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REVIEW OF FISHERIES AND AQUACULTURE DEVELOPMENT POTENTIALS IN GEORGIA

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REVIEW OF FISHERIES AND AQUACULTURE DEVELOPMENT POTENTIALS IN GEORGIA

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PREPARATION OF THIS DOCUMENT

This document was prepared as a follow-up to previous FAO technical assistance efforts in the fields of fisheries and aquaculture development in Georgia, with particular reference to the FAO project TCP/GEO/2904 (A) *"Strengthening the Capacity of the Department of Fisheries to Support Fisheries Sector Rehabilitation"* completed in 2006. The present review was carried out by a team of international and national experts under the technical and administrative supervision of the FAO Subregional Office for Central and Eastern Europe, Budapest, Hungary.

Data and information were provided by Ms Marina Khavtasi †, Ms Marina Makarova and Ms Irina Lomashvili, National Specialists and Mr Archil Phartsvania, National Consultant. Information was also collected through a series of consultations with actual and potential stakeholders, above all fishermen and fish farmers. In collaboration with national specialists, establishment of reliable databases of the different types of inland water-bodies, fish farms and fish species of marine and inland waters of Georgia was initiated and included in the document.

National data and information, together with information from relevant international literature were consulted, grouped and presented by Mr Thomas Moth-Poulsen, Fishery Officer at Regional Office for Europe and Central Asia (REU) 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 reviewed by the Department of Integrated Environmental Management and Biodiversity (DIEMB – now Biodiversity Protection Service) of the Ministry of the Environment Protection and Natural Resources (MEPNR) of Georgia.

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ABSTRACT

The present document is a follow-up to previous FAO technical assistance efforts in the sustainable development and management of the fishery and aquaculture sector in Georgia. It aims to call attention to and provide evidences of the fact that fisheries and aquaculture have substantial development potentials in Georgia. The country is rich in both marine and inland water resources, but the potentials of the fishery and aquaculture sector are far from being exploited. The country could multiply its fish production through improvements in the administration and supervision of marine fisheries and through enhanced implementation of the rules and regulations of inland fisheries together with reliable culture-based fisheries supported by well-managed hatcheries.

The review emphasizes that efficient and sustainable exploitation of potentials requires the concerted and coordinated attention and actions of decision-makers in the government administration and all actual and potential stakeholders of the Georgian fisheries and aquaculture sector. In order to achieve a tangible improvement, the following entry points have been identified and actions proposed. In the field of marine capture fisheries quick action is needed on assistance, to obtain export certification for fresh and processed Black Sea anchovy and to upgrade and optimize the fisheries inspection. Facilitating investment loans for the fishing fleet is another urgent task. The most obvious entry points for the development of inland fisheries and aquaculture are: finalization of the databases of surface water resources, survey of fish farm facilities, establishment of a reliable fish seed production network and rehabilitation of the Geguti Sturgeon Hatchery. In sector management, an updated administrative structure and upgraded Georgian fisheries laws and regulations could fix existing loopholes and provide for sustainable development and responsible management of aquatic resources.

The review also presents the widest possible range of data and information in order to facilitate the identification and utilization of further areas of fisheries and aquaculture development in the country.

To that end, detailed lists of actual and potential natural and social resources are presented and discussed, together with the most important determining factors of sector administration, management and business performance.

Keywords: water resources, fish fauna, marine and inland fisheries, aquaculture, sustainable development potentials, sector administration and management, Georgia, Caucasus

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ABBREVIATIONS AND ACRONYMS

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
BPS	Biodiversity Protection Service
BSEP	Black Sea Environment Programme
CCA	Caucasus and Central Asia
CMS	Conservation of Migratory Species of Wild Animals
CSMP	Centre for Statistics Monitoring and Prognostication
DD	**Data deficient** is a category applied by the IUCN when there is no enough information for a proper assessment of conservation status. Hence it indicates that there is no information on abundance and distribution.
DIEMB	Department of Integrated Environmental Management and Biodiversity
DOF	Department of Fisheries
EDPRP	Economic Development and Poverty Reduction Programme
EEZ	Exclusive economic zone
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRP	Fibre Reinforced Plastic or Fiberglas Reinforced Polyester
FTCC	Fisheries Technical Coordinating Committee
GEL	Georgian Lari (Currency)
IEPD	Inspection of the Environment and Protection Department
IPCC	International Panel on Climate Change
IUCN	International Union for Conservation of Nature
IUUF	illegal, unreported and unregistered fishing
KNP	Kolkheti National Park
lEP	Inspection of Environment Protection
IESC	International Executive Service Corp
LPD	Licensing and Permitting Department
MED	Ministry of Economic Development
MEFRI	Marine Ecology and Fisheries Research Institute
MEPNR	Ministry of the Environment Protection and Natural Resources
MOA	Ministry of Agriculture
MPFSD	Master Plan for Fishery Sector Development
NBG	National Bank of Georgia
NGO	Non-Governmental Organization
Nm	nautical mile (1 852 km)
NRT	Natural Resource Tax
RSWR	Renewable Surface Water Resources
SAFMU	Stock Assessment and Fisheries Management Unit
SARD	Sustainable Agriculture and Rural Development
SARDU	Sustainable Aquaculture Development and Restocking Unit
SME	Small and Medium Enterprise
TAC	total allowable catch
TRWR	Total Renewable Water Resources
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
URRIG	Union for the Rehabilitation and Restocking of the Ichthyofauna of Georgia
USAID	Unites States Agency for International Development
USSR	Union of Soviet Socialist Republics
VMS	vessel monitoring system
WRP	Water Resource Protection

FOREWORD

Georgia is gifted with considerable marine fisheries resources and a vast amount of unutilized clear freshwater-bodies, ponds, rivers and streams. The potential to create revenue for the country on the marine resources and the development potential of the inland fisheries production is far from being utilized.
This report on Fisheries and Aquaculture Development Potential in Georgia is a separate part of an agreement between FAO SEU and SEC to perform an updated fisheries review on all the Caucasus countries. In 2006 a quarter million dollar FAO TCP review project produced master- and action plans for the fisheries sector in Georgia, but the recommendations never really took place presumably for economical reasons.
The present, report which is made on a much smaller budget, presents comprehensive new statistical data valuable to estimate potential for fish production in Georgian inland waters and it updates necessary actions to increase the national revenue from the considerable marine fisheries resource.
Finally the report drafts a number of shorter term projects that could help kick start the marine and aquaculture fish production, processing and management.

Thomas Moth-Poulsen
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SEUM

EXECUTIVE SUMMARY

At the request of the Government of Georgia, in 2006 FAO provided technical assistance in the field of sustainable development and management of the fishery and aquaculture sector in the country. In the framework of this assistance, four important documents were prepared: a review of the actual status of fisheries resources and their utilization, a master plan for fishery sector development, an action plan for fishery sector management and development and a proposed document of the law of Georgia on fisheries and aquaculture.

The present document is a direct follow-up to the above-mentioned FAO efforts and it aims to call attention to, and provide evidence that, fisheries and aquaculture have substantial development potentials in Georgia. It also emphasizes that efficient and sustainable exploitation of those potentials requires the concerted efforts and coordinated actions of decision makers in the government administration and all actual and potential stakeholders of the Georgian fisheries and aquaculture sector.

Georgia is divided into two main river basin systems. The larger one is the Black Sea river basin system which has a humid subtropical climate, while the smaller Caspian Sea river basin system has dry subtropical climate.

Georgia is rich in inland water resources. The yearly average precipitation is about 1 260 mm and the annual total internal renewable water resources (TRWR) are around 58 km^3. There are several thousand rivers and streams in the country, of which about 90 are considered important with an estimated total length of 5 000 km. The number of lakes is about 860, and their total area comes to almost 16 900 ha. The total length of 36 main irrigation canals is 1 296 km, while the total area of water reservoirs is about 23 000 ha. In addition to the surface waters, the total resources of fresh ground waters are 560 m^3 per second. Thermal water resources of Georgia are estimated varying between 960 000 and 1 000 000 m^3 per day.

The coastline of Georgia to the Black Sea is 310 km long, while maritime claims in accordance with the United Nations Convention on the Law of the Sea (UNCLOS) are 12 nm territorial sea and 200 nm exclusive economic zones (EEZ). The total Georgian territorial sea area is about 6 900 km^2, while the area of its EEZ is about 115 000 km^2. The main marine resource is anchovy and its annual quota is 60 000 tonnes. The most important ports for the Georgian fisheries fleet are Poti and Batumi.

National specialists list 75 marine and 68 freshwater species in Georgia, among which there are several highly valued and endangered ones, such as various indigenous sturgeons and trout.

Restoration of independence in 1991 found the country in difficult economic and social situation. The marine fishing fleet virtually disappeared and catches sharply decreased. As a result, marine resources are neither fully nor properly exploited. In inland fisheries and aquaculture similar decline was experienced. At present there are about 41 more or less operating fish farms with a total area of 2 450 ha. FAO statistics (FISHSTAT, 2009) report very low fish production results of both marine and inland capture fisheries and aquaculture. Before independence the average yearly per capita fish consumption was 19 kg. At present it is only 3.8 kg. Most of the imported fish and fish products, a total quantity of 22 600 tonnes (4.8 kg per capita), come from neighbouring countries.

The potentials of the Georgian fishery and aquaculture sector are far from being exploited. Improvements in the existing conditions, including the administration and supervision of marine fisheries and the enhanced implementation of the rules and regulations of inland fisheries, would greatly contribute to an increasing fish production. This, combined with a reliable culture based fisheries management, could raise the yearly production to as much as 1 500–1 900 tonnes. At present the main irrigation canals are not used for fish culture. They, even by modest estimates, could contribute about 30–40 tonnes to the yearly total fish production of the country. The estimated production potential of rivers is around 20–70 tonnes per year.

Within the aquaculture subsector, trout production could be as high as 450–600 tonnes per year which would be enough to replace most of the imports. In an estimated total fish pond area of 2 500 ha, annual fish production could reach about 2 500–3 250 tonnes. The role of fish hatcheries is extremely important in

Georgia. The entire fisheries and fish production of approximately 45 000 ha of inland waters and 2 500 ha of fish ponds depends on the success of fish hatchery operations.

In order to achieve a tangible improvement in the utilization of the rich fishery and aquaculture potentials of the country and reach the above-mentioned results, the following entry points have been identified and actions proposed in the field of marine capture fisheries: upgrading of six Poti trawlers, making necessary arrangements for obtaining export certification for fresh anchovy and upgrading and optimization of the fisheries inspection require early action. The most obvious entry points for the development of inland fisheries and aquaculture are: finalization of the databases of surface water resources, survey of fish farm facilities, and establishment of a reliable fish seed production network and assistance in rehabilitation of the Geguti Sturgeon Hatchery. Finally, in the field of sector management the strong administrative structure and upgraded Georgian fisheries laws and regulations could fix existing loopholes and provide for sustainable development and responsible management of aquatic resources.

1. INTRODUCTION

In 2003 the Government of Georgia requested the Food and Agriculture Organization of the United Nations (FAO) to provide technical assistance in the sustainable development and management of the fishery sector in the country. Assistance was provided in the framework of the FAO project TCP/GEO/2904 (A) *"Strengthening the Capacity of the Department of Fisheries to Support Fisheries Sector Rehabilitation"* completed in 2006.

The objective of the project was to support the Department of Fisheries (DoF) at the Ministry of Agriculture in order to lead and rehabilitate the fisheries sector in Georgia. In the framework of the project the following documents were prepared:

- *Review of Current Status of Fisheries Resources and Utilization in Georgia*
- *Master Plan for Fishery Sector Development in Georgia – 2005–2020*
- *Action Plan for Fishery Sector Management and Development in Georgia – 2005–2008*
- *Law of Georgia on Fisheries and Aquaculture*
- *Summary Reports of Workshops:*
  - Fishery Management and Development, Batumi, 19 August 2004
  - Fisheries Legislation and Management, Tbilisi, 11 - 18 February 2005
  - National Conference on Fisheries Management and Development in Georgia, Tbilisi, 15- 16 June 2005

The above-mentioned *Review* provided background information of the fishery and aquaculture sector and directly supported the preparation of the Master Plan, Action Plan and the Fisheries Law. All these documents were published in FAO Fisheries Circular No.1007 "Fisheries and Aquaculture in Georgia – Current Status and Planning" (Van Anrooy, Mena Millar, Spreij, 2006).

In 2007, USAID provided assistance to the Ministry of Environment Protection and Natural Resources of Georgia (MEPNR) in managing fishing industry and regulating the seafood industry in the country. In the framework of this project another, valuable source information was compiled by Mathews titled "Fisheries Assessment for Ministry of Environment Protection and Natural Resources of Georgia, SME Support Project". This document included an assessment of the fishing industry and presented not only updated facts on the followed practices of capture fisheries, but described the role of MEPNR in the fishery sector, as well.

In addition to the information made available by the FAO and USAID projects, the authors of the present review made a comprehensive inventory of water resources and fish species of Georgian marine and inland waters.

All available data and information have been analyzed in order to determine the development potentials of the fisheries and aquaculture sector in Georgia. The present review builds upon the information of the earlier status reviews, but also presents and discusses additional aspects and details related to development potentials of the fishery and aquaculture sector. In particular, it focuses on the analysis of actual and

potential resources of fisheries and aquaculture activities. Because no sustainable development can be attained without the economic motivation of stakeholders, this document also deals with profitability issues trying to convince actual and potential investors that fisheries and aquaculture might be as profitable in Georgia as in other countries.

The presentation and analysis of an extensive set of data and information were aimed to demonstrate development potentials, support conclusions and recommendations and present feasible and instant entry points to increased utilization of revealed potentials. Furthermore, the authors also tried to supply the widest possible range of information in order to facilitate the identification and utilization of further areas of fisheries and aquaculture development in the country. To that end, detailed lists of actual and potential natural and social resources are presented and discussed, together with the most important determining factors of sector administration, management and business performance.

2. ACTUAL AND POTENTIAL RESOURCES OF THE FISHERY AND AQUACULTURE SECTOR

2.1 Geography and climate

Georgia is situated in the central and western parts of the Caucasus surrounded by Armenia, Azerbaijan, Russia and Turkey (lengths of border lines are 164 km, 322 km, 723 km and 252 km respectively). The coastline of Georgia to the Black Sea is 310 km long, while maritime claims are in accordance with the United Nations Convention on the Law of the Sea (UNCLOS), namely 12 nm territorial sea and 200 nm exclusive economic zones (EEZ).

Table 1: Area of Georgia

Country	Total (km^2)	% of Caucasus countries	% of Central Asian countries	% of CCA countries
Georgia	**69 700**	**37.5**	**1.7**	**1.7**
Caucasus	186 100	100	4.7	4.5
Central Asia	3 994 400	2 146.4	100	95.5
Caucasus and Central Asia (CCA)	4 180 500	2 246.4	104.7	100

Adapted from: The World Factbook, 2008

The total area of the country is 69 700 km^2. The land area (69 490 km^2) is covered by the Great Caucasus Mountains in the north and Lesser Caucasus Mountains in the south. Kolkhida Lowland stretches along the Black Sea in the west and Mtkvari River Basin in the east.

The country is physically divided by the Surami Pass. This creates a dry subtropical climate in the eastern region and a humid sub-tropical climate in the west towards the Black Sea (AQUASTAT, 2008).

Because of terrain features, there is a wide range of microclimates in the country supporting a very diverse flora and fauna. Therefore, while the average winter and summer temperatures are 3 ^oC and 23 ^oC respectively, the actual figures of temperature greatly vary in the different regions of the country.

2.2 Population

Georgia has a population of 4 630 000. About 67 percent of the population is in the age group of 15 to 65 years. The age groups below 15 and above 65 years are proportionate, representing almost equally 16–16 percent of the population (The World Factbook, 2008).

About 43.6 percent (approximately 2 million persons) of the population represent the labor force of the country. Out of them 55.6 percent (1 123 000 persons) are employed in agriculture, while 8.9 percent (about 180 000 persons) and 35.5 percent (727 000 persons) find occupation in the industry and service sectors.

According to The World Factbook the unemployment rate was 13.6 percent, while 31 percent of the population lived under the poverty line in 2007.

The agriculture population density reduced from 1.1 persons/ha to 0.9 persons/ha (by about 18 percent) between the survey periods of 1993–1995 and 2001–2003. (For further details on the population see Tables 1.2, 1.3 and 1.4 in Annex 1).

2.3 Agriculture

The land of Georgia is fertile, especially in river valley flood plains. Climate and soil allow the production of a very wide range of agricultural products, including not only the usual arable crops but also tea, grapes and other fruits, among them citrus fruits.

Box 1: Household based land ownership in Georgia

Land ownership was granted to a household rather than to a family or an individual. This was problematic because such as "household" was neither defined in Georgian legislation, nor was legally clear how a person should become or give up membership in a household. Though in most cases a rural family and household are equivalent, this is not necessarily so. Hence it was possible that in a multi-generational household the elderly parents constituted a separate household in legal terms. Land ownership was ultimately determined on the local "household registers" of villages.

Much of the land is still not transferred into private ownership; meadows and pastures, for example, remain in state ownership. Former collectives have been converted into limited liability companies, often by previous managers. These companies are frequently the leaseholders of the land. While some of the previous machinery and equipment remain in their possession, much of the technology has reportedly been stolen or sold. Local committees decide how state-owned common land is used. Pro-reformers point out that common land is often badly managed and subject to corruption.

The high degree of land fragmentation, the vast majority of which is used for subsistence farming, as well as the lack of technology and investment in agriculture, problems in the leasing procedures of common land and the absence of a clearly defined concept of "household" in legislation are the main problem areas. These may make future land sales and inheritance extremely difficult, especially because current legislation assumes that land ownership rights are shared by all household members.

Source: Kaneff, 2008

FAOSTAT estimated in 2007 that the area of the agricultural land in Georgia was about 2 517 000 ha, covering 36.2 percent of the total land area of the country. Out of the total agricultural land 1 887 750 ha (75 percent) are arable land, 629 250 ha (25 percent) are under permanent crops. About 469 000 ha are irrigable lands (after FAOSTAT, FAO AQUASTAT, 2008 and The World Factbook, 2008).

By the end of 2002 approximately 25 percent of all agricultural land, or 60 percent of intensively farmed former land of *kolkhoz* (state–owned farms) and *sovkhoz* (cooperative farms) were transferred into private ownership. Land was distributed according to occupation and residence. Former *kolkhoz* and *sovkhoz* workers were entitled to a maximum of 1.25 ha of land, while village residents working in the non-agricultural sector were entitled to 0.75 ha. Georgian citizens not resident in the village but with rural connections were entitled to 0.25 ha. In each case the entitlement figure was higher if the location of the village was in the less fertile mountainous areas (Kaneff, 2008). An additional decisive factor in the described system was the unique definition of entitlement summarized in Box 1.

Land privatization resulted in a rather fragmented land ownership structure that indicates, as well as presumes, special forms of cooperations for reliable local production of inputs used in fish culture.

2.4 Water resources

The large natural river supply of phosphorus and nitrogen, the essential nutrients for marine plants and algae has always made the Black Sea very fertile. The narrow continental shelf and the unique quality of the water of the Black Sea at Georgia provide fertile environment for pelagic fish species. Due to stabile vertical stratification of the Black Sea water, the high hydrosulphide concentration causes scarcity of

demersal fish species (Van Anrooy, Mena Millar, Spreij, 2006). The total Georgian territorial sea area is about 6 900 km^2, while the area of its EEZ is about 115 000 km^2.

Georgia is rich in inland water resources. The yearly average precipitation is about 1 260 mm varying between 1 100 and 1 700 mm per year. This produced on an average 71.5 km^3 water resources annually between 1961 and 1990. The total renewable water resources (TRWR) come to about 58.1 km^3 per year. Out of it 17.2 km^3 per year groundwater and 56.9 km^3 per year surface water are produced internally with a 16 km^3 of overlap (FAO AQUASTAT, 2008). More details are presented in Tables 2.1, 2.2 and 2.3 of Annex 2.

The country is divided into two main river basin systems. The Black Sea river basin system is located in the western area of the country. The total renewable surface water resources (RSWR) generated in this basin is about 42.5 km^3 per year. The Caspian Sea river basin system is in the east side of the country, producing about 14.4 km^3 annual RSWR.

Box 2: Databases of Georgian surface waters

In order to obtain reliable information on Georgian surface waters and their fisheries, the preparation of two databases were initiated. It is aimed that the databases will contain the most important geographical and physical data of major water-bodies. After the finalization of these databases they will also facilitate grouping and comparing the fish fauna and the fisheries of the different types of water-bodies.

- The first database includes all flowing surface waters. It is planned that it would contain all of the important parameters of the major rivers and canals. Hence, in the case of rivers and canals not only the length but also their approximate area should also be included. The area of flood plains and the number/area of temporary water-bodies and wetlands created by the floods of rivers should also be listed in the database. These are also very important data for the professional exploitation of their fisheries.
- The second database contains all still surface waters, such as lakes, wetlands and water reservoirs. This database should also contain the classification of lakes and reservoirs according to the physical characteristics of their waters, as well as their trophic status, because they are important information for their fishery management.

Though the compiled databases are already rather detailed, they should be further developed into a reliable set of consolidated information which will effectively support professional planning, monitoring and reporting.

In the mid-1990s about 55.7 percent of the population lived in urban areas that were considered as the biggest source of water pollution. Sewage accounted for about 60 percent of the total volume of waste water, because the sewage treatment systems did not function well or at all. In most of the polluted rivers (Mtkvari, Rioni, Kvirila, Galidzga, Tkibuli, Enguri and Gubistskali) concentration of phenols, hydrocarbons, copper, manganese, zinc and nitrogen was considerably higher than the permitted level of national and international standards. In addition, water courses were also heavily polluted by fertilizers and pesticides, greatly exceeding permissible levels (G.Info, 1996). In spite of the halt of industrial sector and the slow-down of intensive agricultural production which reduced the high rate of pollution of these sectors, pollution is still a serious problem of water resources in Georgia.

2.4.1 Surface waters

Accurate inventory of surface waters helps not only to assess total renewable water resources (TRWR) and renewable surface water resources (RSWR), but also to estimate inland fisheries and aquaculture potentials. For this reason, development of databases of natural and man-made surface waters was initiated within the framework of the present review study. The already completed sections of these databases, described in Box 2, served as sources of information for the tables presented in this document.

Rivers and wetlands

According to different data sources there are about 25 000–26 000 rivers and streams in Georgia. It is believed that their total length may be as much as 54 000–59 000 km. However, only approximately 5 percent (1 250–1 300) of the rivers and streams are longer than 10 km. Because of the large number of water flows most of them have no name and can hardly be found in official lists.

Table 2: Summary table of larger inland waters of Georgia

Type of water	Number of water-bodies	Length* or area
Most important flowing waters		
Canals	36	1 296 km
Rivers with information	58	5 039 km
Total	**93**	**6 335 km**
Rivers without information	31	
Most important still waters		
Lakes with information	17	14 101 ha
Reservoirs	37	23 010 ha
Total	**70**	**37 111 ha**
Lakes without information	20	-

* Length of river within Georgia

Source: Unpublished survey of Khavtasi and Makarova, 2008

Before independence only 1 400 km of the rivers were considered worthwhile mentioning in the context of fishery (Berka, 1989). Nowadays, tourist publications and official statistics list about 57 larger rivers providing their most important parameters, such as length and water carrying capacities. During the preparation of the database of Georgian inland waters the names of an additional 31 rivers were mentioned as habitats of the different fish species. Unfortunately their physical parameters are not yet available.

Table 3: Summary table of larger rivers in Georgia

River basins system	Number of larger rivers	Total length of larger rivers (km)
Black Sea	31	2 595
Caspian Sea	27	2 444
Total	**58**	**5 039**
No detailed information	31	
Grand total	**89**	

Source: Unpublished survey of Khavtasi and Makarova, 2008

The main rivers of the Black Sea river basin system are Inguri, Rioni, Kodori and Chorockhi, while the main rivers of the Caspian Sea river basin system are the Alazani, Algeti, Aragvi, Iori, Khrami, Mtkvari (Kura), Paravani, Prone and Vera (see details in Table 2.4).

