 000	Arpa			I	120	1.5	0.7	22.6	70	27.0
Karnut	Shirak	Akhurian	1 630	1 000–2 000	Akhurian	Arax	Akhurian	I	234	2,2	1,06	11,0	34	22,6
Kechut	VayotsDzor	Vaiq	1 730	1 000–2 000	Arpa	Arax	Arpa	I	136	2.0	0.7	14.0	50.0	3
Mantash	Shirak	Artik	1 900	1 000–2 000	Karkachun	Arax	Karkachun	I, F	76	2.0	0.4	1.9	3.1	1
Mecavan	Lori	Stepanavan	1 850	1 000–2 000	Dzoraget			I	330	2.9	1.2	2.1	7.0	30.0
Shamb	Syunik	Sisian	1 340	1 000–2 000	Vorotan	Arax	Vorotan	E	112	2.1	0.5	4.3	41.0	1
Spandarian	Syunik	Sisian	2 030	2 000–3 000	Vorotan	Arax	Vorotan	I, E	1 025	6.4	1.6	30.4	83.0	26
Tolors	Syunik	Sisian	1 660	1 000–2 000	Vorotan	Arax	Vorotan	I, E	480	2.8	1.7	2.6	11.2	10
Total									**10 494**	–	–	–	–	**353**

* I = irrigation; E = energy; F = fishery.

Table A2.8: Summary tables of fish farms in Armenia

Table A2.8.1: Geographical distribution of fish farms in Armenia

Province	Region	Name of location (village)	Farms		Area	
			Number	%	ha	%
Aragacotn	Ashtarak	Xazaravan	1	0	0.4	0
Aragacotn total			**1**	**0**	**0.4**	**0**
Ararat	Masis	Ararat	1	0	20.0	1
		Armash	3	1	35.0	1
		Armash, Surenavan	1	0	500.0	18
		Armash-Eraskh	1	0	405.0	15
		Dashtavan	1	0	0.0	0
		Eraskh	1	0	110.0	4
		Hovtashat	16	7	11.8	0
		Lanjashat	1	0	11.0	0
		Marmarashen	2	1	0.4	0
		Noramarg	3	1	2.9	0
		Ranchpar	1	0	1.0	0
		Sayat-Nova	4	2	1.7	0
		Sipanik	5	2	0.5	0
		Sis	26	11	771.7	28
		Zorak	2	1	1.8	0
		–	11	5	1.1	0
Ararat total			**79**	**34**	**1 873.7**	**69**
Armavir	Armavir	Arevik	1	0	22.4	1
		Artashat	1	0	194.1	7
		Tanthut	1	0	3.0	0
		Zartonk	5	2	470.1	17
	Echmiatsin	Aknashen	12	5	4.8	0
		Apaga	15	6	5.1	0
		Araqs	10	4	15.0	1
		Arax	1	0	6.5	0
		Echmiatsin t.	8	3	4.1	0
		Gay	19	8	15.0	1
		Griboedov	4	2	2.6	0
		Haykashen	3	1	0.3	0
		Jrarat	8	3	7.1	0
		Jrarat	9	4	3.9	0
		Jrarby	1	0	0.2	0

