

## **Part I**

# **Review of the current status of inland capture fisheries and aquaculture in the Republic of Uzbekistan**



## EXECUTIVE SUMMARY

The fisheries sector in the Republic of Uzbekistan (or Uzbekistan), composed of inland capture fisheries and aquaculture sectors, has a potentially important role in the development of the rural economy of the country. However, in recent years the sector's contribution to the gross domestic product (GDP) was less than 0.1 percent. In spite of vast water resources available for fisheries-sector development (ponds, reservoirs, lakes, rivers, irrigation canals), fish production declined significantly from 27 200 tonnes in 1991, the year of independence from the former Union of the Soviet Socialist Republics (the former USSR), to 7 200 tonnes in 2006. Imports of fish and fish products decreased as well. As a consequence, per capita consumption of fish and fish products decreased to less than 500 g in 2006, which represents a reduction of over 90 percent in comparison with the 5–6 kg per capita consumption of fish in the late 1980s.

Before 1961, fish were captured mainly in the Aral Sea. This landlocked lake was rich in fish species and Uzbekistan captured on average 25 000 tonnes of valuable fish per year. In the basin of the Aral Sea, the irrigated area increased from 2.0 million ha to 7.2 million ha between 1925 and 1980. A huge and extensive network of irrigation and drainage canals was created. This network has become the main cause of the ecological crisis in the basin. The Aral Sea has dwindled and now has an extremely high salinity (74–90 g/litre<sup>-1</sup> compared with 10–11 g/litre<sup>-1</sup> during the years of a more favourable ecohydrological regime). As a result, the lake has only minor fishery importance today.

Because of the deterioration of the Aral Sea for fisheries purposes, the fish industry in Uzbekistan had to find new water sources for producing fresh fish. In the 1970s, a large part of the fish-capture activities was transferred from the Aral Sea to newly created inland reservoirs and lakes intended for residual water storage. In the 1970s and 1980s, up to 6 000 tonnes of fish were caught in those reservoirs and lakes. However, specialists understood as early as the 1960s that fish capture in those reservoirs and lakes could not provide enough fish to meet the demand of the Uzbek population. The attention of sectoral specialists (together with that of the policy-makers), therefore, moved slowly towards aquaculture development. In the early 1960s, the government managed a large-scale programme of fish-culture development with the establishment of about 20 fish-culture farms (with total pond area of about 20 000 ha) located throughout all regions of Uzbekistan. Development of new technologies and the establishment of research centres and educational programmes in fisheries and fish culture were other key components of the programme. The main technology promoted was polyculture of cyprinids in earthen ponds under semi-intensive conditions. Cultured species were common carp, *Cyprinus carpio*, silver carp, *Hypophthalmichthys molitrix*, bighead carp, *H. nobilis*, and grass carp, *Ctenopharyngodon idella*. The growing season lasted from late March–early April to October–November. Market-sized fish were produced in two-year cycles: during the first year, fish were raised in fingerling ponds (each 10–50 ha) to the weight of 25 g; and after the winter season, they were cultured in grow-out ponds referred to as “fattening ponds” (70–150 ha) to market-sized fish weighing between 500 g and 1 000 g. The average productivity of ponds in Uzbekistan was between 3 tonnes/ha and 3.3 tonnes/ha and in the Tashkent region between 4 tonnes/ha and 4.5 tonnes/ha in the 1970s and 1980s. These productivity rates were high in comparison with the rates of between 1.5 tonnes/ha and 1.7 tonnes/ha on average in the former USSR during those years. The Uzbek aquaculture sector produced between 20 000 tonnes and 25 000 tonnes of fish per year in the 1970s and 1980s.

Aquaculture also served as the basis for the development of culture-based fisheries. Local ichthyofauna in inland waters in Uzbekistan is generally rather poor with commercial fish species. The ecological niche for herbivorous fish was not fully occupied according to scientists; this is why artificially reproduced fry of Chinese carp (silver carp, bighead carp and grass carp) were stocked annually in lakes used for residual water storage, in reservoirs and in drainage channels in all regions of Uzbekistan. The cycle between stocking and capture was two or three years. Waterbodies were also stocked with the cultured fry of common carp. As a result, productivity in the main capture fisheries waterbodies increased from 10–15 kg/ha to 20–27 kg/ha. A special culture-based fishery enterprise named Zhizak was established on Lakes Aydar, Tuzkan and Arnasay.

Following independence in 1991 and the subsequent restructuring of the economy from a planned to a market economy, the fisheries sector underwent a process of privatization during the period from 1994 to 2003. The reported total fish production decreased from 26 500 tonnes in 1990 to 4 300 tonnes in 2004. There are several reasons for this decrease, including the overall economic crisis of the country, severed links with the fisheries institutions in the former USSR, problems with fish feeds and equipment supplies, and deteriorating education and research in fisheries. Moreover, during the initial stages of privatization, investment in the fisheries sector was not a preferred option among the various alternatives. Traditional carp culture and small-scale fish-capture facilities with low profitability were not of interest to investors. As a result of the aforementioned factors, fish production as well as fish processing and trade decreased. Privatization also had a negative impact on education and research in the fisheries sector. All the enterprises that provided aquaculture with various services (e.g. fish feeds, chemicals, equipment and gears) closed their doors or changed the nature of their businesses. At present, only a few private fish-capture and fish-culture enterprises remain active in the fisheries sector.