Table 4: Summary table of wetlands in Georgia

Location	Area (ha)
Kolkheti National Park	45.5
Kobuleti Reserve	331.0
Kobuleti managed Reserve	439.0
Forest Fund	1 442.0
Total	**2 257.5**

Source: Unpublished information of I. Lomashvili, 2008

No accurate information is available about the extent of flood plains and temporary water-bodies, but there is some information about the wetlands of Georgia which is summarised in Table 4.

Table 5: Summary table of larger lakes in Georgia

River basin systems	Number of larger lakes	Area (ha)	Water volume (m^3)
Black Sea	4	1 984	13 618 920
Caspian Sea	13	12 117	44 962 300
Total	**17**	**14 101**	**58 581 220**
No detailed information	21	-	-

Source: Unpublished survey of M. Khavtasi and M. Makarova, 2008

Table 6: Altitude of the location of selected lakes in Georgia

Range of altitude	Number of lakes	Total area (ha)	Water volume (m^3)
0– 500 m	3	3 078	9 726 000
500–1 000 m	4	367	9 929 000
1 000–1 500 m	1	10	324 480
1 500–2 000 m	4	5 860	25 362 900
2 000–2 500 m	4	4 656	10 027 840
2 500–3 000 m	1	130	3 211 000
Grand total	**17**	**14 101**	**58 581 220**

Source: Unpublished survey of Khavtasi and Makarova, 2008

Lakes

Before independence only the bigger lakes, their total surface area of 8 800 ha were considered important for inland fisheries (Berka, 1989). Nevertheless, there are country summaries which mention about 860 lakes with a total area of almost 16 900 ha. As in the case of rivers, only a limited number of lakes are actually indicated in the different available documents. Considering that not more than 2 percent of the lakes (17 lakes) represent 83 percent of the total water surface area (14 100 ha), the remaining several hundred lakes must be only slightly larger than 3 ha on an average. It worth considering, that most of the lakes are located at a higher altitude (Table 6). This fact suggests that their water is cold which determines their fish fauna and possible utilization with fisheries.

Canals of irrigation systems

Construction of irrigation systems was one of the prestige investments before independence. Irrigation was considered as one of the criteria and also indicators of advanced agriculture. According to FAO statistics about 44–46 percent of the total agricultural land was equipped for irrigation (FAO AQUASTAT, 2008). Mainly because of the dry subtropical climate, irrigation plays an outstanding role in the eastern part of the country where about 90 percent of the total irrigated land area is situated.

In the late 1980s and early 1990s the physical state of the irrigation systems had a rather decaying tendency. Especially the water distributing concrete troughs and channels were, and increasingly are still today, in a broken shape. As far as the main (also called magisterial) canals are concerned, they are in a much better and a usable shape. The total water carrying capacity of the main canals is about 295 m^3 per second. Their length and estimated water surface area are 1 296 km and 1 674 ha, respectively, as summarized in Table 7. For details see Table 2.6 in Annex 2.

Water reservoirs

All relevant documents agree that the total area of the most important 12 water reservoirs is around 10 700 ha. However, the total number of all existing water reservoirs is as many as 37 and their total area comes to at least 25 825 ha, as it is summarized in Tables 8 and 9 and detailed in Table 2.7 of Annex 2. Although

there is no information about the altitude of most of the reservoirs, it can be assumed that their locations, hence the temperature of their water, vary considerably which determine their fish production capacities.

Table 7: Summary table of water canals in Georgia

Name of water source	Number	Total length (km)	Total estimated area (ha)	Total capacity (m^3/sec)	Total irrigated area (ha)
West Georgia					
Dzevrula	2	8	0.8	1.5	550
Khanistskali	3	43	4.1	2.8	1 945
Kvirila	2	40	9.5	3.5	3 228
Rioni	1	44	87.6	20.0	13 829
Surlori	1	5	0.2	0.5	323
Tskhenistskali	1	13	16.9	13.0	14 134
West Georgia total	**10**	**152**	**119.3**	**41.3**	**34 009**
East Georgia					
Alazani	5	319	681.1	106.0	122 197
Algeti reservoir	3	45	32.9	20.0	29 636
Aragvi	2	68	25.6	8.0	17 383
Great Liakhvi	3	94	83.6	22.5	42 231
Iori	3	191	293.8	45.7	55 180
Khrami	1	66	59.0	9.0	10 014
Ksani	1	34	27.0	8.0	4 441
Little Liakhvi	1	11	7.8	7.0	4 456
Mtkvari (Kura)	4	147	136.9	31.3	20 005
Tbilisi reservoir	3	169	207.0	35.0	53 243
East Georgia total	**26**	**1 144**	**1 554.7**	**292.5**	**358 785**
Grand total	**36**	**1 296**	**1 673.9**	**333.8**	**392 794**

Source: Unpublished survey of Khavtasi and Makarova, 2008

2.4.2 Underground water resources

Georgia is rich in ground water resources. The quality of the ground waters varies from pure freshwater to mineral and thermal waters.

The total capacity of fresh ground water resources is 560 m^3 per second, out of which only about 18 percent (100 m^3 per sec) is presently used.

Over 80 percent of the geothermal resources are found in west Georgia. The capacity of thermal water resources are estimated varying between 960 000 and 1 000 000 m^3/day (11–11.5 m^3/sec). The temperature of these waters ranges between 30 ^oC and 108 ^oC. Out of the mentioned estimated quantity only one-third (about 329 500 m^3/day) is actually used.

Thermal waters surface in 250 locations. The most significant regional centers where geothermal resources are utilized are Khobi (1.2 MW), Senaki (11 MW), Samtredia (5 MW) and Vani (5 MW). In addition, the Zugdidi-Tsaishi deposit has also vast resources and thermal potentials, even if the upper layer of water has about 1.0 g/l mineralization at 82–87 ^oC, while the lower layer contains water with 2.5 gr./l mineralization at 98–102 ^oC.

Table 8: Water reservoirs of Georgia

River basin	Number of canal	Surface area (ha)	Water volume (m^3)
Black Sea river basins system			
Inguri	3	3 510	2 293 680 000
Lajanuri	1	180	39 000 000
Rioni	4	3 092	240 150 000
Black Sea total	**8**	**6 782**	**2 572 830 000**
Caspian Sea river basins system			
Aragvi	1	1 150	713 000 000
Dmanisi	1	200	11 000
Khrami	1	2 770	284 805 000
Mash Vera	1	620	57 800 000
Mtkvari (Kura)	9	11 225	5 904 690 000
Patara Liakhvi	2	175	42 050 000
Caspian Sea total	**15**	**16 140**	**7 013 445 000**
No information			
No information	14	2 903	614 840 000
Grand total	**37**	**25 825**	**10 201 115 000**

Source: Unpublished survey of Khavtasi, Makarova and Lomashvili, 2008

Table 9: Altitude of the location of water reservoirs in Georgia

Range of altitude	Number of reservoirs	Total Area (ha)	Water Volume (m^3)
No information	28	9 513	3 223 650 000
500–1 000 m	3	6 160	1 464 350 000
1 000–1 500 m	5	6 782	2 436 615 000
1 500–2 000 m	1	3 370	3 076 500 000
Grand total	**37**	**25 825**	**10 201 115 000**

Source: Unpublished survey of Khavtasi and Makarova, 2008

The major factors affecting the quality of ground waters are the use of chemicals in agriculture and the industrial pollution. Reports account for about 500 locations where underground water pollutions were diagnosed.

At present, underground waters are used in smaller quantities for irrigation and thermal waters for central heating in major towns. Currently, thermal waters are not used in aquaculture.

2.4.3 Fish farms

There are rather contradictory data available about the physical state, number and total area of fish farms of Georgia. Almost all related reports agree that the physical state of the farms is rather poor owing to the lack of investments in maintenance and development which are explained by the shortage of financial resources and management skills of new owners.

Regarding the actual number and the total area of fish farms, statistics show significant differences between present and earlier data. According to current statistics, there are 41 fish farms in the country covering a total area of 2 450 ha (see the summary in Table 10 and details in Tables 2.8 and 2.9 in Annex 2). In 2006 FAO reported a total of 86 fish farms, out of which 6 were specialized in fish propagation. The total area of

fish farms was about 3 162 ha. The significant difference may derive from the simple fact that earlier statistics also included some lakes and reservoirs where culture based fisheries were carried out.

Abandoned trout fish farm on River Iori (Photo by A. Woynarovich)

Abandoned sturgeon fish farm on River Rioni (Photo by J.R. Sullivan)

One of the still operating carp fish farms (Photo by A. Woynarovich)

Table 10: Number and area of fish farms of Georgia in 2008

Region	Number of farms	Pond area (ha)	Tank area (m^2)
Guria	2	215	-
Imereti	13	357	3 000
Kacheti	11	721	3 200
Kvemo Kartli	1	450	-
Mtskheta-Mtianeti	3	26	1 500
Samtskhe-Javakheti	2	11	-
Samegrelo Zemo Svaneti	5	665	-
Shida Kartli	4	5	15 800
Grand total	**41**	**2 450**	**23 500**

Source: A. Phartsvania, 2008

In 2005 there were some 50 unregistered small water-bodies throughout the country which were also used for extensive aquaculture (Van Anrooy, Mena Millar, Spreij, 2006). There is no reason to assume that this situation has basically changed since then.

2.5 Fishes of Georgia

In the course of the last decades, Georgian ichthyologist, Marina Khavtasi at the Ministry of the Environment Protection and Natural Resources prepared a very detailed inventory of Georgian marine and freshwater fish species and their habitats. This list of fishes with their habitats was consolidated into an Excel database together with the relevant information from FishBase. This combined Excel database served as source of information for the present section and is also attached in Annex 2. (More details of the database are discussed in Box 3.)

Fish species of marine waters

Various data are available about the marine fish species in Georgia. According to FishBase there are 48 species, while national specialists list 75 species living in Georgian waters of the Black Sea. Interestingly enough, there are only 16 species that are included in both of the registers (see details in Table 2.10).

The most important species of Black Sea fishes are anchovy (3 species), sprats (2 species), whiting, spiny dogfish, scads, pickerel, red mullet and mullet.

From a commercial point of view, Black Sea's fisheries have deteriorated dramatically in the last 30 years. During this period the diversity of caught commercial fish decreased from about 26 species to some 6

percent. However, the volume of captured fish increased, despite a near collapse in 1990, but this was almost entirely owing to the large anchovy fishery of Turkey (Mee, 2008).

The predatory sea snail Rapana (*Rapana thomasiana*) arrived into the Black Sea from waters around Japan in the mid-1940s, since then they live on the beds of Black Sea oysters (Mee, 2008).

Fish species of inland waters

The inland waters of Georgia are rich in fish species. Surveys conducted in some of the main inland waters prove that many different species occupy many different ecological niches of the rivers (Table 11).

According to the FishBase, there are 76 freshwater fish species, while national specialists list less, only 68, species living in Georgian inland waters. Out of them 26 species are mentioned by both sources of information (see Table 2.10).

Box 3: Database of Georgian fish species

In relation to fisheries and environment (biodiversity, conservation etc.) there is a constant need for specific analyses and reports in which fish species and their habitats are referred to and grouped according to the specific objective of the document. One of the most obvious aims of developing a fish species database is to spare time and energy when analyses and reports need to be prepared. The main objective of a database of fish species and their habitats should serve as an electronic tool that facilitates an easy and highly professional monitoring of various waters and their fish fauna.

The basic framework of the database had been set up by Ms Marina Khavtasi. It was later improved by the inclusion of several additional features (Environment, Class, Order, Family, Name of Species*, Type and Name of Habitat, Status, IUCN Status and Source). Accordingly, the complete database can be divided into two separate lists:

- A list of fish species with indications on their Environment (Marine and Freshwater), Status (Endemic, Native and Introduced) and IUCN status (Evaluated/Not evaluated, Adequate Data/Data Deficient, Extinct, Critically endangered, Endangered, Vulnerable, Near Threatened and Least Concern).
- An actual list of fish species and the names of those water-bodies where they are to be found.

For the time being only the main marine and inland water habitats are included in the database but in the future the list can be completed with fishes of less frequented territories of the Black Sea and smaller rivers, lakes and reservoirs, as well as with the list of fishes in permanent irrigation canals.

* Latin, English and Georgian names

Without doubt, the most internationally and locally valued freshwater fish species are the sturgeons. Out of the listed seven sturgeons five are considered endangered (*Acipenser guldenstaedtii Colchicus, Acipenser nudiventris, Acipenser stellatus, Acipenser sturio and Huso huso*).

The next group of highly valued fish species is the salmonids which also includes the Black Sea salmon (*Salmo labrax* or *Salmo trutta labrax*) and some local and introduced species.

Although cyprinids, such as common carp, Chinese major carps (grass, silver and bighead carps) and khramuli (*Varicorhinus capoeta*) are less valued than the salmonids, still they are the species that could provide the major part of fish catches in most of the Georgian inland waters and fish ponds. Out of them khramuli is an important native species of the region. The role of this fish among the cyprinids could be increased because of its food spectrum and feeding habit.

The most important freshwater predator fish species in Georgia are the European catfish (*Silurus oxglanis*), pikeperch (*Stizostedion lucioperca*) and pike (*Esox lucius*). They are not only highly valued species, but also important constituents of fish stocks in natural waters and in the polyculture of fish farms.

Freshwater crayfish is an important aquatic organism of the region. Their production in the neighbouring Turkey and Armenia is considerable. The most frequently produced two species are the noble or broad-

finger crayfish (*Astacus astacus*) and Galician crayfish (*Astacus leptodactylus*). Their wider production could be considered in the suitable natural waters of Georgia, as well.

Table 11: Number of recorded fish species in the most important waters of Georgia

Name of habitat or water-body	Total of surveyed fish species
Marine waters	
Open waters	12
Coastal waters	39
Coastline Batumi	17
Coastline Sokhumi	12
Rivers	
Rioni	30
Inguri	24
Mtkvari	23
Supsa	21
Khobi	19
Alazani	18
Iori	15
Chorokhi	13
Khrami	13
Kodori	13
Churia	12
Tikori	9
Aragvi	8
Liakhvi	7
Bzipi	6
Ksani	6
Gumista	5
Kintrishi	5
Natanebi	5
Lakes	
Paliastomi	26
Jandari	19
Bebesiri	11
Inkiti	7
Saghamo	7
Nuria	6
Tabatskuri	6
Japana	5
Paravani	5
Reservoirs	
Tbilisi	14
Sioni	6

Source: M. Khavtasi, 2008

There are a number of endangered native fish species which are significant from biodiversity and conservation points of view. Hence, the culture based support of their stocks in natural waters should be reintroduced and strengthened to upgrade their importance among the produced fish species.

3. PRESENT STATUS OF FISHERIES AND AQUACULTURE PRODUCTION

Restoration of independence in 1991 found the country in a difficult economic and social situation. The lack of financial resources held back by inflexible banking and credit policies, as well as the lost former markets together caused an extremely negative impact on the economy in general and on the fishery sector in particular.

3.1 Marine capture fishery

The most important ports for the Georgian fisheries fleet are Poti and Batumi. The main resource is anchovy. The yearly anchovy quota is 60 000 tonnes which the Georgian small and old fishing fleet (mainly pelagic trawlers) does not have the capacity to utilize.

In 1996, the Black Sea Environment Programme (BSEP) made a survey of fishing activities in the Black Sea. The survey which covered the period of 1975–1995, aimed at providing a reliable database for supporting science-based sustainable fisheries management. The collected data were simple and the survey quantified the major trends in fisheries. One of the interesting conclusion of the survey was that the total Black Sea landings declined from 850 000 to 250 000 tonnes (by 70 percent) between 1980 and 1991. Then it doubled to 517 000 tonnes by 1995. However, the economic return did not recover because the main improvement was in the low-value anchovy stocks. At the same time, higher valued species remained depressed or continued to decline. Although statistics could not quantify factors such as illegal fishing and use of inappropriate gears for catching fish before their reproductive size, they were also causes of the decline (Mee, 1995).

In former socialist countries fishing fleets also shrank considerably. In Georgia the fleet virtually disappeared but Ukraine, Romania and Bulgaria also faced serious difficulties in adjusting to market economy. In addition, anchovy population moved to the Turkish coast (Mee, 1995).

Table 12: Results of Georgian marine fisheries between 1991 and 2004

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Tonnes													
58 054	37 910	17 691	7 397	3 470	2 447	2 582	2 997	1 396	1,769	1 628	1 801	3 267	2 900

Source: FISHSTAT, 2008

In the early 1990s most of the ocean-going fishing fleets were sold to Ukraine and even the remaining vessels could not be operated properly because of the lack of gears, equipment and fuel. Therefore, the yearly catches dropped from about 60 000 tonnes to about 1 400 tonnes by the late 1990s.

During this period not only Georgia struggled with decreased catches. The production of other Black Sea countries also reduced. Turkey was the first one to recover and increased its catches to above 250 000 tonnes. Other Black Sea countries remained below 50 000 tonnes with exception of only the Ukrainian fleet which could produce again its earlier higher results (Mee, 1995).

In 2005, the marine fleet of Georgia consisted of 36 seiners with a power ranging between 110 and 225 HP. Mainly purse-seine and trawl nets were used for catching anchovy. The vessels built in Soviet times lacked maintenance and modernization. In addition to the seiners there were 342 small-scale fishing boats most of them motorized wooden ones for coastal capture fisheries. They were equipped with 103 seine nets, 324 gillnets, 12 bottom liners, 26 cast nets and 100 fishing rods (Van Anrooy, Mena Millar, Spreij, 2006).

Today all fishing licences are in Georgian hands. In 2006, four big licences had been issued for 10 years. They were later split into seven. The total fee was 8 million Lari (around US$5 million). At present the

Georgian enterprises are permitted to hire a fixed number of foreign fishing ships with no restriction on vessel size to help catch the yearly quota. As a result, in 2009 some 20 large Turkish seiners supported by 20 Turkish catch transport ships were fishing for the Georgian licence holders. The Turkish seiners were paid in fish. The native Georgian fleet can not survive in this competition and is facing deep crisis. In an attempt to solve the problem frequent meetings are called with the Government and independent foreign vessels are no more allowed to fish in Georgian waters.

It should be noted, that the hired Turkish seiners manage a surprisingly high standard of discipline, hygiene, ship and catch handling and many of the captains are also owners of their ship. The Georgian fleet could learn a lot from the Turkish seiners.

Box 4: Some fishing facts for consideration

A small Batumi trawler catches 3–4 tonnes per day. A Georgian hired Turkish seiner catches 300–500 tonnes of anchovy per day and sometimes even 1 000 tonnes. Thus, 20 Turkish seiners would catch 6 000–10 000 tonnes per day. The anchovy season begins in mid-November and lasts until 1 April, but the Turkish seiners might start fishing in Georgian waters only on 1 January. Taking a low estimate of 20 fishing days per month, the Turkish hired fleet would have a capacity to catch from 120 000 to 200 000 tonnes of anchovy per month, compared with a yearly total quota of 60 000 tonnes. The official reported total catch of the year 2008 was 35 000 tonnes.

The big licence holders are obliged to have two thirds of the catch processed in Georgia and are allowed to export (to Turkey) one third unprocessed. This restriction is managed by freezing the catch which is interpreted by the licence holders as processing, and then the frozen catch is exported.

In Poti there are 26 Georgian vessels, 20 being operational. In Batumi there are 17 Georgian small vessels of which 10 are operational. The trawlers visited in Batumi were all rigged with bottom trawl. Bottom trawl is illegal. In Poti all trawlers observed were rigged with legal pelagic trawls for anchovy. One of the main problems for the fishing industry is the unavailability of the necessary loans. Banks are not motivated to lend to the fishing industry. Therefore, the Georgian fleet mainly uses trawls because investment in purse seines for anchovy cannot be made without loans. Purse seines, however, are more feasible for anchovy fishing than pelagic trawls.

The Georgian Black Sea coast is considered by experts as an important naturally occurring habitat for the Acinepseridae (sturgeon) species which includes the following: Beluga, Russian Sturgeon, Ship Sturgeon, Star Sturgeon and the Atlantic Sturgeon. A nine kilometres long zone in connection to Kolkhety National Park is a closed sturgeon breeding area. As mentioned above, licence holders demand to enter this zone because of declining catches outside. In addition, illegal fishing also occurs in this zone and the Georgian inspection is weak. Furthermore, illegal fishing by foreign vessels is also happening in Georgian territorial waters. A Vessel Monitoring System (VMS) is in use but it is not efficient enough.

Compared with the fleet in Poti, the fishing fleet of Batumi consists, with some exceptions, of smaller and more primitive vessels. Batumi has two harbours sold to private owners. The harbours are now managed as recreational harbours for yachting. As a result, the fishing fleet has no commercial harbour or landing facilities. Fishing vessels are only allowed to stay in the harbours out of the yachting season and at the mercy of the owners. In addition to the lack of loan-possibilities fishermen suffer from high import taxes on spare parts for engines and equipment. It is generally stated by the semi-industrial Georgian fleet, that anchovy fishing is hopeless after the Turkish seiners' presence on the fishing ground.

The Conventional Inspection under IEPD (Inspection of the Environment and Protection Department) at the Ministry of Environment Protection and Natural Resources) concerned with the implementation of the provision of Bukharest Convention. This includes the inspection of potential polluting industries including the oil terminals of Batumi which have drawn high political and international attention probably because of the proximity of the famous tourist beaches. It should be noted that the relevant inspection of Turkish vessels and the stored catches require the relevant experience and knowledge form the inspection side.

At the time of writing this review, the inspection fleet counted 3 vessels. One of them is old, 10 m long vessel with the speed maximum 11 knots. Besides it there are two vessels in Poti. One of them is quite old, 13 m long with the speed 25 knots. Another one is new, 8, 5 m long vessel with the speed 33–35 knots.

3.2 Inland capture fisheries and aquaculture

No official statistical data and information on inland fisheries and aquaculture were collected in the country during the period of 1991–2005. It is widely agreed that the privatization of fish farms, selected lakes and water reservoirs was not very successful. Some of the new owners have not been able to manage their properties properly. The missing capability and competence combined with the lack of financial resources caused deterioration of hatcheries, ponds, concrete structures and machinery, as well as gears and equipment. Several fish farms reduced or even stopped production and, in extreme cases, some of them were transformed into agricultural land. On the other hand some small-scale fish farms survived and new private large-scale farms were established in the meantime (Van Anrooy, Mena Millar, Spreij, 2006).

The performance of inland fisheries and aquaculture sector showed a considerable fluctuation within the period of 1991–2004. The annual freshwater fish production changed between a wide range of 50 and 3 300 tonnes, while the average yearly reported quantities of fish produced in inland capture fishery and aquaculture varied between 460 and 380 tonnes (see Table 4.1 in Annex 4).

Inland capture fisheries

Current practices followed in inland capture fisheries should be built upon experiences gained in fisheries management of natural waters and their culture based fisheries. Unfortunately, efficient inland fisheries management practices developed and followed during the 1980s did not continue after independence in Georgia.

Box 5: List of water-bodies and captured fish species during MEFRI's inland capture fisheries survey in 2003 and 2004

Water-bodies: Lake **Paravani**, **Khrami** reservoir, Lake **Kartsakhi**, Lake **Tabatskuri**, **Sioni** reservoir, Lake **Jandari**, **Tkibuli** reservoir, **Shaori** reservoir and Lake **Saghamo**

Fish species: Lake trout (*Salmo trutta caspius lacustris*), **Romanov lake trout** (*Salmo trutta caspius romanovi*), **common carp** (*Cyprinus carpio*), **chub** (*Leuciscus cephalus orientalis*), **crucian carp** (*Carassius carassius*), **silver carp** (*Hypophthalmichthys molitrix*), **bighead carp** (*Aristichthys nobilis*), **barbels** (*Barbus tauricus escherichi, Barbus capito and Barbus lacerta cyri*) and **whitefish** such as **vendace** (*Coregonus albula*), **ripus** (*Ladoguri ripusi*)

Source: Van Anrooy, Mena Millar, Spreij 2006

Statistical data on inland capture fishery shows a sharp drop by the 1990s. Then by the years of 2000 the yearly results consolidated at about 50 tonnes (see table 4.4 in Annex 4). The production data of two well monitored rivers of Georgia, Alazani and Mtkvari, are very good examples which show that during the years of 1990s the yearly fish catches fell to one-half (2.5 tonnes) and to the two-thirds (9.4 tonnes) respectively.