Province	Region	Name of location (village)	Farms		Area	
			Number	%	ha	%
		Lusagjux	7	3	4.7	0
		Mecamor	3	1	4.1	0
		Taronik	7	3	3.7	0
Armavir total			**115**	**49**	**766.6**	**28**
Gexarqunik	Gavar	Covazard	1	0	0.3	0
		Ganthak	1	0	0.3	0
		Hacarat	1	0	0.2	0
		Noratus	1	0	30.0	1
	Karchaxbjur	Karchaxbjury thknabucaran	1	0	13.0	0
	Martuny	Lichq	1	0	8.0	0
	Sevan	Sevan t.	2	1	8.6	0
	Vardenis	Gevorgyan Arshik	1	0	0.9	0
Gexarqunik total			**9**	**4**	**61.1**	**2**
Kotayk	Abovyan	Akunk	3	1	0.2	0
		Arzny	1	0	0.3	0
		Garny	2	1	1.2	0
	Hrazdan	Karenis	1	0	0.1	0
		Mexrathor	1	0	0.2	0
	Nairy	Getameg	2	1	0.1	0
Kotayk total			**10**	**4**	**2.0**	**0**
Lory	Gugarq	Debed	1	0	0.3	0
	Spitak	Nor Khachkap	1	0	0.4	0
	Tashir	Saratovka	1	0	0.5	0
	Vanathor	Vanathor	1	0	0.2	0
Lory total			**4**	**2**	**1.4**	**0**
Shirak	Akhuryan	Beniamin	1	0	0.0	0
		Gyumry	1	0	0.2	0
		Krashen	1	0	0.2	0
		Marmarashen	2	1	0.8	0
	Amasia	Amasia	1	0	0.7	0
		Mexrashat	1	0	1.0	0
	Artik	Harich	1	0	0.2	0
	Ashocq	Goghovit	1	0	1.2	0
		Mec Sepasar	2	1	0.4	0
Shirak total			**11**	**5**	**4.6**	**0**
Sunik	Sisian	Sisian	1	0	0.6	0
Sunik total			**1**	**0**	**0.6**	**0**

Province	Region	Name of location (village)	Farms		Area	
			Number	%	ha	%
Tavush	Dilijan	Haxarcin v.	1	0	0.1	0
Tavush total			**1**	**0**	**0.1**	**0**
Vayoc-Thzor	Vayq	Germuk	1	0	9.0	0
		Vajq v.	1	0	0.6	0
Vayoc-Thzor total			**2**	**1**	**9.6**	**0**
Total			**233**	**100**	**2 720.2**	**100**

Table A2.8.2: List of the most important fish farms in Armenia

Name of farm	Location			Water surface area (ha)
	Region	District	Name of location (village)	
"Akvateque - avtomatika" Ltd.	Armavir	Echmiadzin	Arax	6.50
"Akvatik" Ltd.	Gegharkunik	Gavar	Covaberd	0.25
"Armashi karpi tntesutun" Ltd.	Ararat	Ararat	Surenavan	500.00
"Armavir farmer" Ltd.	Armavir	Artashat	Artashat	194.10
"Baks" Ltd.	Ararat	Masis	Sis	0.20
"Bigma Frut"	Ararat	Masis	Sayat-Nova	0.20
"Draxt" Ltd.	Kotayk	Abovyan	Akunk	0.06
"Ecofish Trade" Ltd.	Ararat	Masis	Zorak	1.50
"Garbush" Ltd.	Ararat	Ararat	Eraskh	110.00
"Hakobyan Gurgen" farmer	Gegharkunik	Gavar	Noratus	30.00
"Hamlet Khachatryan" farmer	Lori	Spitak	Ghursali	0.25
"Ishkhanoc" Ltd.	Kotayk	Abovyan	Garni	0.10
"Ishxan Ararat" Ltd.	Gegharkunik	Sevan	Sevan	1.25
"Ishxan" Ltd.	Aragatsotn	Artashat	Ghazaravan	0.43
"Jermuk Fish" Ltd.	Vayots Dzor	Vaiq	Vaiq	9.00
"Lichqi thknabucaran" CJSC	Gegharkunik	Martuni	Lichk	8.00
"Rabs" Ltd.	Ararat	Masis	Hovtashat	0.60
"Sazan" Ltd.	Armavir	Armavir	Arevik	22.40
"Sevani thknabucaran" CJSC	Gegharkunik	Sevan	Sevan	7.30
"Spitak delfin" Ltd.	Ararat	Masis	Noramarg	1.65
"Unifish" Ltd.	Ararat	Masis	Ranchpar	1.00
"Vana tarekh" Ltd.	Armavir	Armavir	Zartonk	209.60
"Varag shushanc"	Ararat	Ararat	Armash, Eracx	405.00
"Xayc ishxan" Ltd.	Shirak	Gumri	Gumri	0.20
"Yerevanshin" CJSC	Ararat	Masisi	Noramarg	1.65
"Zovasar" Ltd.	Shirak	Ashotsk	Mets Sepasar	1.20
Total				**1 512.44**