As far as still waters are concerned, the Marine Ecology and Fisheries Research Institute (MEFRI) completed an inland fisheries survey in a total area of 15 772 ha of the 9 selected lakes and water reservoirs listed in Box 5. The total production of these water-bodies varied between 350 tonnes (22.2 kg/ha) and 400 tonnes (25.4 kg/ha) in 2003 and 2004. The low results were explained, among others, by the irregular and insufficient restocking because the owners or operators could not afford to purchase and stock fingerlings.

According to local opinions the decline of the production of inland waters is rooted in a very characteristic feature of the fisheries management of inland waters in Georgia: the irregular, ad-hoc stocking. Waters are nearly overstocked with fry at the beginning of the leasing periods, but are also fully harvested within the same lease when the stocking occurred. This greatly contributes to the decreasing production and the annual fluctuations equally. Even well managed water-bodies frequented by the public, like the Tbilisi reservoir, produce 20 percent less than they did before.

Pond culture

The official register of the Ministry of Agriculture (MOF) includes 84 inland water-bodies (ponds, lakes and reservoirs) which were used for fisheries and aquaculture purposes in the first half of the 2000s.

Box 6: Main fish culture systems

Culture based fisheries: It is one of the simplest aquaculture activities, when planned stocking of young fish ensures both the required quantity and quality of fish production in a larger water-body.

Pond culture: In case of pond culture fishes and their natural foods are produced in the same place. In order to utilize all the fish food producing niches of a pond, not only the natural fish food production capacity of the water is increased but also several different age groups and species are cultured together in polyculture. The advantage of this culture system is that the usually expensive protein of the fish diet can be produced from farm wastes such as manure. Accordingly, only inexpensive supplementary feeding is needed on top of manuring/fertilization when higher yields are expected. It is a general rule that the more fish species are cultured together the more fish can be produced in the same pond.

The needed water quality in the pond is maintained by carefully balanced fish stock of different fish species, manuring and supplementary feeding. As production intensifies improvement of water quality has to be ensured by appropriate aeration of water.

Pen culture: It is a special combination of fisheries management of natural waters and pond fish culture. A smaller enclosure is made by netting in a bigger natural water-body where a fish stock of controlled quantity is produced with supplementary feeding.

Tank culture: The special feature of tank culture is that the fish and its food are produced separately. The tank, regardless of its size and material (earth, concrete etc.), provides only for good quality water, rich in dissolved oxygen and free of harmful solid or gaseous materials produced during the respiratory and metabolic processes. Therefore, the used feeds have to be biologically complete diet. It means that the feed contains all the needed quantity and quality of protein, carbohydrate, energy, vitamins and minerals.

The required water quality in the tank is ensured by partial or total exchange of water with fresh or/and mechanically, chemically and biologically cleaned and refreshed recycled water.

Cage culture: In principle, it is a special type of tank culture. Fish in the cage has to be fed with biologically complete diet and the needed water quality is ensured by continuous exchange of water in the cage which is naturally ensured in rivers, lakes and in the seas.

Production results in ponds and pens are calculated in unit area (number of fish/ha and kg/ha). Production results in tanks and cages are calculated in unit volume (number of fish/m^3 and kg/ m^3).

Around 2005, the total area of ponds, lakes and reservoirs where culture based fishery or aquaculture were practised was about 3 200 ha. The total yearly production in these waters was about 1 000 tonnes (312 kg/ha). Out of the produced species common carp represented 60 percent while Chinese major carps contributed to the total production by about 25 percent (Van Anrooy, Mena Millar, Spreij, 2006). The total pond area given above includes some minor reservoirs of a few hundred hectares that are also called ponds in Georgia. Production in the latter is low.

The fish pond production is low and not improving. Recent estimations suggest that the yearly fish production of pond per unit area fell by almost 50 percent by the second half of the 2000s.

According to earlier reports, in the early 2000s at least 6 hatcheries reproduced a wide range of species, including common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), barb (*Varicorhinus capoeta*), crucian carp (*Carassius carassius*) and European catfish (*Silurus glanis*). By today there are only two fish farms where fry and fingerling of the above listed species are produced.

Fry and fingerling of carps and other species produced in Georgia are generally considered of poor quality. This, however, can not be proved until the production conditions, where fry and fingerlings are actually raised, are improved substantially. As soon as poor production conditions are excluded as possible cause of low survival rates and slow growth of the different fish species in general and of common carp and trout in particular, the introduction of genetically improved strains of common carp and trout will be justified.

Tank culture

In addition to pond fish farms some 25 registered and 10 unregistered trout farms were recorded as active, operating units in the period of 1991–2004. The total annual production of these 35 trout farms was estimated to be around 120 tonnes (Van Anrooy, Mena Millar, Spreij, 2006).

At present much less, about eight, trout farms are known as still active. Due to different reasons, including the conflicts in 2008, the rest of the farms are not operating. According to earlier findings of FAO, approximately 70 percent of the trout egg, fry and fingerling are produced in Georgia and the rest is imported from Armenia and Turkey.

Table 13: Estimated present production of different fish culture systems in Georgia

Produced fishes	No.	Area		Production per farm		Production per unit area		
		Ponds (ha)	Tanks (m^2)	Fingerling (No./yr.)	Table fish (kg/yr.)	Fingerling (No./ha)	Table fish (kg/ha)	Table fish (kg/m^3)
Pond culture								
Carp	26	2 219	-	950 000	378 000	428	170	-
Carp, catfish	1	70	-	-	14 000	-	200	-
Sturgeon	1	35	-	-	7 000	-	200	-
Sturgeon, carp, catfish	1	100	-	-	-	-	-	-
Trout, carps	4	23	3 000	-	18 000	-	793	6.0
Pond culture total	**33**	**2 447**	**3 000**	**950 000**	**417 000**	**428**	**170**	**-**
Tank culture								
Trout	8	3	20 500	-	49 000			2.4
Tank culture total	**8**	**3**	**20 500**	**-**	**49 000**			2.4
Grand total	**41**	**2 450**	**23 500**	**950 000**	**466 000**			**-**

Source: A. Phartsvania, 2008

The lack of good quality feed for trout culture at an affordable price is still one of the main obstacles of the development of the sub-sector. There are four companies which import feeds from Western Europe. Their prices, due to the long distance and small quantities, are obviously rather high (see Table 3.8 in Annex 3). Normally, fishmeal, one of the most important ingredients of trout feed, is imported mainly from Turkey and Denmark. This makes the local production of fish feed so expensive that the import of commercial feeds remains competitive.

Cage culture

No such fish culture system is currently practised in Georgia.

3.3 Recreational fisheries

Recreational fisheries or amateur fishing is an increasingly important category of fisheries worldwide. Amateur fishing is a widespread activity throughout Georgia too, and amateur fishers are apparently well equipped.

In many countries it is free of charge to catch fish in public waters for own consumption within the open seasons. In other countries certain fees should be paid by anglers, for which they are allowed to catch a certain quantity of fish daily. Georgia belongs to those countries which do not charge any fee for amateur fishing. However, they are obliged to follow the rules of fishery and protection of fish stock set out in Order

No. 512 of MEPNR which also regulates amateur and sport fishing. Some of the owners and leaseholders of water-bodies provide for fee fishing services. They sell daily permits for about GEL 3 which was about US$4 in 2008.

In theory, amateur fishers are obliged to keep a logbook of their catches, but this is hardly observed. Therefore, no statistical data are available on the quantity of fish caught annually by them. As the number of sport fishers is rather high the annually captured quantity of fish may be several hundred tonnes.

3.4 Facilitating industries

Industries facilitating fish production did not develop in Georgia during the Soviet period. Such industries were centrally promoted in other republics of the former Union of the Soviet Socialist Republic (USSR). Hence very few companies produced or traded fishing gears or icing and freezing equipment. Shipyards constructing modern fishing vessels were non-existent. This also explains the fairly limited support provided by the facilitating industries to aquaculture.

One of the many amateur fishers in Tbilisi (Photo by A. Woynarovich)

Restrictions on the size of captured fish are not always observed (Photo by A. Woynarovich)

The lack of financial resources generates interests toward purchasing second hand vehicles, machineries and equipment. Because of lack of capital for buying new boats or engines, it is a common practice that “new” boats or engines are “assembled” from broken or entirely wrecked ones. This need-based recycling of useable materials is even beneficial but authorities often find it problematic to license such old/new boats or engines (Mathews, 2007).

4. STATUS OF PROCESSING AND TRADING OF FISH AND FISH PRODUCTS

4.1 Fish processing and storage

In general, there are cold storage facilities in all major towns. They are not specialized in fish but accept any food items which need cooling.

The formerly well developed processing industry disappeared by the 2000s. Two processing factories were planned to restart in 2005 to produce anchovy flour and oil (Van Anrooy, Mena Millar, Spreij, 2006). However, only one has started production so far. Therefore, it is in a monopolistic position of one of the four big anchovy fishing companies which is the owner (C.P. Mathews, 2007).

At the present visit related to this report, two freezing plants, a fishmeal plant and a fish smoking plant, operate in Poti. They were the “Paliastomi 2004 Ltd -company”, “Black Sea Products” and “Alliance Ltd.” All these industries seemed well managed and despite many problems in connection with export, certification procedures, and conflicts between Georgian and the hired Turkish vessels and lack of political priority for the fishing sector, there is a lot of optimism and expansion plans for the future. Paliastomi in

particular was very well managed and firmly rooted in the import and export of fish and fish products. They had just bought a Turkish seiner thus showing the way the Georgian industry must go. It should gradually take over the fishing capacity by Georgian owned modern and more cost effective fishing vessels. Apparently, larger companies do have accumulated capital which will enable them to invest in new ships and factories.

In comparison with the annual catch, the Georgian processing capacity is very small and most of the catch is exported unprocessed to Turkey that has much better access to the world market than Georgia. The domestic market is not at all saturated but this market would probably require a higher quality of processed fish. Even high value big sturgeon is imported for the only considerable home market place in Tbilisi.

A unanimous and strong need for FAO assistance in obtaining the necessary certification of fresh fish and fish products for selling in the EU market was expressed by all factories. Obviously, the certification procedure should be prepared by the Ministry of Agriculture (MOA) but the political will does not seem strong enough in that respect. In early 2009 the Chief of Marketing Department of MOA was working on an application to EU for certification of fresh fish and fish products to its market.

4.2 Distribution and marketing of fish and fish products

It is estimated that about 100 intermediaries are involved in the wholesale activities and transport of less valued fishes and fish products. More expensive fishery products, such as sturgeon, salmon and trout are often sold directly to restaurants.

One of the live fish stores and distribution enterprises near Tbilisi (Photos by A. Woynarovich)

There are specialized fish markets and sections/departments of larger food markets designated for the sale of fish in every major city in Georgia. Some of the fish markets are privately owned while others are owned, managed and maintained by community/city authorities (Van Anrooy, Mena Millar, Spreij, 2006).

Though Tbilisi is well supplied with fish retailers, in rural areas the formal retail channels are reduced considerably after independence which has made it more feasible for small-scale artisan and poorer amateur fishers to sell part of their catch at the roadside.

4.3 Fish trade

Most of the imported fish products come from Armenia (fresh, salted, frozen and smoked trout), Azerbaijan (frozen and smoked sturgeon) and Turkey (smoked mackerel and bonito). Government statistics presented in Table 4.2 show that about 22 600 tonnes of fish and fish products were imported in 2007, representing a total value of GEL 46 907 000 (US$33 991 000). Within the total import, frozen fish was the far most important item standing for 75 percent. The export of fish and fish products was much less, only 2 514 tonnes (GEL 2 423 000) in 2007 which is about 11 percent of the import. However today the major part of the (lower value) anchovy catch is exported to Turkey unprocessed.

4.4 Fish demand and consumption

The consumption pattern of fish and fish products in Georgia is similar to that in other countries of the region. People living close to the sea or waters rich in fish, consume much more fish by tradition than in

other areas of the country. Georgia's fish consumption strengthens international experiences: differences between regions within the same county can be manifold.

During the 1980s the average yearly per capita fish consumption was 19 kg which reduced considerably after independence. In the 1990s the yearly per capita consumption was reported only 7 kg. Other sources estimate that, after independence, the yearly consumption of fishery products fell to as low as 2 kg (live-weight equivalent) per capita. According to the survey of MEFRI completed in 2005, the yearly demand for fishery products was estimated as much as 30–35 kg per capita (Van Anrooy, Mena Millar, Spreij, 2006).

Table 14: Average off-vessel and off-farm prices of main fish species in 2004

Products	USD/kg		
	Minimum	Average	Maximum
Black Sea salmon		8	
Trout		3.00	
Sturgeon		12.50	
Gobies		1.00	
Common carp	1.00	1.50	3.50
Chinese major carps	1.00	1.50	3.50
Seabream		1.00	
Turbot		7.50	
Black Sea whiting		1.00	
Anchovy		0.15	
Mullet (small)		1.00	
Mullet (large)		1.50	
Spiny dogfish		1.25	
Sprats		0.20	
Shad		1.25	

Source: Van Anrooy, Mena Millar, Spreij 2006

Between 2001 and 2007, the yearly per capita consumption of fish and fish products reduced from 5 kg to 3.8 kg (Table 4.5 in Annex 4). The data of fish demand and consumption are even more confusing if it is considered that the import of fish and fish products was reported about 4.9 kg per capita in 2007.

During the last couple of years the prices of fish, as shown in Table 14 and detailed in Table 3.9 in Annex 3, did not change considerably.

5. GOVERNANCE AND INSTITUTIONAL FRAMEWORKS

5.1 Fisheries administration

In 1994 all fisheries affairs were transferred from the Ministry of Agriculture (MOA) to the Ministry of Environment Protection and Natural Resources (MEPNR). The change was made in order to benefit from synergies in management of biodiversity, fisheries, species introduced, pollution, environmental degradation and other environmental matters that influence fisheries. Responsibilities for post harvest and marketing issues remained at the MOA which included food safety, veterinary, hygiene and quality control in the fishery and aquaculture sector.

The fisheries related departments in the MEPNR are the Biodiversity Protection Service (BPS), the Centre for Statistics Monitoring and Prognostication (CSMP), the Licensing and Permitting Department (LPD) and the Inspection of the Environment and Protection Department (IEPD).

Box 7: The role of fisheries related departments in MEPNR

BPS identifies:
- Sustainable limits to production, maximum effort and gear type allowed
- Sustainable biodiversity levels and risks from overfishing and the introduction of new species
- Maximum tolerable pollution level in each habitat

CSMP:
- Assesses fish stock and fisheries
- Identifies sustainable catch and effort levels and allowable kinds of gear
- Evaluates biodiversity and pollution levels
- Collects necessary statistics
- Provides for pollution and other data

Department of Licences (Ministry of Economic Development)
- Implements the competitive bidding system and should fix TACs at sustainable level determined by BSP

IEPD:
- Acts in implementing Licensing Law

5.2 Fisheries and aquaculture education, training, extension and research

No formal inland fisheries or aquaculture education and training exist in Georgia. To fulfil the gap professionals, specialized in fisheries and aquaculture, give lectures at the university. Vocational education, adult and community training on fisheries management and aquaculture are also non existent. Training facilities, as well as extension and training materials for interested entrepreneurs are also missing.

The marine fisheries related research tasks are covered by MEFRI and, as it was referred to earlier in this report, this institute is also involved in inland fisheries related research. The Institute of Zoology of the Georgian Academy of Sciences also carries out scientific research in Georgian inland waters to determine their hydrobiological resources and study their fish fauna.

Post graduate education (M.Sc. and Ph.D.) of young professionals and scientists abroad is very occasional, because it is difficult to find financing donor institutions and projects.

5.3 Fisheries and aquaculture statistics

Within MEPNR Environmental Inspectorate is responsible for collecting data on marine fisheries including landings and effort data. The disadvantage of the present system is that only those fish species are reported for which licence was issued. Therefore, data collection should be complemented with adequate quantity and quality of samplings.

The structure is responsible for collecting the data of inland fisheries and aquaculture. However, due to the fact that inland fisheries and aquaculture were considered of low importance, the statistical system currently in use is also underdeveloped in Georgia. Recently a GTZ (German Society for Technical Cooperation) supported environment monitoring project at the MEPNR is developing a set of key statistical indicators. Regarding fisheries, only one indicator, namely the “Changes in the total rate of fish catches” has been defined and included in the set so far.

Unfortunately, statistical data on fishing in water reservoirs during the last 10–15 years are either unavailable or very poor. Some remote attempts to collect information in this field have been carried out but the lack of financial resources does not allow conducting long term assessments. Another problem is that different sources provide different information on the same reservoir which makes a reliable analysis of statistics rather complicated. As a result, often superficial or incorrect information is disseminated. It is also difficult to obtain information from newly launched fish farms because Georgian legislation does not oblige them to provide statistical information. Nevertheless, collection and processing of statistical data of inland fisheries and aquaculture have several good and applicable examples as well, in which empirical stock assessments play a key role.

5.4 Institutions of fisheries and aquaculture

The most important institutions of marine fisheries are:
- Georgian Trade Union of Fishers
- Georgian Fishers' Cooperative Union
- Fisher's Association of Poti
- Fisher's Association of Batumi

The most important institutions of inland fisheries and aquaculture are:
- Union for the Rehabilitation and Restocking of the Ichthyofauna of Georgia (URRIG)
- Georgia Union of Ichthyologists
- International Association of the Fishing Industry of Inland Waters and Aquaculture of Georgia

According to FAO's assessment, the unions, cooperatives and other associations should be developed and strengthened so that they are able to defend the interests of their members and attract resources for the social development of their communities. They should also collaborate with government institutions and organizations concerned. These institutions should also be enabled to cooperate with the fishery administration through providing data and information, participating in policymaking decisions and supporting fisheries management and resource conservation. Research institutions with a capacity to work on fishery issues should be able to carry out fishery research, according to the needs of the sector (Van Anrooy, Mena Millar, Spreij, 2006). These proposals are still valid and timely.

5.5 International cooperation in fisheries and aquaculture development and management

Georgia is signatory of numerous international conventions and agreements on fisheries (see Table 4.9 in Annex 4). Apart from the obligations under the above-mentioned agreements, in 1997 the Government of Georgia decided to bring all existing and future legislation in harmony with the EU regulatory framework (Van Anrooy, Mena Millar, Spreij, 2006).

Georgia, as a member of the Food and Agriculture Organization of the United Nations (FAO), has agreed to the Code of Conduct for Responsible Fisheries. The Code is an influential non-binding or "soft law" instrument which sets out principles and international standards with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for ecosystems and biodiversity (Van Anrooy, Mena Millar, Spreij, 2006).

Georgia is not yet the member of a number of regional and international fisheries and aquaculture organizations listed in Table 4.10 in Annex 4, though intention to join had been shown on various occasions.

6. POLICY, REGULATORY AND MANAGEMENT FRAMEWORKS

6.1 Fisheries and aquaculture policies and planning

No national fishery sector policy existed in Georgia before 2005. Unfortunately, the Economic Development and Poverty Reduction Programme (EDPRP) of Georgia which provided an overall framework for national economic policy did not recognize fisheries as a priority sector. In 2005, the first Master Plan for Fishery Sector Development in Georgia was prepared, with FAO assistance, for the period of 2005–2020.

In 2007, C.P. Mathews, in his Fisheries Assessment, suggested a simple minimum fishery sector strategy for the period of 2007-2010. The latter proposed to maintain fisheries at 2007 level for the period of 2007-2010, until the first surveys of SAFMU (Stock Assessment and Fisheries Management Unit) established at MEPNR are completed. Strategy forecasts were then proposed to be reviewed and revised based on the SAMFU stock assessments.

6.2 Fisheries and aquaculture legal and regulatory framework

FAO reported in 2006 that the fishery and aquaculture sector was regulated by 21 laws and regulations (see Table 4.11 in Annex 4). In order to improve the legal and regulatory framework of the sector FAO provided technical assistance in developing a draft Law of Georgia on Fisheries and Aquaculture which was also published in FAO Fisheries Circular No. 1007 in 2006.

In the meantime, in response to the urgent need for guiding rules for fisheries, on 7 December 2005 MEPNR issued Order No. 512 which deals with all important aspects of fisheries. This Order guides marine and inland fisheries ever since, the key articles of which are summarized in Box 8.

Box 8: Key articles of Order No. 512 of MEPNR

- Definitions
- Field of operation of the rules of fishery and protection of fish stock
- Terms and places of prohibitions of fishing
- Species prohibited for fishing
- Means and gears prohibited for fishing
- Size of cells in fishing gears
- Minimal length of the fish allowed for catching
- Maximally allowable by-catch of the other maximally allowable fish species
- By-catch of other maximally allowable fish species
- The rule of insertion of the fishing gears in reservoirs
- Amateurish and sport fishery
- Requirements of fish protection in water-intake buildings
- Commercial journal

Source: C.P. Mathews, 2007

In his fisheries assessment C.P. Mathews made comments on Order No. 512 and recommended the preparation of a manual of biological illustrations and another one with illustrations and photos of fish species in order for the fishermen and enforcement officials to refer to them in case of doubt, disagreements or dispute. Considering that FAO has such publications (catalogues) they could be used also for these purposes as references.

6.3 Fisheries and aquaculture management

The management of the sector belongs to the MEPNR. Hence the various Departments of the Ministry listed in section 6.1 of this review are in charge of setting management plans, determining quotas, technical conditions of licences and supervising implementation of laws, rules and regulation.

Though the Ministry of Economic Development (MED) issues the licences, MEPNR, through its departments, is the responsible ministry for all other related issues. IEPD assists LPD in implementing licensing related laws in general and makes sure that all fishermen are properly licensed in particular. IEPD is also in charge of penalizing fishermen and confiscating nets for illegal fishing which term includes all actions that ignore or violate any rules, regulations and laws on fisheries.

In theory, the licensing procedure is well established. However its practical implementation still needs further enhancement, even if licensing requirements and procedures have been streamlined and have drastically improved since 2004. The licensing systems for fishing in marine and inland waters of the country are summarized in Tables 3.1, 3.2 and 3.3, while the aquaculture related licensing procedures are presented in Tables 3.4, 3.5 and 3.6 in Annex 3.

7. SOCIAL AND ECONOMIC ASPECTS OF FISHERIES AND AQUACULTUE

7.1 Employment in fisheries and aquaculture

Information about the number of people employed in the fishery sector is rather vague. Before independence the sector was reported to employ several thousands of persons which number has dropped sharply. According to FAO and other estimates, only 3 200 persons were employed in the fishery sector in 2004, as is shown in Table 15 below.

Table 15: Number of persons employed in the fishery sector in 2004

Employment field	Estimated number of persons in 2004
Marine fisheries	**1 800**
Marine fishing fleet	300
Coastal small-scale fishing	1 500
Amateur fishers	No information
Processing and marketing	**500**
Inland capture fisheries	**200**
Professional fishers	200
Amateur fishers	**No information**
Aquaculture	**400**
Administration and research	**100**
Administration	**No information**
Education	**No information**
Research	**No information**
Total	**3 200**

Source: Van Anrooy, Mena Millar, Spreij 2006 and Khavtasi 2008

7.2 Economics of fisheries and aquaculture

Fisheries and aquaculture related activities are not supported. Neither direct subsidies nor indirect support through reduced rates of income and import taxes or VATs on machinery, equipment and production materials is granted for the sector.

7.2.1 Economics of marine capture fisheries

The state treasury's revenue is ensured through the licensing system of different marine fisheries activities. The most important dues are the actual licence fees and the natural resource taxes (NRT). Licence fees are paid one time when the licence is obtained, while the NRTs are due according to the actual catch and their amount is GEL 25/tonne or US$14, 7/tonne (see Table 3.1, 3.2 and 3.3 in Annex 3).

In 2007, Mathews concluded that the bidding system for fishing licences favours non-Georgian capital over Georgian capital and the small Georgian fishers were unintentionally driven out from their own anchovy fishery. In addition the licensed marine fishers, regardless the scales of their activities, found the NRT high which, along with the increasing running costs, causes losses thus making their activities unprofitable.

7.2.2 Economics of inland capture fisheries

In general, inland fisheries production is a profitable activity if certain basic management rules are observed and followed. Hence the precondition for profitability is the correct management of fisheries including planned stocking (if applicable) and fishing.

The actual profitability of fisheries in the different types of waters may vary. The rhithron sections of rivers or oligotrophic lakes produce much less fish than the potamon river sections or eutrophic lakes. Both of the mentioned two groups of waters are frequent in Georgia. The first one in the mountainous regions, while the second one on the plains of the country.

In addition to planned fishing, the only other management option for increasing production of inland capture fisheries is the indirect and direct improvement of the quality and quantity of fish stocks. They can be achieved through the protection and maintenance of spawning grounds and the planned stocking of fish seed.

The above techniques are less effective in cold sections of rivers and in oligotrophic lakes than in those waters which warm up more and their fish food production capacities are high. In the first case the yearly production may come to about 3–7 kg/ha having a value of 25–100 GEL/ha, while in warm waters it will go up to several 10 kg of fish with a total value of about 150–500 GEL/ha. In addition, in warming up waters which are densely covered with aquatic vegetation the first years may produce even more than that (see Tables 16 and 17 and Tables 3.10 and 3.11 in Annex 3).

Table 16: Results of culture-based capture fisheries in warming up natural waters covered densely with water weeds (figures are rounded)

Annual results	kg/ha			Estimated GEL/ha		
	Min.	Avg.	Max.	Min.	Avg.	Max.
Year 1	30	40	50	105	180	275
Year 2	235	295	355	925	1 455	2 105
Year 3	455	570	685	1 850	2 915	4 220
After year 3	**60**	**80**	**100**	**290**	**490**	**740**

Table 17: Results of capture-based fisheries in warming up natural waters covered with a normal level of water weeds (figures are rounded)

Annual results	kg/ha			Estimated GEL/ha		
	Min.	Avg.	Max.	Min.	Avg.	Max.
Year 1	25	35	45	90	160	250
Year 2	30	40	50	110	185	280
Year 3	60	80	100	290	490	740
After year 3	**60**	**80**	**100**	**290**	**490**	**740**

7.2.3 Economics of aquaculture

There are many options of profitable production in aquaculture. They include fish propagation and fish seed or table fish production under various conditions ranging from extensive to highly intensive. In Georgia fish propagation, tank culture of trout and pond polyculture of carps and predator species are practised.

Under healthy economic conditions fish propagation is the most profitable fish culture activity. Although capital investment and running costs might be higher, the economic reward is ensured especially if it is combined with fry production.

Commercial feeds for trout are expensive in Georgia but the high price of trout (GEL 8–12/kg) ensures profitable production.

Pond fish culture could also generate significant profit. Cost and benefit calculations based on the main input and output items show that advanced fry production may generate several thousands of Laris within a few weeks. Considering that a pond can be used from two to four times during a production season the seed production of carps and selected predators (pike, pikeperch and European catfish) in ponds might be

regarded as one of the most profitable ones among the fish culture practices. At the actual prices, production of fingerlings (one summer old fish) and two summer old fish could also be profitable (see production options presented in Table 3.15 in Annex 3).

Table fish production in ponds has three basic options such as supplementary feed based, green feed based and only manure based production systems. Because all of them may be equally profitable, fish farmers with different physical and economic conditions can easily make their choice.

7.3 Credit and investment in fisheries and aquaculture

There is a two level banking system in Georgia, the National Bank of Georgia (NBG) and commercial banks (CBs). The NBG has a supervisory function over the CBs. CBs that do not meet the requirements established by the NBG lose their banking licence. The CBs provide institutional credit at a rather high (nowadays about 18–24 percent) interest rate. Most institutional credit is given for one to five years against substantial estate collateral (Van Anrooy, Mena Millar, Spreij, 2006).

The lack of flexibility in the Georgian banking system together with the relatively high interest rates on loans, as well as the current global financial crisis are the most frequent obstacles hindering access to credits needed for covering both fisheries investments and operations.

Non-institutional credits from fish merchants, professional moneylenders and boat owners are fairly limited and mainly intended for short-term to cover working capital requirements. In addition, most of the non-institutional credit arrangements have a number of disadvantages such as high costs and unfavourable terms and conditions attached to loans (Van Anrooy, Mena Millar, Spreij, 2006).

7.4 The role of fisheries and aquaculture in food security and poverty alleviation

It is unquestionable that fisheries and aquaculture have an important role to play in improving food security and reducing rural poverty. This particularly applies to Georgia where conditions for fisheries and aquaculture are extremely favourable. People like fish and fish products, but currently the major portion of the consumption is imported. Both marine and inland water resources are abundant in the country and rural people are lacking income generating activities. Hence, with good incentives, they could be motivated to start potentially profitable businesses in fisheries and aquaculture.

Efforts in inland fisheries and aquaculture may be financially rewarding. When initiatives are supported or even generated by local communities, the development of profitable fisheries and aquaculture activities on public waters can certainly be expected. To reach food security, identification and exploitation of the development potentials of fisheries and aquaculture are indispensable in Georgia.

8. DEVELOPMENT POTENTIALS IN THE FISHERY AND AQUACULTURE SECTOR

Georgia had a well developed fisheries and aquaculture sector in Soviet times. Still after regaining independence, the country has not yet been able to fully adjust to the changing economic and social conditions.

Fisheries and aquaculture resources of Georgia could support a much higher fish production and processing than the actual one. Fish production results of the distant and near past, presented in Table 4.1 in Annex 4, also indicate that there are huge potentials for quantitative and qualitative development of fish production in Georgia.

8.1 Development potentials of marine capture fisheries

Georgia has a large resource of high quality anchovy in the Black Sea which has a huge potential to create more revenue for the country. Most of the catch is transported directly unprocessed (or frozen) to Turkey by Turkish vessels. Turkey has modern, high standard fishing- and support vessels, a good foreign market access and a developed processing industry

The Georgian anchovy fleet needs severely upgrading to larger efficient purse seiners (and pelagic trawlers) with modern cold store and freezing capacity. This transformation has started and might continue slowly with the revenue generated in Georgian companies, but the process could be accelerated considerably by governmental intervention and incentives. There are not adequate facilities for investment loans for the fishing industry – little support for certifying Georgian fish products to foreign markets and insufficient support to monitoring, control and surveillance.

With an appropriate government plan to support the processing industry, there seems to be good potential for development of industries for canning, smoking and fresh fish for export and the home market. Also there is potential for development of high-quality fish meal plants, fish feed pellet production and pet food production. In order to cope with the seasonal nature of the major fisheries, increased energy efficient cold store facilities are needed to give a steady supply for the processing industry.

All resources, and the anchovy resource in particular, has recently shown large fluctuations and changes in spawning grounds, and the global warming is anticipated to enhance these effects. This makes it even more important to increase international cooperation and management of the resources in the Black Sea and to improve the stock assessment. This will secure a more sustainable utilization of the resources and a more steady supply to the factories and thus attract more investments.

Technical support is requested and needed for the processing industry in order to enter new international and national markets and simply to make the existing productions more up to date and feasible. Also workshops on traceability, hygienic standards and certification would help upgrading the industry.

Improvement of conditions for the fishing industry, including more professional administration and supervision, could ensure a tangible development for all stakeholders. Timely issuance of seasonal licences, correct and professional sampling and assessments, as well as support of Georgian fleets against foreign ones are among the potential measures to be taken. The Georgian Black Sea Fishery control needs new vessels, training of personnel and a strategy. Today the focus of the department responsible for the “at sea control” is heavily unbalanced toward pollution and very little emphasis is put on control of fishing- and fish transport vessels.

Development of special bank loans for the fishing fleet and support of specialized banking personnel for these loans as seen in other, Western countries would give good opportunities both for the fishery and the banking sector. Some development banks or agencies might be interested to guarantee for the loans.

Reintroduction of the stocking of important fish species such as sturgeons and Black Sea salmon would definitely contribute to improved catches, but needs to be followed up by increased control. Poaching of sturgeon in rivers and at sea is a huge problem.

8.2 Development potentials of inland fisheries and aquaculture

Inland fisheries

Georgian fisheries laws and regulations applicable for inland waters are good and supportive. Still better enforcement of the observance of closed seasons, protection and maintenance of spawning conditions in general and spawning grounds in particulars, as well as the effective quantitative and qualitative monitoring of catches would considerably improve inland fisheries’ development.

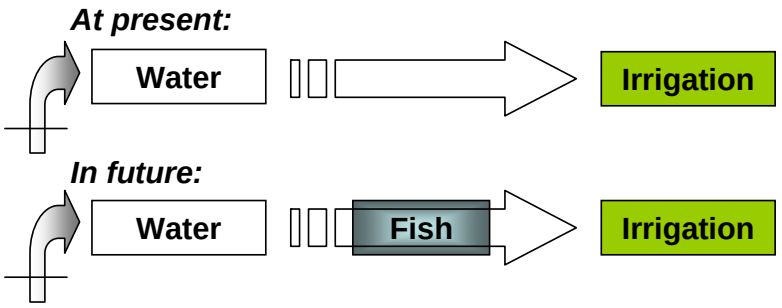
In most of the natural and manmade inland water-bodies the owners and leaseholders proclaim to practice culture based fisheries. It seems, however, that their stocking routine is both irregular and incorrect. It is based on the false belief that occasional stocking is satisfactory enough and the more fish they stock the higher return they should expect. Therefore, perfection of the technical perception and knowledge of owners and leaseholders would lead to significant improvement. As a result, the estimated present average yearly production of about 20–25 kg/ha fish in lakes and reservoirs could be doubled to 40–50 kg/ha and reach a total yearly production of about 1 500–1 900 tonnes.

Table 18: Summary table of fish production potentials of inland waters of Georgia

Type of water	Estimated area (ha)	Potential production (tonnes/year)
Most important flowing waters		
Canals	~ 1 700	30–40
Rivers	~ 5 000	20–70
Total	**6 700**	**50–130**
Most important still waters		
Lakes	~ 14 100	560–700
Reservoirs	~ 23 000	920–1 150
Total	**37 100**	**1 480–1 850**
Grand total	**43 800**	**1 530–1 980**

At present the main irrigation canals are not used for fish culture. According to international experiences and relevant FAO documents and technical papers, canals are ideal waters for growing fish. Considering 20–25 kg/ha fish production annually, water canals could contribute about 30–40 tonnes to the yearly total fish production of the country. In addition, irrigation integrated with fish production could provide higher economic returns on the entire operation.

Box 9: Irrigation integrated with fish production



In lakes, water reservoirs and canals which are densely covered with vegetation grass carp can be stocked for weed control. In this case the expectable yield could be several folds higher until the unwanted weed would be cleared (see Tables 3.10 and 3.11 in Annex 3).

In case of rivers, conservative estimations of 5–15 kg/ha yearly fish production could provide a total contribution of about 20–70 tonnes to the national results, if their restocking would be regular and ban on fishing in the closed seasons could be enforced.

Aquaculture

Development potentials in aquaculture depend on the fish species and practised culture systems. Tank and cage cultures of trout and sturgeon, provided that reliable sources and easy purchase of good quality fingerling and commercial feeds are available, could be developed in Georgia at least up to the production level of self-sufficiency of the country. This would be three to four times higher than the current level of annual production. Trout production could go up as high as 450–600 tonnes per year which would be enough to replace imports from neighbouring countries. Available water resources could also support the production estimated above. Trout farms with an individual production capacity between 5 and 50 tonnes could provide realistic business opportunities for a wide range of rural families and SMEs. Such fish farms require small land areas and water is abundant in many of the regions of Georgia. A medium-sized fish farm with 25 tonnes of production capacity needs about 1 ha of land which can accommodate the needed, approximately 3 500 m^3, water for rearing devices and structures.

Underground waters are also ideal for supporting fish farms, as they can be used either directly as source of water or indirectly as source of heat. The best option is when quality of both cold and warm underground water allows the direct use. When the quality does not allow the direct use of thermal underground water, its heat can still be utilized by a simple heat-exchanger. Underground water resources could support the intensive production of many fish species including trout, sturgeons and different tropical species (tilapia, catfishes, etc.). Underground water recycling culture systems not only can facilitate more efficient use of water and heat but can ensure less impact on the environment, as well.

The domestic market demand for fish is far from being satisfied. Demand for low-priced fish in rural areas and small towns is particularly high (Van Anrooy, Mena Millar, Spreij, 2006). Pond culture is ideal for producing this type of fish.

Pond culture is by far the most frequent fish production system in Georgia. It is practised in both water reservoirs and in ponds, but at present the reservoirs and ponds are not properly utilized, hence there are huge potentials to increase their production.

Pond culture produces mainly less expensive species, such as carps, and only a few percent of the total production is expensive fish like pike, pikeperch and European catfish. Nevertheless, carp production can be very profitable because the pond culture of carps is based on natural fish food produced with manure or/and fertilizers. In addition, in some cases supplementary feeds (maize, forage wheat, etc.) or greens (fresh fodder) are added.

Conservative model calculations in Table 3.15 of Annex 3 demonstrate that reasonable stocking may ensure a yearly gross production of about 1 000–1 300 kg/ha carps and predators. There are different options for building up the polyculture of carps. Hence, all of the pond owners or leaseholders can find their most suitable choices. Taking into consideration that the total area of fish ponds is at least around 2 500 ha in Georgia, their total yearly fish production could reach between 2 500 and 3 250 tonnes.



Simple fish hatchery of Shubunkin Ltd. private fish farm in Hungary with its incubators and larvae rearing jars. (Photos by A. Peteri)

Fish hatchery operations have a distinct role among the fish culture activities because both culture based fishery and any of the fish production systems depend basically on them. When the production of the fish hatcheries decreases or even stops the entire sector of inland fisheries and aquaculture declines which is the case diagnosed in Georgia. Hence, the entire fisheries and fish production of approximately 45 000 ha of inland waters and at least 2 500 ha of fish ponds depends on the success of hatchery operations.

Artificial propagation and fish larvae production need special knowledge and skill. However, the invested efforts highly return in realized profits. Hatchery operations are often believed to need huge investments. This is not correct. Simple, even home made, devices can serve well for incubating eggs and rearing hatched larvae. In the most simple cases incubator jars installed under a shed on the side of a water reservoir can provide for the needed hatchery facilities to produce feeding larvae of practically any of the fish species. In many countries private fish farms normally have, of course, more sophisticated fish hatcheries but even those are fairly inexpensive and simple to install. An illustration of a simple but well functioning fish hatchery is presented in the above pictures.

Table 19 provides some basic data on the potentials and effectiveness of artificial propagation of carps. As demonstrated by the figures, under a pond system, the artificial propagation of 10 brood fish of carps will supply with seed several hundred hectares of ponds, enough to produce many hundred tonnes of table fish.

Increased fish production in public waters would automatically improve chances for increased catches in both qualitative and quantitative terms. At the same time, an increased fish production in private waters would facilitate the wider introduction of fee fishing in Georgia.

During 2004 and 2005, the first period reviewed by FAO, aquaculture was considered to have good prospects for future development in Georgia. Accordingly, in the short term doubling the annual aquaculture production of carps in ponds and reservoirs to 2 000 tonnes seemed realistic with only slight improvements in access to and availability of fingerling, fertilizers and supplementary feeds. In 2006, it was also concluded that, in the longer term, the establishment of an efficient aquaculture extension system along with the improvements in the supply of good quality fingerlings and access to credit would make possible an annual production of around 5 000 tonnes of fish (Van Anrooy, Mena Millar, Spreij, 2006).

Table 19: Potentials of artificial propagation of carps (common carp and Chinese major carps)

	Minimum	Average	Maximum
Individual weight of brooders (kg/fish)	4	5	6
Females (No.)	6	6	6
Males (No.)	4	4	4
Total of brooders	**10**	**10**	**10**
Total weight of females (kg)	24	30	36
Stripped eggs (No./season)	1 800 000	2 000 000	2 500 000
Hatched larvae (No./season)	1 450 000	1 650 000	2 000 000
Feeding larvae produced (No./season)	1 350 000	1 500 000	1 900 000
Feeding larvae stocked (No./season)	1 350 000	1 500 000	1 900 000
Advanced fry harvested (No./season)	650 000	750 000	950 000
Fingerling harvested (No./season)	400 000	450 000	600 000
Two summer old fish harvested (No./season)	280 000	310 000	420000
Table fish harvested			
Number (No./season)	**250 000**	**280 000**	**380 000**
Weight (tonnes/season)	**370**	**420**	**570**

Table 20: Anticipated fish production utilizing full potentials of inland fisheries and aquaculture in Georgia

	Minimum	Rounded average	Maximum
	tonnes/year		
Rivers and canals	50	90	130
Lakes and reservoirs	1 480	1 660	1 850
Trout farms	450	520	600
Pond fish farms	2 500	2 870	3 250
Total	**4 480**	**5 150**	**5 830**

It seems that the role of credit in the above assessment was somewhat overestimated, especially because without the insurance of the produced fish stock, the stock itself can not be used as collateral. Consequently, loans become too risky to take. Otherwise the above considerations are still valid and further supported by the findings and conclusions of the present document. Taking into account all inland water resources, the development potentials of fisheries are huge which not only could provide increased quantities of nationally

produced fish but would ensure enhanced employment and income generating opportunities in the inland fisheries and aquaculture sub-sector in Georgia, as well.

9. CONCLUSIONS AND RECOMMENDATIONS

The present document aims to call attention to and provide evidences of the fact that fisheries and aquaculture have substantial development potentials in Georgia. It also emphasizes that efficient and sustainable exploitation of those potentials requires the concerted and coordinated attention and actions of decision makers in the government administration and all actual and potential stakeholders of Georgian fisheries and aquaculture sector.

During the last 5–6 years a rather intensive interest in starting businesses in the fishery and aquaculture sector has also emerged in Georgia. Owing to the lack of appropriate specialist approach, the sector has not been able to recover and its development could not take-off.

FAO previous intervention in Georgian fisheries has delivered detailed plans for future development, but it is a general feeling that the plans have been too ambitious. The government has not had the capacity, manpower and budget to take on the recommendations and very little impact can be found. In line with what has been the message from the Industry and Government officials we therefore recommend smaller, technical interventions with quick and tangible outputs.

The entry points to and necessary initial actions for a better exploitation of development potentials are thus as follows:

Marine fisheries

Certification of fresh anchovy for export to the EU market would motivate a transparent increase of catches, as well as the development of canned products and fish meal production. FAO and EUROFISH have experience and expertise in this field. Ideally, a pool of funds allocated for quick consultancies and certification workshops should be set up for the use of interested industries. The Delegation of the European Commission to Georgia has shown interest in funding such an effort and awaits proposals. Outline for a workshop could look like this:

Workshop for the Fishing Industry on Certification, Traceability and Market Demands

In corporation with MA and MEPNR, FAO, EUROFISH and Bureau Veritas will conduct a workshop in Batumi or Poti for the fishing industry to elaborate on following elements:
What is certification and why is it important?

- Overview of type of certification schemes today (BRC, IFS, ISO 9000, ISO 22000, MSC) within fishery and aquaculture.
- What is traceability and how to deal with traceability demands within certification?
- What is the market demands to be able to export to EU? Cases from the industry.
- How can Traceability be implemented in practice and what will happen in the future?
- How is the certification procedure, how long time does it take and what are the costs?
- Future demands within certification.

Upgrading of six Poti trawlers. A loan of about US$200 000 would be required to replace rigging with seine. This amount would cover a purchase price of about US$35 000 per seine and seines would be installed by the fishermen themselves. This would enable each of them to catch 2 000–3 000 tonnes of anchovy per year and thus replace 10 Turkish seiners. They could start fishing at the beginning of the season in November when the Turkish seiners are fishing in Turkish waters. Loans are available through a fund set up by the Bush administration.

Upgrading and optimization of the fisheries inspection through training and modern vessels. Norway and Denmark have a history of support to developing countries in this field. It is proposed that requests are made to these countries and to EU which is also anticipated to be interested in a better management and

control of the Black Sea. In such a project FAO could coordinate assistance to the Ministry of Environmental Protection and Natural Resources to: i) draft a strategy for development of the Georgian Marine Fisheries Inspection, ii) set up a training course for at sea inspection, iii) make a plan for efficient utilization of Vessel Monitoring System (VMS), iv) draft a penalty scheme for violations, v) liaise with possible donors for upgrading of inspection vessels, vi) draft a plan for operation and maintenance of upgraded vessels.

Development of special investment loans for the fishing industry. A TCP Facility could try to connect development banks with the local banks to develop investment loans for the fishing fleet for maintenance, upgrading or to buy modern feasible purse seiners and trawlers in line with what exist in the western world. Training should be included in the facility of specialized local bank personnel to evaluate the risk and manage the loans.

Upgrading the Georgian fish processing industry. In Cooperation with the Ministry of Agriculture, Division of Marketing Research and Strategic Development, the MEPNR and the Georgian fish processing industry FAO could assist to: i) draft an action plan for ministerial and industry needs to be able to process the Georgian anchovy resource in Georgia, ii) identify needs for upgrading the fishmeal production on quantity and quality needed for export to the European market and for handling an appropriate part of the Georgian quota, iii) make a feasibility study for quality fish (and pet) feed production to serve the region's needs including investment needs, iv) liaise and facilitate contacts with investment banks to finance necessary investments in the new production.

Inland fisheries and aquaculture

Preparation and maintenance of reliable fisheries and aquaculture statistics is a very difficult task which should also be combined with simple professional assessments of changes in the actual potentials of the different types of water-bodies and fish culture systems. Consequently, inventories of surface waters and fish farms would be one of the most important preconditions of good quality inland fisheries and aquaculture statistics which is of vital importance for a reliable management and sustainable development of the sector.

Completion of the databases of surface water resources, combined with technical and environmental awareness rising, in order to enhancer sustainable management. Expected outcomes are:

- Detailed inventory of rivers, lakes, canals and water reservoirs, including all fisheries related physical and biological parameters. This inventory would facilitate the classification of waters from fisheries point of view.
- Learning social aspects of actual and potential fisheries through meetings with local people and fishers (both amateurs and professionals).
- Learning the opinion of actual and potential stakeholders.
- Increased awareness of and enhanced interest in learning proper and professional use of inland waters.
- Regional technical workshops for farmers and communities.

Survey of fish farm facilities, combined with farmers meetings and short trainings would include among others:

- Detailed inventory of the fish farms, including both their facilities and needs. This inventory would, among others, facilitate the classification of fish farms by the actually practised culture systems.
- Personal consultations with fish farm owners and operators.
- Learning the opinion of actual and potential stakeholders.
- Regional technical workshops for farmers and communities.

Establishment of a reliable fish seed production network combined with privatized extension services would ensure both reliable fish seed supply and the dissemination of technical knowledge. This would also include the preparation of simple but useful technical and aquatic environment related awareness rising and training materials in general, and handbooks for trout and carp farming, in particular.

Rehabilitation of the Sturgeon Hatchery would ensure not only the partial restocking of the Black Sea sturgeon species, but the supply of Georgian fish farms with fingerling, as well. This would result in a much higher production in Georgia of one of the most valued fish species of the World. An outline for a $300.000US project could look like this:
In cooperation with MEPNR, Biodiversity Protection Division, FAO would assist in rehabilitation of the Geguti Sturgeon Hatchery. This would ensure not only the partial restocking of the Black Sea sturgeon species, but would also supply the Georgian fish farms with sturgeon fingerlings. This would result in a much higher production in Georgia of one of the most valued fish species of the world. The project would include:

- Partial restocking and rehabilitation of the Black Sea sturgeon species.
- Maintenance of gene pool of rare and endangered species.
- Approbation and application of small sturgeon farms in Georgia.
- Marketable sturgeon production in Geguti sturgeon farm.