Table A2.9: Tables of fish production

Table A2.9.1: Estimated average yearly fish production by region

Province	Name of location (village)	Fish production (tonnes/farm)	Average of fish production (tonnes/ha)
Aragacotn	Xazaravan	7.5	7.5
Aragacotn total		**7.5**	**7.5**
Ararat	Armash, Surenavan	3.5	3.5
	Armash-Eraskh	2.7	2.7
	Dashtavan	20.0	20.0
	Hovtashat	295.0	22.7
	Marmarashen	30.0	15.0
	Noramarg	2.0	2.0
	Ranchpar	100.0	100.0
	Sayat-Nova	135.0	33.8
	Sipanik	37.0	7.4
	Sis	300.0	25.0
	Zorak	40.0	20.0
Ararat total		**965.2**	**22.4**
Gexarqunik	Covazard	0.1	0.1
	Ganthak	15.0	15.0
	Gevorgyan Arshik	5.0	5.0
	Hacarat	2.0	2.0
	Lichq	–	–
	Sevan t.	50.0	25.0
Gexarqunik total		**72.1**	**10.3**
Kotayk	Akunk	64.0	21.3
	Arzny	7.0	7.0
	Garny	10.0	10.0
	Getameg	3.5	1.8
	Karenis	6.0	6.0
Kotayk total		**90.5**	**11.3**

Province	Name of location (village)	Fish production (tonnes/farm)	Average of fish production (tonnes/ha)
Shirak	Amasia	1.5	1.5
	Beniamin	0.1	0.1
	Goghovit	2.0	2.0
	Gyumry	20.0	20.0
	Harich	1.0	1.0
	Krashen	1.0	1.0
	Marmarashen	5.5	2.8
	Mec Sepasar	4.0	2.0
	Mexrashat	2.0	2.0
Shirak total		**37.1**	**3.4**
Tavush	Haxarcin v.	0.5	0.5
Tavush total		**0.5**	**0.5**
Vayoc-Thzor	Vajq v.	5.0	5.0
Vayoc-Thzor total		**5.0**	**5.0**
Total		**1 177.9**	**16.4**

Table A2.9.2: Proportion of the yearly produced fish species of most important fish farms

Name of farm	Proportion of produced species (%)				
	Acipenseridae	Salmonidae	Cyprinidae	Siluridae	**Total**
"Akvateque - avtomatika" Ltd.	30	60	–	10	**100**
"Akvatik" Ltd.	–	100	–	–	**100**
"Armashi karpi tntesutun" Ltd.	–	–	70	30	**100**
"Armavir farmer" Ltd.	–	60	20	20	**100**
"Baks" Ltd.	40	60	–	10	**110**
"Bigma Frut"	–	100	–	–	**100**
"Draxt" Ltd.	20	80	–	–	**100**
"Ecofish Trade" Ltd.	50	50	–	–	**100**
"Garbush" Ltd.	10	20	50	20	**100**
"Hakobyan Gurgen" farmer	–	100	–	–	**100**
"Hamlet Khachatryan" farmer	–	100	–	–	**100**
"Ishkhanoc" Ltd.	20	80	–	–	**100**
"Ishxan Ararat" Ltd.	–	100	–	–	**100**
"Ishxan" Ltd.	–	100	–	–	**100**
"Jermuk Fish" Ltd.	20	80	–	–	**100**
"Lichqi thknabucaran" CJSC	–	100	–	–	**100**

Name of farm	Proportion of produced species (%)				
	Acipenseridae	Salmonidae	Cyprinidae	Siluridae	**Total**
"Rabs" Ltd.	20	80	–	–	**100**
"Sazan" Ltd.	5	5	70	20	**100**
"Sevani thknabucaran" CJSC	–	100	–	–	**100**
"Spitak delfin" Ltd.	30	70	–	–	**100**
"Unifish" Ltd.	50	50	–	–	**100**
"Vana tarekh" Ltd.	30	70	–	–	**100**
"Varag shushanc"	–	–	70	30	**100**
"Xayc ishxan" Ltd.	20	80	–	–	**100**
"Yerevanshin" CJSC	–	100	–	–	**100**
"Zovasar" Ltd.	–	–	100	–	100
Total	**13**	**67**	**15**	**5**	100

Table A2.9.3: Estimated proportion of fishes in different water bodies of Armenia

Name of water body	Proportion of produced species (%)						
	Acipenseridae	Salmonidae	Cyprinidae	Siluridae	Others	Crayfish	**Total**
Sevan Lake	–	1	–	–	1	11	**12**
Lake Parz	–	–	0		0	–	**0**
Other lakes	–	1	2	0	2	–	**4**
All reservoirs	7	53	14	2	1	2	**78**
All rivers	–	1	0	0	1	1	**3**
All canals	–	–	1	0	0	–	**2**
Total	**7**	**55**	**17**	**3**	**5**	**13**	**100**

Table A2.10: Fish species of Armenia

Scientific name	FishBase name	Russian name	Status	FishBase	Armenian source
Acipenseridae					
Acipenser baeri		Сибирский осётр	introduced		1
Acipenser gueldenstaedtii		Русский осётр	introduced		1
Acipenser ruthenus		Стерлядь	introduced		1
Balitoridae					
Nemacheilus angorae	Angora loach		native	1	
Orthrias brandtii	Kura loach		native	1	
Barbatula angorae		Ангорский голец	native		1
Cobitidae					
Sabanejewia aurata aurata	Golden spined loach		native	1	
Cyprinidae					
Abramis brama	Carp bream	Лещ	native	1	1
Acanthalburnus microlepis	Blackbrow bleak	Чернобровка	native	1	
Alburnoides bipunctatus	Chub		native	1	
Alburnoides bipunctatus armeniensis		Арм. быстрянка	native		1
Alburnus charusini hohenakeri		Уклея закавказская	native		1
Alburnus filippi	Kura bleak	Уклея филлипи	native	1	1
Alburnus hohenackeri	North Caucasian bleak		native	1	
Aristichthys nobilis	Bighead carp	Пёстрый толстолобик	introduced	1	1
Aspius aspius	Asp		native	1	
Aspius aspius taeniatus		Красногубый жерех	native		1
Ballerus ballerus	Zope		native	1	
Barbus capito		Усач чанар	native		1
Barbus capito capito	Bulatmai barbel		native	1	
Barbus goktschaicus	Gokcha barbel		endemic	1	
Barbus lacerta	Kura barbel		native	1	
Barbus lacerta cyri		Куринский усач	native		1
Barbus mursa	Mursa		native	1	
Barbus mursa mursoides		Усач мурца	native		1
Blicca bjoerkna	White bream		native	1	
Blicca bjoerkna derjavini		Арм. густера	native		1
Capoeta capoeta capoeta	Transcaucasian barb		native	1	
Capoeta capoeta sevangi	Sevan khramulya		native	1	
Carassius auratus		Карась	native		1
Carassius carassius	Crucian carp		native	1	