Management of the sector

For unknown reasons and despite its considerable development potential, the fisheries and aquaculture sector has got very low priority by the Georgian Government. This has created a series of problems for the fisheries management, the fishing industry, the aquaculture industry, the fish processing industry and the export of fish products alike.

Upgrading of the administrative and management structure. The 2006 FAO Master- and Action Plans for the Fishery Sector Development in Georgia gave clear guidelines for upgrading of the Fisheries administrative and management sector. An upgraded organization is needed to represent and support the fishing- and aquaculture industry, hence facilitate better exploitation of the sector's development potentials. In this respect, reconsideration of the role of a Department of Fisheries at the MOA and its increased collaboration with the concerned departments of MEPNR would probably be the right point of departure. A likely return could be a significant increase of revenue and local employment for the country. Some feedback from the involved ministries has indicated that the plans were too ambitious and thus a mission that could bridge the ideas of the old plans with the capacity and available funds of the ministries would be preferable.

Upgrading of Georgian fisheries laws and regulations. The recent mission related to the present review identified together with the Georgian counterparts some loopholes in laws and regulations especially related to the utilization of the anchovy licences. A concerted action involving FAO's gear technical section to technically formulate the new regulations and FAO Fisheries legal department to update existing law was requested and would be a good help to prevent further incidents and loss of revenue for the country.

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Table 1.1: Regions of Georgia

Regions	Summary notes	Districts	
		Name	Number
Guria	The region is 2 033 km2. Its capital is Ozurgeti. The economy of the region is based on subtropical farming and tourism. Guria is also one of the largest tea growing regions in Georgia. The province is famous for the mineral water of Nabeglavi. The Black Sea health resort, Ureki is rich in magnetic sand. The average temperatures are about 0 and 21 Celsius in January and July, respectively.	Chokhatauri	1
		Lanchkhuti	1
		Ozurgeti	1
		Total	**3**
Imereti	The region is 6 552 km2, its main city is Kutaisi. The main river of the region is the Rioni (upper and middle sections). Its economy is based on manganese and different other metals production and coal mining. Some of its districts have advanced agriculture. Main products are the mulberries and grapes. The average temperatures are about 5 and 22 Celsius in January and July, respectively.	Bagdati	1
		Chiatura	1
		Kharagauli	1
		Khoni	1
		Kutaisi	1
		Sachkhere	1
		Samtredia	1
		Terjola	1
		Tkibuli	1
		Tskaltubo	1
		Vani	1
		Zestaponi	1
		Total	**12**
Kakheti	Kacheti is one of the most important and diverse regions of Georgia. It is 11 310 km2, which has traditionally 4 subdivisions. Inner Kacheti along the right bank of River Alazani, outer Kacheti along the middle of River Iori, Qiziki between Alazani and Iori rivers, and Thither area on the left bank of the Alazani. The most distinguished traditional activity is wine growing and making. On the lowlands arable crop production, while on the highlands cattle breeding are the most important agricultural activities. In addition to agriculture tourism is also important. The region includes Alazani River basin and Iori River's middle and lower flows. Arghuni and Andis-Koisu Rivers are also to be found here. Kacheti rivers are swift typical mountain rivers. Lakes of the region are tectonic (Kajiri, Malkhazovsky, Jandari), glacier and relict types. Climate ranges from warm temperate to subtropical dry.	Akhmeta	1
		Dedoflistskaro	1
		Gurdjaani	1
		Kvareli	1
		Lagodekhi	1
		Sagarejo	1
		Sighnaghi	1
		Telavi	1
		Total	**8**
Kvemo Kartli	It is a historic administrative region in south-eastern Georgia. It has a total area of 6 528 km2. The capital of the region is Rustavi. The population is mixed between Azeris and Georgians, who constituted a majority of the population.	Dmanisi	1
		Gardabani	1
		Marneiuli	1
		Tetritskaro	1
		Tsalka	1
		Tsnori	1
		Total	**6**

Regions	Summary notes	Districts	
		Name	Number
Mtskheta-Mtianeti	The capital of the region is Mtskheta, its total area is 6 785 km2.	Akhalgori	1
		Kazbegi	1
		Thianethi	1
		Stepantsminda	1
		Dusheti	1
		Mtskheta	1
		Total	**6**
Racha-Lechkhumi and Kvemo Svaneti	The region is located in north-western of Georgia and includes the historical provinces of Racha, Lechkhumi and Kvemo Svaneti. It covers an area of 4 954 km2. It is the lowest populated region in the country. The capital is Ambrolauri.	Ambrolauri	1
		Lentekhi	1
		Oni	1
		Tsager	1
		Total	**4**
Samegrelo and Zemo Svaneti	It is a region in western Georgia, which includes the historical Georgian provinces of Samegrelo and Zemo Svaneti. Its capital is Zugdidi. The total area of the region is 7 441 km2.	Abasha	1
		Chkhorotsku	1
		Khobi	1
		Martvili	1
		Mestia	1
		Poti	1
		Senaki	1
		Tsalenjikha	1
		Zugdidi	1
		Total	**9**
Samtskhe-Javakheti	It is a region in southern Georgia. Its capital is Akhaltsikhe. Its area is 6 413 km2 and 2 fuel pipelines pass through its territory. They are the Baku-Tbilisi-Ceyhan oil pipe and South Caucasus natural gas pipe. One of the major tourist attractions of the country is located here in the region. It is the cave monasteries.	Adigeni	1
		Akhalkalaki	1
		Akhaltsikhe	1
		Aspindza	1
		Borjomi	1
		Ninotsminda	1
		Total	**6**
Shida Kartli	The capital of the region is Gori. Its total area is 6 200 km2. The northern part of the region (Java, Kareli and Gori), with a total area of 1 393 km2, is controlled by the authorities of the self-proclaimed republic of South Ossetia since 1992.	Gori	1
		Java	1
		Kaspi	1
		Khashuri	1
		Kareli	1
		Tskhinvali	1
		Total	**6**
Total			**60**

Table 1.2: Population of Georgia

Country	Population (CIA 2008 est.)				Density of population (CIA)				Agriculture population density (FAO AQUASTAT)		
	Persons	% of Caucasus countries	% of CA countries	% of CCA countries	Persons per km2	% of Caucasus countries	% of CA countries	% of CCA countries	1993-1995 (persons per ha)	2001-2003 (persons per ha)	Change (%)
Georgia	4 630 841	29.4	7.5	6.0	66.4	78.4	432.5	360.1	1.10	0.90	(18.2)
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 (CA)	**61 357 297**	**388.9**	**100.0**	**79.5**	**15.4**	**18.1**	**100.0**	**83.3**	**-**	**-**	**-**
Total of CCA	**77 134 441**	**488.9**	**125.7**	**100.0**	**18.5**	**21.8**	**120.1**	**100.0**	**-**	**-**	**-**

Adapted from CIA The World Fact Book 2008 and FAO AQUASTAT 2008

Table 1.3: Demographic data of Georgia

Country	Population (2008 est.)							
	Persons				Age structure (%)			Growth (%)
	Total	Under 14	15 - 64	Above 65	Under 14	15 - 64	Above 65	
Georgia	4 630 841	754 827	3 107 294	768 720	16.3	67.1	16.6	(0.325)
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 CCA	**77 134 441**	**21 654 527**	**50 438 622**	**5 025 951**	**28.1**	**65.4**	**6.5**	**-**

Adapted from CIA The World Fact Book 2008

Table 1.4: Labour force and poverty in the Georgia

Country	Labour force (2007)					Unemployment (%)	Population below poverty Line *
	Persons	% of Population	by Occupation (%)				
			Agriculture	Industry	Services		
Georgia	2 020 000	43.6	55.6	8.9	35.5	13.6	31.0

Note: * 2004 - 2006

Adapted from CIA The World Fact Book 2008

Table 1.5: Economic data of Georgia

Country	GDP (2007)								
	Amount (million USD)	Composition (million USD)			Composition (%)			Real growth rate (%)	Per capita (USD)
		Agriculture	Industry	Services	Agriculture	Industry	Services		
Georgia	10 290	1 348	3 015	5 927	13.1	29.3	57.6	12.4	2 222
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 CCA	**210 064**	**22 362**	**86 878**	**100 823**	**10.6**	**41.4**	**48.0**	**210 064**	**2 723**

Adapted from CIA The World Fact Book 2008

Table 1.6: Gross domestic product comparison of Georgia

Country	GDP (2007 purchase power parity) - absolute					GDP (2007 purchase power parity) - relative				
	Million USD	% of world	% of Caucasus countries	% of CA countries	% of grand total	USD per capita	% of world	% of Caucasus countries	% of CA countries	% of grand total
Georgia	20 500	0.031	19.9	7.3	5.3	4 427	45.1	67.7	96.7	88.9
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 CCA	**383 920**	**0.585**	**372.3**	**136.7**	**100**	**4 977**	**50.7**	**76.2**	**108.8**	**100**

Adapted from CIA The World Fact Book 2008

Table 1.7: Details on land area of Georgia

Country	Land area (km^2)			Agricultural land		as Total land area			Irrigated land	
	Land	Water	Total	km^2	%	Arable Land (%)	Permanent Crops (%)	Other (%)	km^2	% of Agricultural Land
Georgia	69 490	210	69 700	25 170	36.2	11.5	3.8	84.7	4 690	44.0
Total of Caucasus	**184 200**	**1 900**	**186 100**	**36 001**	**-**	**-**	**-**	**-**	**22 100**	**-**
Total of Central Asia	**3 917 300**	**77 100**	**3 994 400**	**316 673**	**-**	**-**	**-**	**-**	**114 310**	**-**
Total of CCA	**4 101 500**	**79 000**	**4 180 500**	**352 675**	**-**	**-**	**-**	**-**	**136 410**	**-**

Adapted from FAOSTAT 2007 estimation, CIA The World Fact Book 2008

Table 1.8: Poverty in Georgia

Country	Location	% of Population								
		1995	1996	1997	1998	1999	2000	2001	2002	2003
Georgia	national	-	-	**11**	-	-	-	-	**52**	**55**
	rural	-	-	10	-	-	-	-	55	53
	urban	-	-	12	-	-	-	-	49	56

Source: FAO Statistic Division

Table 1.9: Consumption of basic food items in Georgia - 1

Country name	Periods	Food groups (gr./person/year)									
		Alcohol	Animal fats & products	Beverage crops	Cereals & products	Eggs & products	Fish, seafood & products	Fruits & products	Meat & products	Milk & products	Offals edible
Georgia	1993-1995	28 470	730	8 760	167 170	3 650	2 190	60 590	21 535	66 065	1 825
	2001-2003	12 045	1 460	4 015	182 135	5 475	730	48 545	25 550	142 350	2 555
	Change:	**(16 425)**	**730**	**(4 745)**	**14 965**	**1 825**	**(1 460)**	**(12 045)**	**4 015**	**76 285**	**730**

Source: FAO Statistic Division

Table 1.10: Consumption of basic food items in Georgia - 2

Country name	Periods	Food groups (gr./person/year)							
		Oil crops	Pulses & products	Spices	Starchy roots & products	Sugar & Sweeteners	Tree nuts & products	Vegetable oils & products	Vegetables & products
Georgia	1993-1995	-	365	365	46 355	10 585	4 015	1 825	77 380
	2001-2003	365	-	730	54 020	31 025	3 650	5 110	81 760
	Change:	**365**	**(365)**	**365**	**7 665**	**20 440**	**(365)**	**3 285**	**4 380**

Source: FAO Statistic Division

Table 1.11: Food consumption related statistical data of Georgia

Country	Share of food aid in consumption (%)		Undernourished persons (#)				Undernourished persons as % of 2008 population			
	1993-1995	2001-2003	1993-1995	2001-2003 provisional	2002-2004 preliminary	Change 1993-2004	1993-1995	2001-2003 provisional	2002-2004 preliminary	Change 1993-2004
Georgia	51.5	6.5	2 400 000	700 000	500 000	(1 900 000)	52	15	11	(41)

Source: FAO Statistic Division

Table 2.1: Water resources of Georgia

Country	Average precipitation (1961-1990 km^3/year)	Average precipitation (1961-1990 mm/year)	Total Internal TRWR (km^3/year)	Groundwater: produced internally (km3/year)	Surface water: produced internally (km^3/year)	Overlap: Surface and groundwater (km^3/year)	TRWR (natural) (km^3/year)	TRWR (actual) (km^3/year)	Dependency ratio (%)
Georgia	71.5	1 026	58.1	17.2	56.9	16.0	63.3	63.3	8

Observation: * Large discrepancies between national and IPCC data on rainfall average. In these cases, IPCC data were modified to ensure consistency with water resources data.
Source: FAO AQUASTAT 2008

Table 2.2: Water resources per unit area of Georgia

Country	Average precipitation (1961-1990) m^3 per km2	RWR (actual) in 2000	
		m^3 per capacity per year	m^3 per km^2 per year
Georgia	1 025 825	12 035	799 601

Source: FAO AQUASTAT 2008

Table 2.3: Freshwater withdrawal in Georgia

Country	Total Freshwater Withdrawal			Per Capita Freshwater Withdrawal (m^3/yr)	Composition of Consumption (%)			TRWR (km^3/yr)		
	km^3/yr	TRWR (km^3/yr)	% of TRWR		Domestic	Industrial	Agricultural	FAO	CIA	Difference
Georgia *	3.6	63.3	5.7	808	20	21	59	63.3	63.3	-

Note: * 1997
Adapted from CIA: The World Fact Book 2008

Table 2.4: Rivers of Georgia

River system	Name of river	Number of rivers	Total length in Georgia (km)
Black Sea river basin system			
Ajaratskali	Ajaratskali	1	90
Ajaratskali	Chiruziskali	1	40
Ajaratskali	**Total**	**2**	**130**
Bzipi	Bzipi	1	110
Chorokhi	Chorokhi	1	26
Chorokhi	Dologanistskali	1	40
Chorokhi	**Total**	**3**	**176**
Inguri	Inguri	1	206
Java-Kvara	Java-Kvara	1	20
Kaparchina	Kaparchina	1	16
Khobi	Khobi	1	150
Kodori	Kodori	1	84
Natanebi	Choloki	1	27
Natanebi	Natanebi	1	60
Natanebi	**Total**	**7**	**563**
Psou	Psou	1	53
Rioni	Chkherimela	1	40
Rioni	Chvana	1	40
Rioni	Dzirula	1	60
Rioni	Jojola	1	50
Rioni	Khanistskali	1	57
Rioni	Kuluri	1	80
Rioni	Kvirila	1	152
Rioni	Logoba	1	35
Rioni	Nogela	1	59
Rioni	Qvirila	1	152
Rioni	Rioni	1	333
Rioni	Sulori	1	40
Rioni	Tekhuri	1	100
Rioni	Tsivi	1	28
Rioni	Tskaltsitela	1	60
Rioni	Tskhenistskali	1	184
Rioni	Zevristskali	1	85
Rioni	**Total**	**18**	**1 608**
Supsa	Supsa	1	118
Total of Black Sea water basin system		**31**	**2 595**
Caspian Sea river basin system			
Lashispe	Lashispe	1	23
Mtkvari (Kura)	Alazani	1	390
Mtkvari (Kura)	Algeti	1	118
Mtkvari (Kura)	Aragvi	1	110
Mtkvari (Kura)	Debet	1	40
Mtkvari (Kura)	Dzama	1	42
Mtkvari (Kura)	Great Liakhvi	1	98

River system	Name of river	Number of rivers	Total length in Georgia (km)
Mtkvari (Kura)	Iori	1	317
Mtkvari (Kura)	Khrami	1	187
Mtkvari (Kura)	Ksani	1	18
Mtkvari (Kura)	Lekhura	1	47
Mtkvari (Kura)	Machakhlistskali	1	21
Mtkvari (Kura)	Mashavera	1	75
Mtkvari (Kura)	Moshevani	1	25
Mtkvari (Kura)	Mtkvari (Kura)	1	351
Mtkvari (Kura)	Narekvavi	1	41
Mtkvari (Kura)	Potskhovi	1	64
Mtkvari (Kura)	Paravani	1	81
Mtkvari (Kura)	Prone	1	38
Mtkvari (Kura)	Shavi Aragvi	1	23
Mtkvari (Kura)	Suramula	1	45
Mtkvari (Kura)	Tana	1	39
Mtkvari (Kura)	Tedzami	1	51
Mtkvari (Kura)	Tetri Arargvi	1	41
Mtkvari (Kura)	Tsablarastskali	1	50
Mtkvari (Kura)	Vera	1	38
Mtkvari (Kura)	**Total**	**26**	**2 373**
Terek	Terek	1	71
Total of caspian Sea river basin system		**27**	**2 444**
Total Black Sea and Caspian Sea river basin systems		**58**	**5 039**
No information			
No information	Akagrela	1	-
No information	Bakhviskali	1	-
No information	Besleti	1	-
No information	Chelta	1	-
No information	Chkviskali	1	-
No information	Churia	1	-
No information	Debeda	1	-
No information	Galidzga	1	-
No information	Gujaretistskali	1	-
No information	Gumista	1	-
No information	Kaparcha	1	-
No information	Karolitskhali	1	-
No information	Kelasuri	1	-
No information	Kintrishi	1	-
No information	Liakhvi	1	-
No information	Machakhela	1	-
No information	Macharasha	1	-
No information	Maltakva	1	-
No information	Mejuda	1	-
No information	Narionali	1	-
No information	Ochkhamuri	1	-
No information	Okumi	1	-
No information	Pichora	1	-

River system	Name of river	Number of rivers	Total length in Georgia (km)
No information	Shavnabada	1	-
No information	Shavtskala	1	-
No information	Skhalta	1	-
No information	Tikori	1	-
No information	Tiripona	1	-
No information	Toloshistskali	1	-
No information	Tortla	1	-
No information	Tuapse	1	-
No information	**Total**	**31**	-
Grand total		**89**	-

Source: M. Khavtasi and M. Makarova, 2008

Table 2.5: Lakes of Georgia

Region	Name	Altitude (m)	Avg. depth (m)	Max. depth (m)	Number of lakes	Area (ha)
Black Sea river basins system						
Abkhazia	Little Ritsa	1 235	34	76	1	10
Abkhazia	Mzi	2 053	5	12	1	4
Abkhazia	Ritsa	884	63	101	1	150
Abkhazia	**Total**				**3**	**164**
Samegrelo and Zemo Svaneti	Paliastomi	-	2	3	1	1 820
Total of Black Sea river basin system					**4**	**1 984**
Caspian Sea river basins system						
Kakheti	Jandari	291	5	7	1	1 230
Mtskheta-Mtianeti	Bazaleti	878	4	7	1	120
Mtskheta-Mtianeti	Gldani	153	(blank)	(blank)	1	28
Mtskheta-Mtianeti	Keli	2 914	25	63	1	130
Mtskheta-Mtianeti	**Total**				**3**	**278**
Samtskhe-Javakheti	Akhmaz	2 033	2	3	1	22
Samtskhe-Javakheti	Kartsakhi	1 799	1	1	1	2 630
Samtskhe-Javakheti	Khanchali	1 928	1	1	1	1 330
Samtskhe-Javakheti	Madatafa	2 108	1	2	1	880
Samtskhe-Javakheti	Paravani	2 073	2	3	1	3 750
Samtskhe-Javakheti	Saghamo	1 996	2	2	1	480
Samtskhe-Javakheti	Tabatsquri	1 997	16	40	1	1 420
Samtskhe-Javakheti	**Total**				**7**	**10 512**
Tbilisi	Lisi	624	1	2	1	47
Tbilisi	Turtle (Tbilisi)	687	(blank)	18	1	50
Tbilisi	**Total**				**2**	**97**
Total of Caspian Sea river basin system					**13**	**12 117**
Total of Black Sea and Caspian Sea river basin systems					**17**	**14 101**
No information						
Kvemo Kartli	Bashkovi				1	-
Kvemo Kartli	Kainegeli				1	-
Kvemo Kartli	Karageli				1	-
Kvemo Kartli	Tambukhgeli				1	-
Kvemo Kartli	**Total**				**4**	-
Samtskhe-Javakheti	Khosapani				**1**	-
No information	Aliastomi				1	-
No information	Bebesiri				1	-
No information	Bugdasheni				1	-
No information	Childiri				1	-
No information	Dapnari				1	-
No information	Gardabani				1	-
No information	Gomareti				1	-
No information	Inkiti				1	-
No information	Japana				1	-
No information	Kumisi				1	-
No information	Nabada				1	-

Region	Name	Altitude (m)	Avg. depth (m)	Max. depth (m)	Number of lakes	Area (ha)
No information	Nuria				1	-
No information	Peatbogs				1	-
No information	Psirckhi				1	-
No information	Shavnabada				1	-
No information	Skurchia				1	-
No information	**Total**				**16**	-
No information total					**21**	-
Grand total					**38**	-

Source: M. Khavtasi, M. Makarova and I. Lomashvili 2008

Table 2.6: Water canals of Georgia

Name of water source	Name of main irrigation canal	Number	Total length (km)	Total estimated area (ha)	Total Avg. (m^3/sec)	Total irrigated area (ha)
West Gerogia						
Dzevrula	Etseri	1	6	0.8	1.2	471
Dzevrula	Sigtarvi	1	2	0.1	0.3	79
Dzevrula total		**2**	**8**	**0.8**	**1.5**	**550**
Khanistskali	Apkhanauri	1	5	0.1	0.3	250
Khanistskali	Dini-Rokiti	1	3	0.5	1.5	1 000
Khanistskali	Vartsikhe	1	35	3.5	1.0	695
Khanistskali total		**3**	**43**	**4.1**	**2.8**	**1 945**
Kvirila	Ajameti	1	30	9.0	3.0	2 799
Kvirila	Khodabuli	1	9	0.5	0.5	429
Kvirila total		**2**	**40**	**9.5**	**3.5**	**3 228**
Rioni	Mashveli	1	44	87.6	20.0	13 829
Surlori	Tsikhisulori	1	5	0.2	0.5	323
Tskhenis Tskali	Kukhi	1	13	16.9	13.0	14 134
West Georgia total		**10**	**152**	**119.3**	**41.3**	**34 009**
East Gerogia						
Alazani	Alazani - Lower	1	91	218.5	24.0	31 262
Alazani	Alazani - Upper	1	89	214.1	24.0	29 904
Alazani	Kvemo Alazani	1	40	88.0	22.0	22 000
Alazani	Zemo Alazani	1	35	84.0	24.0	24 000
Alazani	Zilicha	1	64	76.6	12.0	15 031
Alazani total		**5**	**319**	**681.1**	**106.0**	**122 197**
Algeti reservoir	Kumisi	1	11	2.2	2.0	4 700
Algeti reservoir	Tbisi	1	23	20.7	9.0	12 470
Algeti reservoir	Tbisi-Kumisi	1	11	10.0	9.0	12 466
Algeti reservoir total		**3**	**45**	**32.9**	**20.0**	**29 636**
Aragvi	Mukhrani	1	30	18.0	6.0	14 718
Aragvi	Saguramo	1	38	7.6	2.0	2 665
Aragvi total		**2**	**68**	**25.6**	**8.0**	**17 383**
Great Liakhvi	Kekhvi	1	25	8.8	3.5	4 079
Great Liakhvi	Saltvisi	1	19	12.4	6.5	9 762
Great Liakhvi	Tiriponi	1	50	62.5	12.5	28 390
Great Liakhvi total		**3**	**94**	**83.6**	**22.5**	**42 231**
Iori	Kvemo Samgori (left)	1	45	72.0	16.0	16 000
Iori	Kvemo Samgori (right)	1	70	56.0	8.0	8 000
Iori	Samgori - Lower	1	76	165.8	21.7	31 180
Iori total		**3**	**191**	**293.8**	**45.7**	**55 180**
Khrami	Khrami	1	66	59.0	9.0	10 014
Khrami total		**1**	**66**	**59.0**	**9.0**	**10 014**
Ksani	Tezi-Okami	1	34	27.0	8.0	4 441
Ksani total		**1**	**34**	**27.0**	**8.0**	**4 441**
Little Liakhvi	Vanati	1	11	7.8	7.0	4 456
Mtkvari (Kura)	Gardabani	1	32	51.2	16.0	1 264
Mtkvari (Kura)	Marini	1	22	1.1	0.5	500
Mtkvari (Kura)	Skra-Kareli	1	29	8.1	2.8	3 210
Mtkvari (Kura)	Tashiskari	1	64	76.6	12.0	15 031
Mtkvari (Kura) total		**4**	**147**	**136.9**	**31.3**	**20 005**
Tbilisi reservoir	Marjvena magistraluri	1	29	27.4	9.5	9 510
Tbilisi reservoir	Qvemo Samgori	1	58	72.0	12.5	13 450
Tbilisi reservoir	Samgori - Upper	1	83	107.6	13.0	30 283
Tbilisi reservoir total		**3**	**169**	**207.0**	**35.0**	**53 243**
East Georgia total		**26**	**1 144**	**1 554.7**	**292.5**	**358 785**
Grand total		**36**	**1 296**	**1 673.9**	**333.8**	**392 794**