Scientific name	FishBase name	Russian name	Status	FishBase	Armenian source
Carassius gibelio	Prussian carp		native	1	
Chalcalburnus chalcoides	Danube bleak		native	1	
Chondrostoma colchicum	Colchic nase		native	1	
Chondrostoma cyri	Kura nase		native	1	
Chondrostoma cyrileptosoma		Куринский подуст	native		1
Ciprinus carpio	Common carp	Сазан	native		
Ctenopharyngodon idella	Grass carp	Белый амур	introduced	1	1
Cyprinus carpio		кои	introduced		1
Cyprinus carpio carpio	Common carp		native	1	
Gobio gobio		Обыкновенный пескарь	native		1
Gobio gobio gobio	Gudgeon		native	1	
Gobio perca		Куринский пескарь	native		1
Gobistis aurata		Переднеазиатская щиповка	native		1
Hypophthalmichthys molitrix	Silver carp	Белый толстолобик	introduced	1	1
Leucaspius delineatus	Belica		native	1	
Leuciscus cephalus	European chub		native	1	
Leuciscus cephalus orentalis		Кавказский голавль	native		1
Leuciscus delineatus		Верховка обыкновенная	native		1
Leuciscus idus	Ide		native	1	
Leuciscus leuciscus	Common dace		native	1	
Mylopharyngodon piceus	Black carp	Чёрный амур	introduced	1	1
Pelecus cultratus	Ziege		native	1	
Phoxinus phoxinus	Eurasian minnow		native	1	
Pseudorasbora parva	Stone moroko	Амурский чебачок	introduced	1	1
Rhodeus amarus	Bitterling		questionable	1	
Rhodeus sericeus	Amur bitterling	Горчак обыкновенный	native	1	1
Romanogobio persus	Kura gudgeon		native	1	
Rutilus rutilus	Roach		native	1	
Rutilus rutilus schelkovnikovi		Арм. плотва	native		1
Scardinius erythrophthalmus	Rudd		native	1	
Tinca tinca	Tench		native	1	
Varicorhinus capoeta		Куринская храмуля	native		1
Vimba vimba	Vimba		native	1	
Esocidae					
Esox lucius	Northern pike		native	1	
Gobiidae					
Knipowitschia caucasica		Бычок бобырь	native		1

Scientific name	FishBase name	Russian name	Status	FishBase	Armenian source
Neogobius fluviatilis		Бычок песочник	native		1
Neogobius fluviatilis fluviatilis	Monkey goby		native	1	
Ictaluridae					
Ictalurus punctatus	Channel catfish		introduced	1	
Percidae					
Perca fluviatilis	European perch		native	1	
Sander lucioperca	Zander		native	1	
Poeciliidae					
Gambusia affinis affinis		Гамбузия	introduced	1	1
Gambusia affinis holbrooki		Гамбузия восточная	introduced	1	1
Polyodontidae					
Polyodon spathula	Paddlefish	Веслонос	introduced		1
Salmonidae					
Coregonus lavaretus ladoga	Common whitefish		introduced	1	1
Coregonus lavaretus maraenoides	Common whitefish		introduced	1	1
Coregonus lavaretus sevanicus	Sevan whitefish		hybrid	1	1
Oncorhynchus mykiss	Rainbow trout	Радужная форель	introduced		1
Salmo ischchan	Sevan trout		endemic	1	
Salmo ischchan gegarkuni		Гегаркуни	endemic		1
Salmo ischchan aestivalis		Летний ишхан	endemic		1
Salmo trutta fario	Brown trout	Ручьевая форель	introduced	1	1
Salmo trutta trutta	Sea trout		native	1	
Siluridae					
Silurus glanis	Wels catfish	Сом	native	1	1
Total				**56**	**42**

Sources: FishBase, 2008; H. Roubenyan, 2009.