Source: M. Khavtasi, M. Makarova and I. Lomashvili 2008

Table 2.7: Water reservoirs of Georgia

River basin	Name of reservoirs	Number of reservoirs	Surface area (ha)	Total volume (m^3)
Black Sea River Basin System				
Inguri	Gali-Jvari	1	840	1 092 000 000
Inguri	Inguri	1	1 350	1 092 000 000
Inguri	Shaori	1	1 320	109 680 000
Inguri	**Total**	**3**	**3 510**	**2 293 680 000**
Lajanuri	Lajanuri	1	180	39 000 000
Lajanuri	**Total**	**1**	**180**	**39 000 000**
Rioni	Chaori	1	1 022	102 200 000
Rioni	Gumati	1	240	39 000 000
Rioni	Tkibuli	1	1 210	84 350 000
Rioni	Vartsikhe	1	620	14 600 000
Rioni	**Total**	**4**	**3 092**	**240 150 000**
Total		**8**	**6 782**	**2 572 830 000**
Caspian Sea River Basin System				
Aragvi	Zhinvali	1	1 150	713 000 000
Aragvi	**Total**	**1**	**1 150**	**713 000 000**
Dmanisi	Iagublo	1	200	11 100 000
Dmanisi	**Total**	**1**	**200**	**11 100 000**
Khrami	Khrami	1	2 770	284 805 000
Khrami	**Total**	**1**	**2 770**	**284 805 000**
Mashavera	Pantiani	1	620	57 800 000
Mashavera	**Total**	**1**	**620**	**57 800 000**
Mtkvari (Kura)	Algeti	1	230	88 850 000
Mtkvari (Kura)	Dalismta	1	1 800	180 000 000
Mtkvari (Kura)	Kukhi	1	38	1 900 000
Mtkvari (Kura)	Kushiskhevi	1	80	4 000 000
Mtkvari (Kura)	Lipi	1	400	32 000 000
Mtkvari (Kura)	Sioni	1	1 440	1 851 080 000
Mtkvari (Kura)	Tavtskaro	1	67	3 360 000
Mtkvari (Kura)	Tbilisi	1	3 800	667 000 000
Mtkvari (Kura)	Tsalka	1	3 370	3 076 500 000
Mtkvari (Kura)	**Total**	**9**	**11 225**	**5 904 690 000**
Patara Liakxvi	Oktomberi	1	35	1 750 000
Patara Liakxvi	Zonkari (Little Liakhvi)	1	140	40 300 000
Patara Liakxvi	**Total**	**2**	**175**	**42 050 000**
Caspian Sea Total		**15**	**16 140**	**7 013 445 000**
No information				
No information	Jinvali	1	1 120	510 000 000
No information	Chali	1	34	1 700 000
No information	Cheremi	1	26	1 300 000
No information	Dmanisi	1	118	11 000 000
No information	Jandari	1	520	52 000 000
No information	Kranchiskhevi	1	25	1 260 000
No information	Kumisi	1	440	11 000 000
No information	Lapianis Kure (Kudigoris)	1	70	3 500 000

River basin	Name of reservoirs	Number of reservoirs	Surface area (ha)	Total volume (m^3)
No information	Marabda	1	24	1 200 000
No information	Mtisdziri	1	66	3 300 000
No information	Nadarbazevi	1	100	8 200 000
No information	Narekvavi	1	80	6 800 000
No information	Tskhenisis Cha	1	30	1 500 000
No information	Zresi	1	250	2 080 000
No information	**Total**	**14**	**2 903**	**614 840 000**
Grand Total		**37**	**25 825**	**10 201 115 000**

Source: M. Khavtasi, M. Makarova and I. Lomashvili 2008

Table 2.8: Operating fish farms in Georgia

Region	Culture system	Produced fishes	Name of farm	Number of farms	Area of production units		Produced	
					ha	m^2	Fingerling (#/yr.)	Table fish (kg/yr.)
Guria	Pond culture	Carps	Chokhatauri	1	15	-	-	2 500
			Djapana	1	200	-	-	40 000
		Carps total		**2**	**215**	**-**	**-**	**42 500**
Guria total				**2**	**215**	**-**	**-**	**42 500**
Imereti	Pond culture	Carps	Terjola	1	12	-	-	3 000
			Bashi	1	27	-	-	5 400
			Djicha	1	25	-	-	5 000
			Djikhaishi	1	18	-	50 000	36 500
			Eceri	1	15	-	-	3 000
			Ganiri	1	28	-	-	6 000
			Gvishtibi	1	35	-	-	-
			Kachaberi	1	100	-	-	20 000
			Maglaki	1	45	-	-	9 000
			Varciche	1	15	-	-	3 000
		Carps total		**10**	**320**	**-**	**50 000**	**90 900**
		Sturgeon	Geguti	1	35	-	-	7 000
		Sturgeon total		**1**	**35**	**-**	**-**	**7 000**
	Pond/tank culture	Trouts, carps	Sachkhere	1	2	2 000	-	2 000
		Trouts, carps total		**1**	**2**	**2 000**	**-**	**2 000**
	Tank culture	Trouts	Kumistavi	1	-	1 000	-	1 500
		Trouts total		**1**	**-**	**1 000**	**-**	**1 500**
Imereti total				**13**	**357**	**3 000**	**50 000**	**101 400**

Region	Culture system	Produced fishes	Name of farm	Number of farms	Area of production units		Produced	
					ha	m^2	Fingerling (#/yr.)	Table fish (kg/yr.)
Kakheti	Pond culture	Carps	Sagarejo	1	200	-	-	40 000
			Alvani	1	180	-	500 000	5 000
			Cnori	1	23	-	-	5 000
			Djafaridze	1	53	-	-	11 000
			Djimiti	1	15	-	-	30 000
			Kondoli	1	35	-	-	7 000
			Ulianovka	1	45	-	200 000	2 000
		Carps total		**7**	**551**	**-**	**700 000**	**100 000**
		Carps, catfish	Telavi	1	70	-	-	14 000
		Carps, catfish total		**1**	**70**	**-**	**-**	**14 000**
		Sturgeon, carps, catfish	GF-S Company	1	100	-	-	-
		Sturgeon, carps, catfish total		**1**	**100**	**-**	**-**	**-**
	Tank culture	Trouts	Gurgeniani	1	-	1 200	-	6 000
			Shakhvetila	1	-	2 000	-	3 000
		Trouts total		**2**	**-**	**3 200**	**-**	**9 000**
Kakheti total				**11**	**721**	**3 200**	**700 000**	**123 000**
Kvemo Kartli	Pond culture	Carps	Kumisi	1	450	-	-	50 000
		Carps total		**1**	**450**	**-**	**-**	**50 000**
Kvemo Kartli total				**1**	**450**	**-**	**-**	**50 000**
Mtskheta-Mtianeti	Pond culture	Carps	Bulachauri	1	18	-	-	3 600
		Carps total		**1**	**18**	**-**	**-**	**3 600**
	Pond/tank culture	Trouts, carps	Sioni	1	8	-	-	-
		Trouts, carps total		**1**	**8**	**-**	**-**	**-**
	Tank culture	Trouts	Pasanauri	1	-	1 500	-	2 500
		Trouts total		**1**	**-**	**1 500**	**-**	**2 500**
Mtskheta-Mtianeti total				**3**	**26**	**1 500**	**-**	**6 100**

Region	Culture system	Produced fishes	Name of farm	Number of farms	Area of production units		Produced	
					ha	m^2	Fingerling (#/yr.)	Table fish (kg/yr.)
Samegrelo Zemo Svaneti	Pond culture	Carps	Gejeti	1	130	-	-	26 000
			Gejeti 2	1	230	-	200 000	2 000
			Kolobani	1	120	-	-	24 000
			Nokalakevi	1	120	-	-	24 000
			Senaki	1	65	-	-	15 000
		Carps total		**5**	**665**	**-**	**200 000**	**91 000**
Samegrelo Zemo Svaneti total				**5**	**665**	**-**	**200 000**	**91 000**
Samtskhe-Javakheti	Pond/Tank Culture	Trouts, carps	Borjomi	1	8	-	-	2 000
		Trouts, carps total		**1**	**8**	**-**	**-**	**2 000**
	Tank culture	Trouts	Bejano	1	3	-	-	3 000
		Trouts total		**1**	**3**	**-**	**-**	**3 000**
Samtskhe-Javakheti total				**2**	**11**	**-**	**-**	**5 000**
Shida Kartli	Pond/tank culture	Trouts, carps	Kachreti	1	5	1 000	-	14 000
		Trouts, Carps total		**1**	**5**	**1 000**	**-**	**14 000**
	Tank culture	Trouts	Gori	1	-	800	-	2 500
			Ruisi	1	-	4 000	-	28 000
			Variani	1	-	10 000	-	2 500
		Trouts total		**3**	**-**	**14 800**	**-**	**33 000**
Shida Kartli total				**4**	**5**	**15 800**	**-**	**47 000**
Grand total				**41**	**2 450**	**23 500**	**950 000**	**466 000**

Source: A. Phartsvania, 2008

Table 2.9: Estimated production of different fish culture systems in Georgia

Produced fishes	Name of farm	Number of farms	Area of production units		Production per farm		Production per unit area		
			Ponds (ha)	Tanks (m^2)	Fingerling (#/yr.)	Table fish (kg/yr.)	Fingerling (#/ha)	Table fish (kg/ha)	Table fish (kg/m^3)
Pond culture									
Carps	Sagarejo	1	200	-	-	40 000	-	200.0	-
	Terjola	1	12	-	-	3 000	-	250.0	-
	Alvani	1	180	-	500 000	5 000	2 778	27.8	-
	Bashi	1	27	-	-	5 400	-	200.0	-
	Bulachauri	1	18	-	-	3 600	-	200.0	-
	Chokhatauri	1	15	-	-	2 500	-	166.7	-
	Cnori	1	23	-	-	5 000	-	217.4	-
	Djafaridze	1	53	-	-	11 000	-	207.5	-
	Djapana	1	200	-	-	40 000	-	200.0	-
	Djicha	1	25	-	-	5 000	-	200.0	-
	Djikhaishi	1	18	-	50 000	36 500	2 778	2 027.8	-
	Djimiti	1	15	-	-	30 000	-	2 000.0	-
	Eceri	1	15	-	-	3 000	-	200.0	-
	Ganiri	1	28	-	-	6 000	-	214.3	-
	Gejeti	1	130	-	-	26 000	-	200.0	-
	Gejeti 2	1	230	-	200 000	2 000	870	8.7	-
	Gvishtibi	1	35	-	-	-	-	-	-
	Kachaberi	1	100	-	-	20 000	-	200.0	-
	Kolobani	1	120	-	-	24 000	-	200.0	-
	Kondoli	1	35	-	-	7 000	-	200.0	-
	Kumisi	1	450	-	-	50 000	-	111.1	-
	Maglaki	1	45	-	-	9 000	-	200.0	-
	Nokalakevi	1	120	-	-	24 000	-	200.0	-
	Senaki	1	65	-	-	15 000	-	230.8	-
	Ulianovka	1	45	-	200 000	2 000	4 444	44.4	-
	Varciche	1	15	-	-	3 000	-	200.0	-
	Total	**26**	**2 219**	**-**	**950 000**	**378 000**	**428**	**170.3**	**-**

Produced fishes	Name of farm	Number of farms	Area of production units		Production per farm		Production per unit area		
			Ponds (ha)	Tanks (m^2)	Fingerling (#/yr.)	Table fish (kg/yr.)	Fingerling (#/ha)	Table fish (kg/ha)	Table fish (kg/m^3)
Carps, catfish	Telavi	1	70	-	-	14 000	-	200.0	-
	Total	**1**	**70**	**-**	**-**	**14 000**	**-**	**200.0**	**-**
Sturgeon	Geguti	1	35	-	-	7 000	-	200.0	-
	Total	**1**	**35**	**-**	**-**	**7 000**	**-**	**200.0**	**-**
Sturgeon, carps, catfish	GF-S Company	1	100	-	-	-	-	-	-
	Total	**1**	**100**	**-**	**-**	**-**	**-**	**-**	**-**
Trouts, carps	Sachkhere	1	2	2 000	-	2 000	-	1 111.1	1.0
	Borjomi	1	8	-	-	2 000	-	250.0	-
	Kachreti	1	5	1 000	-	14 000	-	2 857.1	14.0
	Sioni	1	8	-	-	-	-	-	-
	Total	**4**	**23**	**3 000**	**-**	**18 000**	**-**	**793.0**	**6.0**
Pond culture total		**33**	**2 447**	**3 000**	**950 000**	**417 000**	**388**	**170.4**	**-**
Tank culture									
Trouts	Bejano	1	3	-	-	3 000			-
	Gori	1	-	800	-	2 500			3.1
	Gurgeniani	1	-	1 200	-	6 000			5.0
	Kumistavi	1	-	1 000	-	1 500			1.5
	Pasanauri	1	-	1 500	-	2 500			1.7
	Ruisi	1	-	4 000	-	28 000			7.0
	Shakhvetila	1	-	2 000	-	3 000			1.5
	Variani	1	-	10 000	-	2 500			0.3
	Total	8	3	20 500	-	49 000			2.4
Tank culture total		**8**	**3**	**20 500**	**-**	**49 000**			**2.4**
Grand total		**41**	**2 450**	**23 500**	**950 000**	**466 000**			**-**

Source: A. Phartsvania, 2008

Table 2.10: Marine and inland fish species of Georgia according to different sources

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	**total**	Both sources	FishBase	M. Khavtasi	**total**	
Lampreys											
Petromyzontiformes	Petromyzontidae	Eudontomyzon mariae					1			1	1
Petromyzontiformes	**Petromyzontidae total**						**1**			**1**	**1**
Petromyzontiformes total							**1**			**1**	**1**
							1			**1**	**1**
Sharks and rays											
Carcharhiniformes	Scyliorhinidae	Scyliorhinus capensis			1	1					1
Carcharhiniformes	**Scyliorhinidae total**				**1**	**1**					**1**
Carcharhiniformes total					**1**	**1**					**1**
Squaliformes	Squalidae	Squalus acanthias		1		1					1
Squaliformes	**Squalidae total**			**1**		**1**					**1**
Squaliformes total				**1**		**1**					**1**
Rajiformes	Dasyatidae	Dasyatis pastinaca	1			1					1
Rajiformes	**Dasyatidae total**		**1**			**1**					**1**
Rajiformes	Gymnuridae	Gymnura altavela		1		1					1
Rajiformes	**Gymnuridae total**			**1**		**1**					**1**
Rajiformes	Rajidae	Raja clavata			1	1					1
Rajiformes	**Rajidae total**				**1**	**1**					**1**
Rajiformes total			**1**	**1**	**1**	**3**					**3**
Sharks and rays			**1**	**2**	**2**	**5**					**5**
Ray-finned fishes											
Acipenserifirmes	Acipenseridae	Acipenser gueldenstaedtii						1		1	1
Acipenserifirmes	Acipenseridae	Acipenser guldenstaedtii Colchicus							1	1	1
Acipenserifirmes	Acipenseridae	Acipenser nudiventris					1			1	1
Acipenserifirmes	Acipenseridae	Acipenser persicus						1		1	1
Acipenserifirmes	Acipenseridae	Acipenser ruthenus						1		1	1
Acipenserifirmes	Acipenseridae	Acipenser stellatus					1			1	1
Acipenserifirmes	Acipenseridae	Acipenser sturio					1			1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Acipenserifirmes	Acipenseridae	Huso huso					1			1	1
Acipenserifirmes	**Acipenseridae total**						**4**	**3**	**1**	**8**	**8**
Acipenserifirmes total							**4**	**3**	**1**	**8**	**8**
Anguilliformes	Anguillidae	Anguilla anguilla					1			1	1
Anguilliformes	**Anguillidae total**						**1**			**1**	**1**
Anguilliformes total							**1**			**1**	**1**
Clupeiformes	Clupeidae	Alosa caspia caspia						1		1	1
Clupeiformes	Clupeidae	Alosa caspia paliastomi			1	1					1
Clupeiformes	Clupeidae	Alosa Caspia tanaica			1	1					1
Clupeiformes	Clupeidae	Alosa Kesleri Pontica			1	1					1
Clupeiformes	Clupeidae	Alosa Kesleri Pontica Pontica			1	1					1
Clupeiformes	Clupeidae	Alosa maeotica		1		1					1
Clupeiformes	Clupeidae	Alosa pontica						1		1	1
Clupeiformes	Clupeidae	Glupeonella delikatula delikatula			1	1					1
Clupeiformes	Clupeidae	Sardina pilchardus		1		1					1
Clupeiformes	Clupeidae	Sardinella aurita	1			1					1
Clupeiformes	Clupeidae	Sprattus sprattus phalericus			1	1					1
Clupeiformes	Clupeidae	Sprattus sprattus sprattus		1		1					1
Clupeiformes	**Clupeidae total**		**1**	**3**	**6**	**10**		**2**		**2**	**12**
Clupeiformes	Engraulidae	Engraulis encrasicolus		1		1					1
Clupeiformes	Engraulidae	Engraulis engraulis moeticus			1	1					1
Clupeiformes	Engraulidae	Engraulis engraulis pontichs			1	1					1
Clupeiformes	**Engraulidae total**			**1**	**2**	**3**					**3**
Clupeiformes total			**1**	**4**	**8**	**13**		**2**		**2**	**15**
Cypriniformes	Balitoridae	Barbatula merga						1		1	1
Cypriniformes	Balitoridae	Nemacheilus angorae							1	1	1
Cypriniformes	Balitoridae	Nemacheilus brandti							1	1	1
Cypriniformes	Balitoridae	Orthrias brandtii						1		1	1
Cypriniformes	**Balitoridae total**							**2**	**2**	**4**	**4**
Cypriniformes	Cobitidae	Cobitis aurata							1	1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Cypriniformes	Cobitidae	Cobitis melanoleuca						1		1	1
Cypriniformes	Cobitidae	Cobitis satunini						1		1	1
Cypriniformes	Cobitidae	Cobitis taenia							1	1	1
Cypriniformes	Cobitidae	Misgurnus fossilis						1		1	1
Cypriniformes	Cobitidae	Sabanejewia aurata aurata						1		1	1
Cypriniformes	Cobitidae	Sabanejewia caspia						1		1	1
Cypriniformes	Cobitidae	Sabanejewia caucasica						1		1	1
Cypriniformes	**Cobitidae total**							**6**	**2**	**8**	**8**
Cypriniformes	Cyprinidae	Abramis bjoerkna							1	1	1
Cypriniformes	Cyprinidae	Abramis brama						1		1	1
Cypriniformes	Cyprinidae	Abramis brama orientalis							1	1	1
Cypriniformes	Cyprinidae	Abramis sara							1	1	1
Cypriniformes	Cyprinidae	Acanthalburnus microlepis					1			1	1
Cypriniformes	Cyprinidae	Alburnoides bipunctatus					1			1	1
Cypriniformes	Cyprinidae	Alburnus albidus							1	1	1
Cypriniformes	Cyprinidae	Alburnus alburnus							1	1	1
Cypriniformes	Cyprinidae	Alburnus charusini							1	1	1
Cypriniformes	Cyprinidae	Alburnus filippii					1			1	1
Cypriniformes	Cyprinidae	Aristichtis nobilis						1		1	1
Cypriniformes	Cyprinidae	Aspius aspius					1			1	1
Cypriniformes	Cyprinidae	Ballerus ballerus						1		1	1
Cypriniformes	Cyprinidae	Barbus barbus Chanari							1	1	1
Cypriniformes	Cyprinidae	Barbus barbus Colchicus							1	1	1
Cypriniformes	Cyprinidae	Barbus barbus Mtkvari							1	1	1
Cypriniformes	Cyprinidae	Barbus capito capito						1		1	1
Cypriniformes	Cyprinidae	Barbus cyclolepis						1		1	1
Cypriniformes	Cyprinidae	Barbus lacerta						1		1	1
Cypriniformes	Cyprinidae	Barbus mursa							1	1	1
Cypriniformes	Cyprinidae	Blicca bjoerkna					1			1	1
Cypriniformes	Cyprinidae	Blicca bjoerkna transcaucasica							1	1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	**total**	Both sources	FishBase	M. Khavtasi	**total**	
Cypriniformes	Cyprinidae	Capoeta capoeta capoeta						1		1	1
Cypriniformes	Cyprinidae	Carassius auratus							1	1	1
Cypriniformes	Cyprinidae	Carassius carassius					1			1	1
Cypriniformes	Cyprinidae	Carassius gibelio						1		1	1
Cypriniformes	Cyprinidae	Chalcalburnus chalcoides					1			1	1
Cypriniformes	Cyprinidae	Chondrostoma arcasii Colchicus							1	1	1
Cypriniformes	Cyprinidae	Chondrostoma colchicum						1		1	1
Cypriniformes	Cyprinidae	Chondrostoma cyri					1			1	1
Cypriniformes	Cyprinidae	Chondrostoma shmidti							1	1	1
Cypriniformes	Cyprinidae	Ctenopharyngodon idella					1			1	1
Cypriniformes	Cyprinidae	Cyprinus carpio							1	1	1
Cypriniformes	Cyprinidae	Cyprinus carpio carpio						1		1	1
Cypriniformes	Cyprinidae	Cyprinus carpio morpha hungaricus							1	1	1
Cypriniformes	Cyprinidae	Gobio gobio							1	1	1
Cypriniformes	Cyprinidae	Gobio gobio gobio						1		1	1
Cypriniformes	Cyprinidae	Hypophthalmichthys molitrix					1			1	1
Cypriniformes	Cyprinidae	Leucaspius delineatus						1		1	1
Cypriniformes	Cyprinidae	Leuciscus cephalus						1		1	1
Cypriniformes	Cyprinidae	Leuciscus cephalus Orientalis							1	1	1
Cypriniformes	Cyprinidae	Leuciscus idus						1		1	1
Cypriniformes	Cyprinidae	Leuciscus leuciscus						1		1	1
Cypriniformes	Cyprinidae	Pelecus cultratus						1		1	1
Cypriniformes	Cyprinidae	Petroleuciscus borysthenicus					1			1	1
Cypriniformes	Cyprinidae	Phoxinus phoxinus						1		1	1
Cypriniformes	Cyprinidae	Phoxinus phoxinus Colchicum							1	1	1
Cypriniformes	Cyprinidae	Rhodeus colchicus						1		1	1
Cypriniformes	Cyprinidae	Rhodeus sericeus						1		1	1
Cypriniformes	Cyprinidae	Rhodeus sericeus amarius (Bloch)							1	1	1
Cypriniformes	Cyprinidae	Romanogobio ciscaucasicus						1		1	1
Cypriniformes	Cyprinidae	Romanogobio pentatrichus						1		1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Cypriniformes	Cyprinidae	Rutilus frisii					1			1	1
Cypriniformes	Cyprinidae	Rutilus rutilus							1	1	1
Cypriniformes	Cyprinidae	Rutilus rutilus caspicus							1	1	1
Cypriniformes	Cyprinidae	Scardinius erythrophthalmus					1			1	1
Cypriniformes	Cyprinidae	Tinca tinca					1			1	1
Cypriniformes	Cyprinidae	Varicorhinus capoeta					1			1	1
Cypriniformes	Cyprinidae	Varicorhinus colchicus							1	1	1
Cypriniformes	Cyprinidae	Varicorhinus sebvany							1	1	1
Cypriniformes	Cyprinidae	Varicorhinus tinca, Berg 1914							1	1	1
Cypriniformes	Cyprinidae	Vimba vimba						1		1	1
Cypriniformes	Cyprinidae	Vimba vimba Tenella							1	1	1
Cypriniformes	Cyprinidae	Vimba vimba vimba n.carinata							1	1	1
Cypriniformes	**Cyprinidae total**						**15**	**22**	**27**	**64**	**64**
Cypriniformes total							**15**	**30**	**31**	**76**	**76**
Siluriformes	Siluridae	Silurus chantrei						1		1	1
Siluriformes	Siluridae	Silurus glanis					1			1	1
Siluriformes	**Siluridae total**						**1**	**1**		**2**	**2**
Siluriformes total							**1**	**1**		**2**	**2**
Esociformes	Esocidae	Esox lucius						1		1	1
Esociformes	Esocidae	Rhamphochromis esox							1	1	1
Esociformes	**Esocidae total**							**1**	**1**	**2**	**2**
Esociformes total								**1**	**1**	**2**	**2**
Salmoniformes	Salmonidae	Coregonus albula							1	1	1
Salmoniformes	Salmonidae	Coregonus lavaretus							1	1	1
Salmoniformes	Salmonidae	Coregonus peled							1	1	1
Salmoniformes	Salmonidae	Oncorhynchus mykiss						1		1	1
Salmoniformes	Salmonidae	Salmo fario							1	1	1
Salmoniformes	Salmonidae	Salmo irideus							1	1	1
Salmoniformes	Salmonidae	Salmo ischchan							1	1	1
Salmoniformes	Salmonidae	Salmo labrax						1		1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Salmoniformes	Salmonidae	Salmo trutta labrax			1	1					1
Salmoniformes	Salmonidae	Salmo trutta morpha lacustris							1	1	1
Salmoniformes	**Salmonidae total**				**1**	**1**		**2**	**7**	**9**	**10**
Salmoniformes total					**1**	**1**		**2**	**7**	**9**	**10**
Atheriniformes	Atherinidae	Atherina boyeri	1			1					1
Atheriniformes	**Atherinidae total**		**1**			**1**					**1**
Atheriniformes total			**1**			**1**					**1**
Gadiformes	Gadidae	Merlangius merlangus		1		1					1
Gadiformes	Gadidae	Merluccins merluccins	1			1					1
Gadiformes	Gadidae	Odontogadus merlangus muxinus			1	1					1
Gadiformes	**Gadidae total**		**1**	**1**	**1**	**3**					**3**
Gadiformes	Lotidae	Gaidropsarus mediterraneus		1		1					1
Gadiformes	**Lotidae total**			**1**		**1**					**1**
Gadiformes total			**1**	**2**	**1**	**4**					**4**
Ophidiifromes	Ophidiidae	Ophidion rachei			1	1					1
Ophidiifromes	**Ophidiidae total**				**1**	**1**					**1**
Ophidiifromes total					**1**	**1**					**1**
Lophiiformes	Lophiidae	Lophius piscatorius			1	1					1
Lophiiformes	**Lophiidae total**				**1**	**1**					**1**
Lophiiformes total					**1**	**1**					**1**
Gobiesociformes	Gobiesocidae	Lepadogaster Lepatogaster			1	1					1
Gobiesociformes	**Gobiesocidae total**				**1**	**1**					**1**
Gobiesociformes total					**1**	**1**					**1**
Gasterosteiformes	Gasterosteidae	Gasterosteus aculeatus			1	1					1
Gasterosteiformes	**Gasterosteidae total**				**1**	**1**					**1**
Gasterosteiformes total					**1**	**1**					**1**
Cyprinodontiformes	Poeciliidae	Gambusia affinis					1			1	1
Cyprinodontiformes	**Poeciliidae total**						**1**			**1**	**1**
Cyprinodontiformes total							**1**			**1**	**1**
Beloniformes	Belonidae	Belone belone		1		1					1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	**total**	Both sources	FishBase	M. Khavtasi	**total**	
Beloniformes	Belonidae	Belone belone euxini			1	1					1
Beloniformes	**Belonidae total**			**1**	**1**	**2**					**2**
Beloniformes total				**1**	**1**	**2**					**2**
Zeiformes	Zeidae	Zeus faber			1	1					1
Zeiformes	**Zeidae total**				**1**	**1**					**1**
Zeiformes total					**1**	**1**					**1**
Gasterosteiformes	Gasterosteidae	Gasterosteus aculeatus aculeatus						1		1	1
Gasterosteiformes	**Gasterosteidae total**							**1**		**1**	**1**
Gasterosteiformes total								**1**		**1**	**1**
Syngnathiformes	Syngnathidae	Hippocampus guttulatus			1	1					1
Syngnathiformes	Syngnathidae	Hippocampus hippocampus		1		1					1
Syngnathiformes	Syngnathidae	Nerophis hidion teres			1	1					1
Syngnathiformes	Syngnathidae	Nerophis ophidian teres			1	1					1
Syngnathiformes	Syngnathidae	Nerophis ophidion						1		1	1
Syngnathiformes	Syngnathidae	Syngnathus abaster	1			1					1
Syngnathiformes	Syngnathidae	Syngnathus acus		1		1					1
Syngnathiformes	Syngnathidae	Syngnathus nigrolineatus			1	1					1
Syngnathiformes	Syngnathidae	Syngnathus schmidti						1		1	1
Syngnathiformes	Syngnathidae	Syngnathus tenuirostris			1	1					1
Syngnathiformes	**Syngnathidae total**		**1**	**2**	**5**	**8**		**2**		**2**	**10**
Syngnathiformes total			**1**	**2**	**5**	**8**		**2**		**2**	**10**
Scorpaeniformes	Scorpaenidae	Scorpaena porcus	1			1					1
Scorpaeniformes	**Scorpaenidae total**		**1**			**1**					**1**
Scorpaeniformes	Triglidae	Eutrigla gurnardus		1		1					1
Scorpaeniformes	Triglidae	Trigla gurnardus			1	1					1
Scorpaeniformes	**Triglidae total**			**1**	**1**	**2**					**2**
Scorpaeniformes total			**1**	**1**	**1**	**3**					**3**
Perciformes	Ammodytidae	Gymnammodytes cicerellus			1	1					1
Perciformes	**Ammodytidae total**				**1**	**1**					**1**
Perciformes	Blenniidae	Blennius sanguinolentus			1	1					1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	**total**	Both sources	FishBase	M. Khavtasi	**total**	
Perciformes	Blenniidae	Blennius sphinx			1	1					1
Perciformes	Blenniidae	Blennius tentacularis Brunnic			1	1					1
Perciformes	Blenniidae	Blennius Zvonimiri Kolombatovie			1	1					1
Perciformes	Blenniidae	Coryphoblenius galerita			1	1					1
Perciformes	Blenniidae	Parablennius sanguinolentus		1		1					1
Perciformes	**Blenniidae total**			**1**	**5**	**6**					**6**
Perciformes	Callionymidae	Callionymus belenus			1	1					1
Perciformes	Callionymidae	Callionymus festivus			1	1					1
Perciformes	Callionymidae	Callionymus lyra			1	1					1
Perciformes	**Callionymidae total**				**3**	**3**					**3**
Perciformes	Carangidae	Trachurus mediterraneus ponticus			1	1					1
Perciformes	**Carangidae total**				**1**	**1**					**1**
Perciformes	Centracanthidae	Spicara maena		1		1					1
Perciformes	Centracanthidae	Spicara smaris	1			1					1
Perciformes	**Centracanthidae total**		**1**	**1**		**2**					**2**
Perciformes	Centrarchidae	Lepomis gibbosus		1		1					1
Perciformes	**Centrarchidae total**			**1**		**1**					**1**
Perciformes	Gobiidae	Aphia minuta		1		1					1
Perciformes	Gobiidae	Benthophilus grimmi		1		1					1
Perciformes	Gobiidae	Benthophilus stellatus						1		1	1
Perciformes	Gobiidae	Gobius cavcasius			1	1					1
Perciformes	Gobiidae	Gobius cephalarges			1	1					1
Perciformes	Gobiidae	Gobius cephalarges canstructor							1	1	1
Perciformes	Gobiidae	Gobius gimnotrachelus			1	1					1
Perciformes	Gobiidae	Gobius gulosus (Smith, 1936)			1	1					1
Perciformes	Gobiidae	Gobius hypselosoma			1	1					1
Perciformes	Gobiidae	Gobius melanostomus			1	1					1
Perciformes	Gobiidae	Gobius niger		1		1					1
Perciformes	Gobiidae	Gobius paganellus		1		1					1
Perciformes	Gobiidae	Gobius ratan			1	1					1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Perciformes	Gobiidae	Knipowitschia longecaudata							1	1	1
Perciformes	Gobiidae	Mesogobius batrachocephalus						1		1	1
Perciformes	Gobiidae	Neogobius cyrius						1		1	1
Perciformes	Gobiidae	Neogobius fluviatilis fluviatilis					1			1	1
Perciformes	Gobiidae	Neogobius gymnotrachelus						1		1	1
Perciformes	Gobiidae	Neogobius melanostomus						1		1	1
Perciformes	Gobiidae	Neogobius platyrostris						1		1	1
Perciformes	Gobiidae	Neogobius rhodioni						1		1	1
Perciformes	Gobiidae	Pomatoschistus marmoratus		1		1					1
Perciformes	Gobiidae	Proterorhinus marmoratus					1			1	1
Perciformes	**Gobiidae total**			**5**	**7**	**12**	**2**	**7**	**2**	**11**	**23**
Perciformes	Istiophoridae	Istiophorus albicans		1		1					1
Perciformes	**Istiophoridae total**			**1**		**1**					**1**
Perciformes	Labridae	Crenilabr ocelatus			1	1					1
Perciformes	Labridae	Grenilabrus guinguemacubeirus			1	1					1
Perciformes	Labridae	Symphodus cinereus		1		1					1
Perciformes	Labridae	Symphodus roissali		1		1					1
Perciformes	Labridae	Symphodus tinca		1		1					1
Perciformes	**Labridae total**			**3**	**2**	**5**					**5**
Perciformes	Moronidae	Dicentrarchus labrax		1		1					1
Perciformes	**Moronidae total**			**1**		**1**					**1**
Perciformes	Mullidae	Mullus barbatus ponticus			1	1					1
Perciformes	Mullidae	Mullus surmuletus		1		1					1
Perciformes	**Mullidae total**			**1**	**1**	**2**					**2**
Perciformes	Trachinidae	Trachinus draco			1	1					1
Perciformes	**Trachinidae total**				**1**	**1**					**1**
Perciformes	Uranoscopidae	Romanogobio uranoscopus			1	1					1
Perciformes	**Uranoscopidae total**				**1**	**1**					**1**
Perciformes	Percidae	Parca fluviatilis					1			1	1
Perciformes	Percidae	Percarina demidoffii						1		1	1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Perciformes	Percidae	Stizostedion lucioperca					1			1	1
Perciformes	**Percidae total**						**2**	**1**		**3**	**3**
Perciformes	Pomatomidae	Pomatomus saltatrix	1			1					1
Perciformes	**Pomatomidae total**		**1**			**1**					**1**
Perciformes	Sciaenidae	Sciaena umbra	1			1					1
Perciformes	Sciaenidae	Umbrina cirrosa			1	1					1
Perciformes	**Sciaenidae total**		**1**		**1**	**2**					**2**
Perciformes	Scombridae	Auxis rochei rochei		1		1					1
Perciformes	Scombridae	Sarda sarda	1			1					1
Perciformes	Scombridae	Scomber scombrus	1			1					1
Perciformes	Scombridae	Thunnus thynnus			1	1					1
Perciformes	**Scombridae total**		**2**	**1**	**1**	**4**					**4**
Perciformes	Serranidae	Epinephelus caninus		1		1					1
Perciformes	Serranidae	Epinephelus costae		1		1					1
Perciformes	Serranidae	Morone labrax			1	1					1
Perciformes	Serranidae	Sander lucioperca			1	1					1
Perciformes	Serranidae	Serranus seriba	1			1					1
Perciformes	**Serranidae total**		**1**	**2**	**2**	**5**					**5**
Perciformes	Sparidae	Boops boops		1		1					1
Perciformes	Sparidae	Boops salpa			1	1					1
Perciformes	Sparidae	Diplodus annularis	1			1					1
Perciformes	Sparidae	Diplodus puntazzo		1		1					1
Perciformes	Sparidae	Puntazzo bleeker			1	1					1
Perciformes	Sparidae	Sparus aurata			1	1					1
Perciformes	**Sparidae total**		**1**	**2**	**3**	**6**					**6**
Perciformes	Xiphiidae	Xiphias gladius			1	1					1
Perciformes	**Xiphiidae total**				**1**	**1**					**1**
Perciformes total			**7**	**19**	**30**	**56**	**4**	**8**	**2**	**14**	**70**
Pleuronectifromes	Bothidae	Arnoglossus kessleri	1			1					1
Pleuronectifromes	Bothidae	Scophtanmus maeoticus maeoticus			1	1					1

Order - Latin	Family - Latin	Scientific name	1. Marine waters				2. Inland waters				Grand total
			Both sources	FishBase	M. Khavtasi	total	Both sources	FishBase	M. Khavtasi	total	
Pleuronectifromes	**Bothidae total**		**1**		**1**	**2**					**2**
Pleuronectifromes	Pleuronectidae	Flounder flesus			1	1					1
Pleuronectifromes	Pleuronectidae	Hippoglossus hippoglossus			1	1					1
Pleuronectifromes	**Pleuronectidae total**				**2**	**2**					**2**
Pleuronectifromes	Scophthalmidae	Psetta maeotica		1		1					1
Pleuronectifromes	Scophthalmidae	Scophthalmus rhombus		1		1					1
Pleuronectifromes	**Scophthalmidae total**			**2**		**2**					**2**
Pleuronectifromes	Soleidae	Pegusa lascaris		1		1					1
Pleuronectifromes	Soleidae	Solea lascaris nasuta			1	1					1
Pleuronectifromes	**Soleidae total**			**1**	**1**	**2**					**2**
Pleuronectifromes total			**1**	**3**	**4**	**8**					**8**
Tetraodontiformes	Balistidae	Balistes capriscus			1	1					1
Tetraodontiformes	**Balistidae total**				**1**	**1**					**1**
Tetraodontiformes total					**1**	**1**					**1**
Mugiliformes	Mugilidae	Liza aurata	1			1					1
Mugiliformes	Mugilidae	Liza saliens	1			1					1
Mugiliformes	Mugilidae	Mugil auratus			1	1					1
Mugiliformes	Mugilidae	Mugil cephalus	1			1					1
Mugiliformes	Mugilidae	Mugil soiuy			1	1					1
Mugiliformes	**Mugilidae total**		**3**		**2**	**5**					**5**
Mugiliformes total			**3**		**2**	**5**					**5**
Ray-finned Fishes total			**16**	**32**	**59**	**107**	**26**	**50**	**42**	**118**	**225**
Grand total			**17**	**34**	**61**	**112**	**27**	**50**	**42**	**119**	**231**

Source: M. Khavtasi, 2008, Froese, Pauly, 2008

Table 3.1: Licensing system for marine fisheries in Georgia

1st Application					
Name of permission	**Length of time to complete procedure**	**Related expenses**		**Responsible authority to issues licence**	**Observations**
		GEL	**USD**		
Anchovy fishery of Georgia					
Total of 4 lots for 54,000 tonnes per year	License fee total on auction	8 000 000	5 797 101	Ministry of Economic Development of Georgia	In agreement with the Ministry of Environment (Licensing and Permission Department)
	Natural resource tax per catch (GEL/tonne)	25	18		
	Natural resource tax per catch (Total GEL)	1 350 000	978 261		
1 lot of 13,500 tonnes catch per year	License fee per lot on auction	2 000 000	1 449 275		
	Natural resource tax per catch (Total GEL)	337 500	244 565		
Total of 50 lots for 6,000 tonnes per year	License fee total on auction	8 000 000	5 797 101		
	Natural resource tax per catch (Total GEL)	150 000	108 696		
1 lot of 1,500 tonnes catch per year	License fee per lot on auction	4 000 000	2 898 551		
	Natural resource tax per catch (Total GEL)	37 500	27 174		
Black Sea coastal fishery					
Total of 20 lots for 240 tonnes per year	License fee total on auction	14 000	10 145	Ministry of Economic Development of Georgia	In agreement with the Ministry of Environment (Licensing and Permission Department)
	Natural resource tax per catch (GEL/tonne)	25	18		
	Natural resource tax per catch (Total GEL)	6 000	4 348		
1 lot of 12 tonnes catch per year	License fee per lot on auction (GEL 604 - 800)	700	507		
	Natural resource tax per catch (Total GEL)	300	217		

Source: Mathews, 2007

Table 3.2: Licensing system in Lake Paliastomi coastal fishery

1st Application					
Name of permission	**Length of time to complete procedure**	**Related expenses**		**Responsible authority to issues licence**	**Observations**
		GEL	**USD**		
Total of 4 lots for 40 tonnes per year	License fee total on auction	2 800	2 029	Ministry of Economic Development of Georgia	In agreement with the Ministry of Environment (Licensing and Permission Department)
	Natural resource tax per catch (GEL/tonne)	25	18		
	Natural resource tax per catch (Total GEL)	1 000	725		
1 lot of 12 tonnes catch per year	License fee per lot on auction (GEL 600 - 800)	700	507		
	Natural resource tax per catch (Total GEL)	250	181		

Source: Mathews, 2007

Table 3.3: Fishery licence for inland water bodies in Georgia

1st Application					
Name of permission	**Length of time to complete procedure**	**Related expenses**		**Responsible authority to issues licence**	**Observations**
		GEL	**USD**		
One time fishery license	30 days beginning from submitting of application	-	-	Ministry of Economic Development of Georgia	In agreement with the Ministry of Environment (Licensing and Permission Department)
Long term fishery licence	30days	Cost of the licence as auction, determined also by quantity of fish indicated in application + 50 GEL for participation in auction.		Ministry of Economic Development of Georgia	License tax and a tax for admission to auction should be paid

Source: A. Phartsvania, 2008

Table 3.3: Fishery licence for inland water bodies in Georgia - Continuation

Renewal					
Name of permission	Length of time to complete procedure	Related expenses		Responsible authority to issues licence	Observations
		GEL	USD		
Once per year	30 days	-	-	Ministry of Economic Development of Georgia	In agreement with the Ministry of Environment (Licensing and Permission Department)
After license expiry date, or in case of violation of provisions of the license	30days	Cost of the licence as auction, determined also by quantity of fish indicated in application + 50 GEL for participation in auction.		Ministry of Economic Development of Georgia	In agreement with Ministry of Environment. In case of failure in the auction, the license tax is to be returned

Source: A. Phartsvania, 2008

Table 3.4: Licence for construction and upgrading fish farms

Name of permission	Length of time to complete procedure	Related expenses		Responsible authority to issues licence	Observations
		GEL	USD		
Old system					
The permission to impact on environment	20 day	500	362	Ministry of Economic Development of Georgia	Environmental Impact Assessment prepared by Ministry of Environment Protection and Natural resources of Georgia
The waste discharge permit	20 day	Expenses are proportional to level of pollution of sewage		Ministry of Environment Protection and Natural resources of Georgia	Auction is possible
Present system					
No permission is required					Tax for water use should be paid (GEL 0.01per m3). Water use tax according to the Law of Georgia on Taxation on Use of Natural Resources

Source: A. Phartsvania, 2008

Table 3.5: Licence for using surface water in fish farms

Name of permission	Length of time to complete procedure	Related expenses		Responsible authority to issues licence	Observations
		GEL	USD		
Licence for using surface water in fish farms	30 day	0.010	0.007	Ministry of Economic Development of Georgia	Price per m3 in the Caspian Sea Basin
		0.005	0.004		Price per m3 in the Black Sea Basin
					Water use tax according to the Law of Georgia on Taxation on Use of Natural Resources

Source: A. Phartsvania, 2008

Table 3.6: Licence for using underground water in fish farms

Name of permission	Length of time to complete procedure	Related expenses		Responsible authority to issues licence	Observations
		GEL	USD		
Licence for using underground water in fish farms	30 day	0.005	0.004	Ministry of Economic Development of Georgia	Fresh water per m3
		0.030	0.022		Thermal water per m3 between 40^0 and 60^0
		0.050	0.036		Thermal water per m3 between 60^0 and 80^0
		0.060	0.043		Thermal water per m3 between 80^0 and 100^0
		0.080	0.058		Thermal water per m3 over 100^0

Source: A. Phartsvania, 2008

Note: 1 GEL= **1.38** USD in Sep 2008

Table 3.7: Prices of main fishing equipment in 2008

Group	Item	Unit	Price (GEL/unit)			Price (USD/unit)		
			Min.	Avg.	Max.	Min.	Avg.	Max.
Boats	Fisheries boats ЛПТ- 7 and ЛПТ -8. Made in Russia. New	pc			11 500	-	-	8 333
	Boat " Казанка 5М4" Made in Russia, 2004 year., Engines "YAMAHA F40BETS" 2004 year	pc			11 200	-	-	8 116
	Boat " Казанка 5М4" Made in Russia, , Engines "Mercury 60" ,trailer	pc			9 600	-	-	6 957
	Boat " Казанка 6М" Made in Russia	pc			1 870	-	-	1 355
	Boats different	pc	2 200		9 300	1 594	-	6 739
Boat engines	Honda	pc	1 500		15 763	1 087	-	11 422
	Mercury	pc	1 210		6 733	877	-	4 879
	Yamaha	pc	1 000		19 800	725	-	14 348
	Suzuki	pc	1 230		9 360	891	-	6 783
	Tohatsu	pc	1 200		8 000	870	-	5 797
	Evinrude	pc	8 900		17 700	6 449	-	12 826
	Min Kotta, electrical engine	pc	374		615	271	-	446
Nets	Nets Profi , "Momoi Fishing" Japan	pc	1 300		5 642	942	-	4 088
	Nets "Chameleon" caprone, Standard, 30 metr	pc	640		734	464	-	532
	Nets "Chameleon" fishing line, Standard, 30 metr	pc	600		850	435	-	616
	Nets "Chameleon Extra" twisted fishing line, 30 - 60 metr	pc	1 050		1 550	761	-	1 123
	Nets "Chameleon Extra", Capron, fishing line	pc	910		1 063	659	-	770
	Nets "Chameleon Extra Sprut", Capron	pc	1 662		1 682	1 204	-	1 219
	Nets "Chameleon Extra Sprut", fishing line	pc	1 275		1 700	924	-	1 232
	Nets of different size in bags (Made in Russia)	bag	5 200		17 200	3 768	-	12 464
Ropes, floats, weights and hooks	Weights for net 20 - 150 gr.	pc	10		20	7	-	14
	Floats for nets	pc	2		60	1	-	43
	Hooks	pc	2		10	1	-	7
Freezers and ice making machines	Iindustrial ice maker	pc	8 400		105 000	6 087	-	76 087
	Industrial freezers	pc	12 000		225 000	8 696	-	163 043