Tables of fisheries and aquaculture production and trade of Armenia

Table A3.1: Results of capture fisheries and aquaculture in Armenia

Type	Species	Before yearly reporting to FAO									Since yearly reporting to FAO									
		1975–1979			1980–1984			1985–1987			1988–1990			1991–2004			2005–2008			
		Tonnes									Tonnes									
		Min.	Average	Max.	Min.	Average	Max.	Min.	Average	Max	Min.	Average	Max	Min.	Average	Max.	2005	2006	2007	2008
Aquaculture	Carps, barbels and other cyprinids	3 436	3 648	3 936	4 091	4 190	4 274	4 314	4 618	4 938	4 202	4 401	4 644	125	908	2 243	440	653	1 230	1 600
	Freshwater crustaceans	–	–	–	–	–	–	–	–	–	0	0	0	0	2	20	3	3	12	21
	Miscellaneous freshwater fishes	–	–	–	–	–	–	–	–	–	0	0	0	0	16	90	0	0	103	153
	Salmons, trouts, smelts	48	75	97	98	152	202	213	251	302	241	352	413	235	354	465	296	400	2 305	3 326
	Total	**3 484**	**3 723**	**4 033**	**4 189**	**4 342**	**4 476**	**4 527**	**4 869**	**5 240**	**4 443**	**4 753**	**5 057**	**360**	**1 279**	**2 818**	**739**	**1 056**	**3 650**	**5 100**
Capture fishery	Carps, barbels and other cyprinids	484	607	740	461	519	703	403	488	604	374	468	574	45	123	338	82	115	134	153
	Miscellaneous freshwater fishes	63	144	243	50	107	202	40	92	161	0	46	139	0	11	81	56	80	73	69
	Salmons, trouts, smelts	2 041	2 171	2 320	2 073	2 201	2 350	2 051	2 154	2 302	2 025	2 104	2 241	97	848	1 769	112	155	141	121
	Total	**2 588**	**2 922**	**3 303**	**2 584**	**2 827**	**3 255**	**2 494**	**2 734**	**3 067**	**2 399**	**2 618**	**2 954**	**142**	**982**	**2 188**	**250**	**350**	**348**	**343**
Grand total		**6 072**	**6 645**	**7 336**	**6 773**	**7 169**	**7 731**	**7 021**	**7 603**	**8 307**	**6 842**	**7 371**	**8 011**	**502**	**2 261**	**5 006**	**989**	**1 406**	**3 998**	**5 443**

Sources: FAO FishStat; Ministry of Agriculture.

Table A3.2: Exports of fish and fishery products between 2000 and 2008

Exports (tonnes)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Live fish	0.6	–	–	0.2	–	–	5.4	5.1	6.1
Fresh or quick-frozen fish	1.0	3.6	2.2	6.0	21.6	46.2	64.7	41.5	49.5
Frozen fish	7.9	70.1	51.5	1.1	13.4	75.1	3.0	13.0	22.2
Different parts of fish	–	–	–	0.3	–	0.1	0.0	0.0	0.5
Dried, salted and fish in brine	16.5	–	–	2.6	2.3	0.8	1.0	1.0	0.3
Total finfish	**26.0**	**73.7**	**53.7**	**10.2**	**37.3**	**122.2**	**74.1**	**60.6**	**78.6**
Crustaceans	273.3	243.4	407.6	767.0	804.8	669.1	934.3	793.5	687.5
Molluscs/other aquatic invertebrates	–	147.4	107.4	0.0	–	0.0	–	0.0	0.0
Total others	–	**243.4**	**407.6**	**767.0**	**804.8**	**669.1**	**934.3**	**793.5**	**687.5**
Total fishery products	**299.3**	**317.1**	**461.3**	**777.2**	**842.1**	**791.3**	**1 008.4**	**854.1**	**766.1**

Exports (1 000 US$)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fresh or quick-frozen fish	3.9	14.2	16.8	35.9	128.0	320.2	494.6	425.2	509.2
Frozen fish	4.3	19.2	27.1	2.0	19.5	76.5	13.3	47.4	104.7
Different parts of fish	–	–	–	2.9	0.1	0.9	0.1	0.2	0.8
Dried, salted and fish in brine	6.8	–	0.2	14.7	4.7	4.7	5.8	6.0	1.9
Total finfish	**15.0**	**33.4**	**44.1**	**55.5**	**152.3**	**402.3**	**513.8**	**478.8**	**616.6**
Crustaceans	456.9	646.5	1 689.3	3 086.2	2 753.5	2 527.3	3 851.9	4 138.6	4 341.4
Molluscs/other aquatic invertebrates	–	–	–	–	–	–	–	–	–
Total others	**–**	**646.5**	**1 689.3**	**3 086.2**	**2 753.5**	**2 527.3**	**3 851.9**	**4 138.6**	**4 341.4**
Total fishery products	**471.9**	**679.9**	**1 733.4**	**3 141.7**	**2 905.8**	**2 929.6**	**4 365.7**	**4 617.4**	**4 958.0**