Source: A. Phartsvania, 2008

Note: 1 GEL= **1.38** USD in Sep 2008

Table 3.8: Prices of main inputs of fisheries and aquaculture in Georgia in 2008

Group	Item	Unit	Price (GEL/unit)			Price (USD/unit)			Obser4vation
			Min.	Avg.	Max.	Min.	Avg.	Max.	
Fuel and energy	Diesel	litre	1.95		2.20	1.41	-	1.59	
	Petrol	litre	1.75		2.10	1.27	-	1.52	
	Electricity	kWh	0.13		0.18	0.09	-	0.13	
	Gas	m3	0.26		0.55	0.18	-	0.40	
Manures and fertilizer	Chicken manure	mt				-	-	-	Not available
	Pig manure	mt				-	-	-	Not available
	Cattle manure	mt				-	-	-	Not available
	Lime	mt	175	179	182	127	129	132	
	Urea	mt	320	357	394	232	259	286	
	Ammonium nitrate	mt	350	420	490	254	304	355	
	superphosphate	mt	640	645	650	464	467	471	
	double superphosphate	mt	1 200	1 400	1 600	870	1 014	1 159	
	triple superphosphate	mt	1 400	2 100	2 800	1 014	1 522	2 029	
Feeds	Wheat	mt	440	495	550	319	359	399	
	Maize	mt	316	319	322	229	231	233	
	Soya	mt	250	260	270	181	188	196	
	Clover	mt				-	-	-	No information
	Alfalfa	mt	250	300	350	181	217	254	
Chicken	Starter	mt	1 000	1 125	1 150	725	815	833	
	Pre grower	mt	1 000	1 025	1 050	725	743	761	
	Grower	mt	1 000	1 005	1 011	725	728	733	
	Layers mash	mt				-	-	-	Not available
	Broodstock feed	mt	790	820	850	572	594	616	
Trout feeds	Crumbles	kg	3.05	3.55	4.05	2.21	2.57	2.93	
	Micro pellets	kg	3.00	3.00	3.00	2.17	2.17	2.17	
	Pre grower	kg	2.00	2.18	2.35	1.45	1.58	1.70	
	Grower	kg	1.75	2.05	2.30	1.27	1.49	1.67	
	Broodstock feed	kg	2.40	2.60	2.80	1.74	1.88	2.03	

Group	Item	Unit	Price (GEL/unit)			Price (USD/unit)			Obser4vation
			Min.	Avg.	Max.	Min.	Avg.	Max.	
Sturgeon feeds	Artemia	kg				-	-	-	Not available
	Crumbles	kg	3.00		3.55	2.17	-	2.57	
	Micro pellets	kg	2.00		2.35	1.45	-	1.70	
	Pre grower	kg	1.70		1.90	1.23	-	1.38	
	Grower	kg	1.55		1.80	1.12	-	1.30	
	Broodstock feed	kg	1.75		2.00	1.27	-	1.45	
Salaries	Minimum wage	per month	150		200	109	-	145	
	Unskilled rural worker	per month	150		200	109	-	145	
	Skilled rural worker	per month	280		350	203	-	254	
	Foreman	per month	280		350	203	-	254	
	Technician	per month	300		500	217	-	362	
	Driver	per month	300		500	217	-	362	
	Secretary	per month	280		350	203	-	254	
	Manager	per month	500		1 400	362	-	1 014	

Source: A. Phartsvania, 2008

Note: 1 GEL= **1.38** USD in Sep 2008

Table 3.9: Prices of main outputs of inland fisheries and aquaculture in Georgia in 2008

Species	Age Group	Size (length or weight per fish)	Price per Fish (GEL/pc.)			Price per Weight (GEL/kg)			Price per Fish (USD/pc.)			Price per Weight (USD/kg)		
			Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.
Trout	Eyed egg (import)	-	0.012	0.016	0.020	800	1 000	1 200	0.009	0.012	0.014	580	725	870
	Fingerling	1-3 gr	0.150	0.200	0.250	40	45	50	0.109	0.145	0.181	29	33	36
	Table fish 1	200 - 300 gr	1.600	2.000	2.800	8	10	14	1.159	1.449	2.029	6	7	10
	Table fish 2	0.5 kg	4.00	5.00	7.00	8	10	14	2.90	3.62	5.07	6	7	10
Sturgeon	Fingerling	1 - 3 gr	1.00	1.20	1.40	500	950	1 400	0.72	0.87	1.01	362	688	1 014
	Juvenile	0.25-0.35 kg	6.50	8.00	9.50	20	24	29	4.71	5.80	6.88	14	17	21
	Table fish 1	1 kg	21.00	24.00	27.00	21	24	27	15.22	17.39	19.57	15	17	20
	Table fish 2	3 kg	63.00	72.00	81.00	21	24	27	45.65	52.17	58.70	15	17	20
Common carp	feeding larvae	Million pcs.	750	775	800				543	562	580	-	-	-
	Advanced fry	Million pcs.	800	850	900				580	616	652	-	-	-
	Fingerling	1 - 3 gr	0.10	0.13	0.15	100	130	150	0.07	0.09	0.11	72	94	109
	Juvenile	0.25-0.35 kg	1.50	2.15	2.50	5	7	9	1.09	1.56	1.81	4	5	6
	Table fish	> 3 kg	9.00	12.00	15.00	3	4	5	6.52	8.70	10.87	2	3	4
Silver carp and bighead carp	feeding larvae	Million pcs.	800	825	850				580	598	616	-	-	-
	Advanced fry	Million pcs.	825	850	875				598	616	634	-	-	-
	Fingerling	1-3 gr.	0.15	0.15	0.15	150	150	150	0.11	0.11	0.11	109	109	109
	Juvenile	0.25-0.35 kg	1.80	2.20	2.70	6	7	8	1.30	1.59	1.96	4	5	6
	Table fish	>3 kg	12.00	15.00	18.00	4	5	6	8.70	10.87	13.04	3	4	4
Grass carp	feeding larvae	Million pcs.	850	875	900				616	634	652	-	-	-
	Advanced fry	Million pcs.	850	875	900				616	634	652	-	-	-
	Fingerling	1-3 gr	0.15	0.18	0.20	8	10	11	0.11	0.13	0.14	6	7	8
	Juvenile	0.25-0.35 kg	1.60	2.13	2.67	5	6	8	1.16	1.55	1.93	3	5	6
	Table fish	>3 kg	12.00	15.00	18.00	4	5	6	8.70	10.87	13.04	3	4	4
Sevan khramulya	Table fish 1	0.05-0.10 kg	1.50	1.75	2.00	15	18	20	1.09	1.27	1.45	11	13	14
	Table fish 2	0,3 - 0,5 kg	2.00	3.00	4.00	7	8	8	1.45	2.17	2.90	5	5	6
European catfish	Fingerling	10 - 50 gr	0.70	0.85	1.00	7	8	10	0.51	0.62	0.72	5	6	7
	Juvenile	0.25-0.35 kg	2.67	3.00	3.33	8	9	10	1.93	2.17	2.42	6	7	7
	Table fish	> 7 kg	70.00	84.00	98.00	10	12	14	50.72	60.87	71.01	7	9	10

Source: A. Phartsvania, 2008

Note: 1 GEL= **1.38** USD in Sep 2008

Table 3.10: Model calculation of culture based fisheries on warming up natural waters covered densely with water weeds (Figures are rounded)

Species	Year of stocking	Stocking		Harvest			Length of growth and expectable size of fish
		Age group	No./ha	Min. kg/ha	Avg. kg/ha	Max. kg/ha	
Common carp	1st and subsequent years	Fry	150	10	15	20	2-3 years - weight of fish 1-2 kg
	1st year	Fingerling	40	15	20	25	1-2 years - weight of fish 1-2 kg
	1st year	2 summer old fish	20	15	20	25	0-1 years - weight of fish 1-2 kg
Silver carp	1st and subsequent years	Fry	230	30	35	40	2-3 years - weight of fish 1-2 kg
	1st year	Fingerling	50	20	25	30	1-2 years - weight of fish 1-2 kg
	1st year	2 summer old fish	20	15	20	25	0-1 years - weight of fish 1-2 kg
Grass carp	1st year	Fry	4 150	400	500	600	2-3 years - weight of fish 1-2 kg
	2nd year	Fry	2 100	200	250	300	1-2 years - weight of fish 1-2 kg
	Subsequent years	Fry	125	10	15	20	3-4 years - weight of fish 1-2 kg
Pike, pikeperch, catfish	1st and subsequent years	Fry	125	10	15	20	2-3 years - weight of fish 1 kg
Total results in the 1st year			**40**	**30**	**40**	**50**	
Total results in the 2nd year			**2 190**	**235**	**295**	**355**	
Total results in the 3rd year			**4 655**	**450**	**565**	**680**	
Total yearly results after the 3rd year			**630**	**60**	**80**	**100**	

Table 3.11: Model calculations of capture based fisheries on warming up natural waters normally covered with water weeds (Figures are rounded)

Species	Year of stocking	Stocking		Harvest			Length of growth and expectable size of fish
		Age group	No./ha	Min. kg/ha	Avg. kg/ha	Max. kg/ha	
Common carp	1st and subsequent years	Fry	150	10	15	20	2-3 years - weight of fish 1 kg
	1st year	Fingerling	40	10	15	20	1-2 years - weight of fish 1 kg
	1st year	2 summer old fish	20	10	15	20	0-1 years - weight of fish 1 kg
Silver carp	1st and subsequent years	Fry	230	30	35	40	2-3 years - weight of fish 1-2 kg
	1st year	Fingerling	50	20	25	30	1-2 years - weight of fish 1-2 kg
	1st year	2 summer old fish	20	15	20	25	0-1 years - weight of fish 1-2 kg
Grass carp	1st and subsequent years	Fry	125	10	15	20	2-3 years - weight of fish 1-2 kg
Pike, pikeperch, catfish	1st and subsequent years	Fry	125	10	15	20	2-3 years - weight of fish 1 kg
Total results in the 1st year			**40**	**25**	**35**	**45**	
Total results in the 2nd year			**90**	**30**	**40**	**50**	
Total results in the 3rd year			**630**	**60**	**80**	**100**	
Total yearly results after the 3rd year			**630**	**60**	**80**	**100**	

Table 3.12: Model calculations of fry production of selected fish species

Carps (common carp, silver carp and grass carp) - Production period: 30 days

Age group of fish	Average size of fish (gr.)	No.
Stocking of larvae	-	1 500 000
Harvested fry	1	750 000

Pike (production period: 30 - 40 days)

Age group of fish	Average size of fish (gr.)	No.
Stocking of larvae	-	100 000
Harvested fry	0.5	40 000

Pikeperch (production period: 30 - 40 days)

Age group of fish	Average size of fish (gr.)	No.
Stocking of nests	-	40
Harvested fry	0.5	50 000

European catfish (production period: 30 - 40 days)

Age group of fish	Average size of fish (gr.)	No.
Stocking of larvae	-	100 000
Harvested fry	0.5	40 000

Table 3.13: Model calculations of fingerling production of selected fish species in polyculture (Duration: 10 - 12 weeks)

Age group of fish	Average size of fish (gr.)	No.
Big advanced fry of common carp	1	70 000
Big advanced fry of silver carp	1	15 000
Big advanced fry of grass carp	1	30 000
Fry of pike, pikeperch, catfish	0.5	15 000
Total of stocked fish		**130 000**
Fingerling of common carp	10	35 000
Fingerling of silver carp	10	7 500
Fingerling of grass carp	10	15 000
Fingerling of pike, pikeperch, catfish	5	7 500
Total of harvested fish		**65 000**

Table 3.14: Model calculations of juvenile production of selected fish species in polyculture (Duration: 22 - 24 weeks)

Age group of fish	Average size of fish (gr.)	No.
Fingerling of common carp	10	8 000
Fingerling of silver carp	10	500
Fingerling of grass carp	10	1 500
Fingerling of pike, pikeperch, catfish	5	300
Total of stocked fish		**10 300**
2 summer old common carp	250	6 000
2 summer old silver carp	250	400
2 summer old grass carp	250	1 000
2 summer old pike, pikeperch, catfish	250	200
Total of harvested fish		**7 600**

Table 3.15: Model calculations of table fish production of selected fish species in 3 basic types of polyculture (Duration: 22 - 24 weeks)

Stocking and harvest by number of fish

Age group of fish	Average size of fish (gr.)	The production based on		
		Supplementary feeds	Green feeds	Manure and/or fertilizer
		Number/ha	Number/ha	Number/ha
2 summer old common carp	250	800	100	100
2 summer old silver carp	250	50	50	500
2 summer old grass carp	250	100	750	100
2 summer old pike, pikeperch, catfish	250	40	40	40
Total of stocked fish		**990**	**940**	**740**
Total of main inputs			**-**	**-**
Table fish of common carp	1 500	720	90	90
Table fish of silver carp	1 500	45	45	450
Table fish of grass carp	1 500	90	675	90
Table fish of pike, pikeperch, catfish	1 000	35	35	35
Total of harvested fish		**890**	**845**	**665**

Stocking and harvest by weight of fish

Age group of fish	Average size of fish (gr.)	The production based on		
		Supplementary feeds	Green feeds	Manure and/or fertilizer
		kg/ha	kg/ha	kg/ha
2 summer old common carp	250	200	25	25
2 summer old silver carp	250	15	15	125
2 summer old grass carp	250	25	190	25
2 summer old pike, pikeperch, catfish	250	10	10	10
Total of stocked fish		**250**	**240**	**185**
Total of main inputs			**-**	**-**
Table fish of common carp	1 500	1 060	135	135
Table fish of silver carp	1 500	70	70	695
Table fish of grass carp	1 500	135	1 010	135
Table fish of pike, pikeperch, catfish	1 000	35	35	35
Total of harvested fish		**1 300**	**1 250**	**1 000**

Table 4.1: Results of fisheries in Georgia in the distant and near pasts

Type or name of waters	Date or period	Species	Unit	Quantity per year		
				Min.	Avg.	Max.
All waters	1930	Salmonids	tonnes	-	6	-
	1930	Sturgeon	tonnes	-	87	-
	1930-1950	All	tonnes	2 300	-	7 600
	1950	All	tonnes	-	6 360	-
	1950	Salmonids	tonnes	-	20	-
	1950	Sturgeon	tonnes	-	61	-
	1960	All	tonnes	-	5 900	-
	1965	All	tonnes	-	16 990	-
	1980	All	tonnes	-	113 889	-
	1990	All	tonnes	-	5 067	-
Black Sea	1901	All	tonnes	-	5 700	-
	1930-1950	All	tonnes	2 162	-	7 144
	1950	All	tonnes	-	6 250	-
	1960	All	tonnes	-	5 730	-
	1965	All	tonnes	-	16 690	-
	1970	All	tonnes	-	35 130	-
	1980	All	tonnes	-	111 389	-
	1990	All	tonnes	-	4 879	-
All inland waters	1930-1950	All	tonnes	138	-	456
	1950	All	tonnes	-	110	-
	1960	All	tonnes	-	170	-
	1965	All	tonnes	-	300	-
	1980	All	tonnes	-	2 500	-
	1980-1990	All	tonnes	920	-	1 700
	1990	All	tonnes	-	188	-
Inland reservoirs	1950	All	tonnes	-	70	-
	1960	All	tonnes	-	140	-
	1965	All	tonnes	-	160	-
	1970	All	tonnes	-	140	-
Aquaculture	1930-1950	Trout - table fish	tonnes	-	260	-
	1930-1950	Trout fingerling	pc	-	2 500 000	-
	1950-1970	Black Sea trout	pc	-	400 000	-
	1960-1970	Black Sea trout	pc	120 000	-	565 000
	1970	All	tonnes	-	590	-
	1970-1980	Black Sea trout	pc	100 000	-	120 000
	1980-1990	All	tonnes	1 780	-	3 300
Black Sea, Batumi	1901	All	tonnes	-	2 260	-
Black Sea, Poti	1901	All	tonnes	-	400	-
Black Sea, Sukhumi	1901	All	tonnes	-	3 040	-
River Inguri and Khobi	1880s	Sturgeon	tonnes	-	660	-
River Rioni	1880s	Sturgeon	tonnes	-	660	-

Source: Van Anrooy, Mena Millar, Spreij, 2006

Table 4.2: Total fish production in the natural waters of Georgia between 1965 and 1980

Type of Waters	1965	1970	1975	1976	1977	1978	1979	1980
	Tonnes/year							
Lakes	140	140	270	220	190	190	190	260
Reservoirs	30	30	70	80	60	180	120	80
Rivers	20	10	20	10	10	-	-	130
Total	**190**	**180**	**360**	**310**	**260**	**370**	**310**	**470**

Source: Berka, 1989

Table 4.3: Estimated fish production per unit area in the natural waters of Georgia between 1965 and 1980

Type and Area of Waters	1965	1970	1975	1976	1977	1978	1979	1980
	Tonnes/ha/year							
Lakes (8.8 km2)	16	16	31	25	22	22	22	30
Reservoirs (7.5 km2)	4	4	9	11	8	24	16	11
Rivers (1,400 km – 3.5 km2)	6	3	6	3	3	-	-	37
Average	**10**	**9**	**18**	**16**	**13**	**19**	**16**	**24**

Source: Berka, 1989

Table 4.4: Results of capture fisheries and aquaculture in Georgia

Type	Species	Since Georgian production separately reported to FAO								
		1988-1990			1991-2004			2005-2007		
		Metric tons								
		Min.	Avg.	Max.	Min.	Avg.	Max.	2005	2006	2007
Marine areas	Abalones, winkles, conchs	-	-	-	-	221	711	150	300	600
	Cods, hakes, haddocks	2 293	6 000	8 002	-	108	413	33	37	41
	Flounders, halibuts, soles	-	3	8	-	3	11	5	-	-
	Herrings, sardines, anchovies	41 997	69 261	109 118	970	6 614	29 367	9 587	9 222	17 447
	Marine fishes not identified	507	1 210	1 608	-	240	1 327	20	10	-
	Miscellaneous coastal fishes	436	666	960	-	125	490	50	25	4
	Miscellaneous demersal fishes	36	47	60	-	15	92	-	-	-
	Miscellaneous pelagic fishes	58 016	73 334	81 345	-	2 952	26 078	55	55	53
	Shads	-	82	247	-	8	112	-	-	-
	Sharks, rays, chimaeras	61	135	217	1	77	550	20	10	2
	Squids, cuttlefishes, octopuses	-	74	205	-	11	114	-	-	-
	Sturgeons, paddlefishes	-	-	-	-	2	7	3	-	-
	Tunas, bonitos, billfishes	34	71	90	-	4	28	-	-	-
Grand total of marine areas		**103 380**	**150 884**	**201 860**	**971**	**10 379**	**59 300**	**9 923**	**9 659**	**18 147**
Aquaculture	Carps, barbels and other cyprinids	530	719	1 030	48	366	2 652	54	60	30
	Miscellaneous freshwater fishes	-	-	-	-	10	40	3	-	-
	Salmons, trouts, smelts	10	118	243	3	7	15	15	15	150
	Total	**540**	**837**	**1 273**	**51**	**383**	**2 707**	**72**	**75**	**180**
Inland capture fishery	Carps, barbels and other cyprinids	34	161	275	1	60	517	29	35	42
	Miscellaneous coastal fishes	-	4	12	-	-	-	-	-	-
	Miscellaneous freshwater fishes	6	74	203	-	4	24	22	15	8
	Salmons, trouts, smelts	40	82	138	-	15	78	-	-	-
	Total	**80**	**321**	**628**	**1**	**79**	**619**	**51**	**50**	**50**
Grand total of inland waters		**620**	**1 158**	**1 901**	**52**	**461**	**3 326**	**123**	**125**	**230**
Grand total of all waters		**104 000**	**152 042**	**203 761**	**1 023**	**10 841**	**62 626**	**10 046**	**9 784**	**18 377**

After: FAO Fishstat, 2009

Table 4.5: Imports of fish and fishery products in 2007

Imports	Tonnes	1 000 USD	1 000 GEL
Fats, oils from marine mammals	1	3	4
Fish dried, salted, smoked	213	690	952
Fish fillets	285	700	966
Flour, meals, pellets	1 764	118	163
Fresh or quickfrozen fish	1	13	18
Frozen fish	17 131	26 306	36 302
Live Fish	9	25	35
Prepared of preserved items (caviar)	3 171	5 772	7 965
Preserved crustaceans and molluscs	39	113	156
Total finfish	**22 614**	**33 740**	**46 561**
Crustaceans	15	172	237
Molluscs/other aquatic invertebrates	12	79	109
Total others	**27**	**251**	**346**
Total fishery products	**22 641**	**33 991**	**46 908**

Table 4.6: Exports of fish and fishery products in 2007

Exports (tonnes)	Tonnes	1 000 USD	1 000 GEL
Fats, oils from marine mammals	439	300	414
Fish dried, salted, smoked	829	668	922
Flour, meals, pellets	296	282	389
Frozen fish	950	505	697
Live Fish	NA	1	1
Total finfish	**2 514**	**1 756**	**2 423**
Molluscs/other aquatic invertebrates			-
Total others	**-**	**-**	**-**
Total fishery products	**2 514**	**1 756**	**2 423**

Table 4.7: Average wages and salaries in the fishery sector between 2002 and 2007

Wages	2001	2002	2003	2004	2005	2006	2007
GEL/month	-	83	97	130	171	233	355
USD/month	-	60	70	94	124	169	257

Table 4.8: Fish consumption in Georgia between 2001 and 2007

Fish Consumption	2001	2002	2003	2004	2005	2006	2007
kg/Capita/yr.	5.0	3.8	3.9	3.8	3.5	3.6	3.8
Tonnes/Population/yr.	23 154	17 597	18 060	17 597	16 208	16 671	17 597

Note: 1 USD **1.38** GEL

Table 4.9: International conventions and agreements signed by Government of Georgia on environment and fisheries

1/ International Convention for the Regulation of Whaling (Washington, 1946)
2/ Convention on the Conservation of European Wildlife and Natural Habitats (Berne, 1979)
3/ Convention on Biodiversity (CBD) 31 August 1994
4/ Convention for the Protection of the Black Sea Against Pollution (Bucharest, 1992), Accession: 21/04/92, Entry into force: 12/01/94
5/ Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement) 1994
6/ Bucharest Convention on Protection of the Black Sea against Pollution 1994
7/ Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)
8/ Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) 12 August 1996
9/ United Nations Convention on the Law of the Sea (Montego Bay, 1982) (UNCLOS), Accession 21/04/1996
10/ Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona, 1995)
11/ United Nations Convention on the Law of the Sea (UNCLOS) 21 March 1996
12/ Convention on International Trade in Endangered Species of Fauna and Flora (CITES - Washington, 1973), Accession: 13/09/1996, Entry into force: 12/12/1996
13/ Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention on Wetlands) 30 April 1996
14/ General Fisheries Commission for the Mediterranean
15/ La Commission Internationale pour l'Exploration Scientifique de la Méditerranée
16/ Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979), Entry into force: 01/06/2000
17/ Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 6 January 2000
18/ Convention on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) March 2001
19/ Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)

Source: ACCOBAMS - CMS, 2004, Van Anrooy, Mena Millar, Spreij, 2006

Table 4.10: List of possible regional and international fisheries bodies for the fisheries sector of Georgia

1/ General Fisheries Commission for the Mediterranean (GFCM)
2/ European Inland Fisheries Advisory Committee (EIFAC)
3/ EUROFISH in the field of marketing of fishery products and trade
4/ Network of Aquaculture Centres in Central and Eastern Europe (NACEE)
5/ Black Sea Fisheries Commission

Source: Van Anrooy, Mena Millar, Spreij, 2006

Table 4.11: List of laws and regulations related to the fishery sector in Georgia until 2005

1/ The Georgian Constitution (1995)
2/ The Law on the Protection of the Environment (1996)
3/ The Law on Wildlife (1996)
4/ The Law on Protected Areas (1996)
5/ The Law on Environmental Permit (1996)
6/ The Law on Water (1997)
7/ The Law on General Procedures for Granting Business Licenses and Permits (2002, as amended in 2004)
8/ The Law on Maritime Areas (1998)
9/ The Marine Code (1997)
10/ The Law on Food and Tobacco (1999, as amended in 2003)
11/ The Law on Standardization (1999)
12/ The Sanitary Code (2003, as amended)
13/ The Veterinary Law (1995, as amended)
14/ The Law on Agricultural Quarantine (1997)
15/ The Law on Veterinary Activities and Licensing and Permits (2003)
16/ The Tax Code (1997, as amended)
17/ The Administrative Penalties Code (1984)
18/ The Criminal Code (1999)
19/ The Law on Control of Entrepreneurial Activity (2001)
20/ The Law on the Privatization of State Property (1997)
21/ The Law on Promoting and Ensuring Investment Activity (1996)

Source: Van Anrooy, Mena Millar, Spreij, 2006

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