Table A3.3: Imports of fish and fishery products between 2000 and 2008

Imports (tonnes)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Live fish	0.1	–	–	1.9	–	–	–	0.2	**0.4**
Fresh or quick-frozen fish	–	0.1	–	0.5	0.4	8.7	–	4.8	**14.6**
Frozen fish	15.5	248.4	212.0	138.3	169.0	5 577.6	683.7	576.5	**1 981.3**
Different parts of fish	0.1	–	0.0	–	–	–	–	5.7	**3.7**
Total finfish	**15.7**	**248.5**	**212.0**	**140.7**	**169.4**	**5 586.3**	**683.7**	**587.2**	**2 000.0**
Molluscs/other aquatic invertebrates	0.2	–	–	–	–	–	3.6	5.1	**8.0**
Total others	**–**	**–**	**0.0**	**0.0**	**0.0**	**0.0**	**3.6**	**5.1**	**8.0**
Total fishery products	**15.9**	**248.5**	**212.0**	**140.7**	**169.4**	**5 586.3**	**687.3**	**592.3**	**2 008.0**

Imports (1 000 US$)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Live fish	6.6	–	0.9	0.7	–	–	–	12.4	**17.0**
Fresh or quick-frozen fish	–	0.1	0.1	2.0	2.2	3.3	0.4	3.3	**21.3**
Frozen fish	16.8	141.0	131.7	102.8	54.0	1 674.8	499.6	543.3	**2 881.2**
Different parts of fish	0.5	–	0.2	–	–	–	–	16.0	**20.5**
Total finfish	**23.9**	**141.1**	**132.9**	**105.5**	**56.2**	**1 678.1**	**500.0**	**575.0**	**2 940.0**
Molluscs/other aquatic invertebrates	1.2	–	0.3	0.6	–	0.2	10.2	21.3	**78.4**
Total others	**–**	**0.0**	**0.3**	**0.6**	**0.0**	**0.2**	**10.2**	**21.3**	**78.4**
Total fishery products	**25.1**	**141.1**	**133.2**	**106.1**	**56.2**	**1 678.3**	**510.2**	**596.3**	**3 018.4**

Table A3.4: Wholesale and retail price of fresh or live fish

Species	Wholesale				Retail price			
	AMD		US$		AMD		US$	
	From	To	From	To	From	To	From	To
Rainbow trout	1 200	1 300	3.3	3.6	1 700	1 800	4.7	4.9
River trout	1 300	1 400	3.6	3.8	1 800	2 000	4.9	5.5
Sevan trout	1 500	1 750	4.1	4.8	2 100	2 500	5.8	6.8
Sturgeon	1 700	2 000	4.7	5.5	2 400	2 800	6.6	7.7
Common carp	1 700	2 000	4.7	5.5	2 400	2 800	6.6	7.7
Grass carp	1 400	1 800	3.8	4.9	2 000	2 500	5.5	6.8
Silver carp	1 400	1 800	3.8	4.9	2 000	2 500	5.5	6.8
Bream	300	350	0.8	1.0	420	490	1.2	1.3
Crucian carp	200	250	0.5	0.7	280	350	0.8	1.0
Crayfish	700	1 300	1.9	3.6	1 000	1 800	2.7	4.9

Note: US$1 = AMD365.

Table A3.5: Wages and salaries in the fisheries and aquaculture sector

Post	AMD		US$	
	From	To	From	To
Manager (per month)	150 000	200 000	410	550
Foreman (per month)	75 000	125 000	210	340
Worker (per month)	50 000	70 000	140	190
Driver (per month)	70 000	100 000	190	270
Daily labour (per day)	3 500	5 000	10	14

Note: US$1 = AMD365.

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