Enactment No. 350 “On measures to remove monopolies and to privatize the fishery sector” (Annex 4) approved by the Cabinet of Ministers on 13 August 2003 officially ended the privatization process. The main state fishery enterprises Uzbalyk and Karakalpakbalyk were liquidated; all fish-culture and fish-capture facilities were privatized. The main administrative functions relating to the development of animal husbandry, poultry farming and fisheries were centralized within the Ministry of Agriculture and Water Resources (MAWR) of the Republic of Uzbekistan, while departments for the development of animal husbandry, poultry farming and fisheries were established in the regional administrations for agriculture and water resources.

Today, it is common practice to assign natural waterbodies to fishery enterprises on a rental agreement basis. Fish capture in reservoirs and lakes is carried out by fishery enterprises that conclude contractual rental agreements with local administrations for periods of more than ten years. These enterprises catch fish on a quota-free basis, exploiting the available biological resources in an attempt to meet their customers’ demands. At the same time, they are required by contract to take measures to conserve species and to maintain the productivity of waterbodies and the reproductive capacity of fishery resources at proper levels. Two groups of lakes are of major importance for capture fisheries: (a) one group of about 20 lakes covering a total of 97 000 ha in the Amudarya delta, which provides about 1 500 tonnes of fish annually; and (b) one group of lakes in the the Aydar-Arnasay lake system midway along the course of the Syrdarya River, which provides 1 600–2 300 tonnes of fish annually. One of the main problems of fish capture in Uzbekistan is that the water levels are greatly influenced by irrigation needs and annual natural changes of water volumes in the basin and that sizes and depths of waterbodies can change every year and during the growing seasons. Changes in water levels have a negative impact on fish production.

At present, aquaculture is the most important and also the most promising sector for development in the fisheries industry. Currently, only one aquaculture system is applied in the country, namely extensive or semi-intensive pond culture of cyprinids. The total area of pond fish farms is 10 200 ha. For over 15 years, fish-farm ponds have been used without the necessary maintenance and major repairs. Pond productivity at present is between 1 tonne/ha and 1.9 tonnes/ha. Although private entrepreneurs have expressed interest in fish farming as a profitable venture, since privatization ended in 2003–2004 there is scarce evidence (to 2006) of new investments in the sector. A few entrepreneurs have adopted modern technologies and their farms are beginning to show some progress in fish production.

In 2003, the state ended the financing of fish restocking in the country, and since then fish have not been restocked in most of the waterbodies in Uzbekistan, with the exception of those waterbodies leased or rented out to private enterprises. Today, fisheries-sector support industries are nonexistent in Uzbekistan. All fish producers try to produce their own equipment and feeds or import equipment and materials.

Fish-processing and storage facilities are poorly developed in the country. Reasons for this are the limited domestic live and fresh fish supply, and the lack of investment in the sector. In the last two to

five years, some enterprises began to process and store fish. All currently active fish-processing and trade companies are private enterprises.

Fish and fisheries marketing and sales can be performed only in places allocated by local municipal and district authorities (hokimiyats). Officially, fish sales are allowed only if a wholesaler or retailer has documents confirming the lawfulness of the catch or of the purchase of the fish, as well as a certificate confirming the quality of the produce.

In the town of Chinaz, Tashkent province, there is a wholesale fish market. Fish are transported from this market to Tashkent, a distance of 70 km. Fish are transported to this market from the Aydar-Arnasay lake system and from the Chardara reservoir in the Republic of Kazakhstan. It is very difficult to estimate the volume of fish sold in this market because almost all the fish sold are illegally caught, go unreported and/or are smuggled in across the border. According to various unofficial sources, on average between 3 tonnes and 5 tonnes of fresh fish are sold every day in the Chinaz market, although on some days the volume of fish traded reaches 20 tonnes. Refrigerators are available in the market, as well as ice, and there are designated places for selling fish, but generally the conditions for the wholesale fish activities are unhygienic.

Most fish farms are situated near cities and towns (at distances of 5–70 km) and most farmed-fish sales are made in the autumn. Part of the harvested fish is sold pondside to wholesalers in small lots (up to 200 kg), for which sales contracts are drawn up. Another part of the fish is sold by the fish farmers to nearby markets and shops.

The main fisheries industry authority of Uzbekistan is the Ministry of Agriculture and Water Resources (MAWR). The ministry has a central administrative board for animal husbandry, poultry farming and fisheries. Research in the fisheries sector is conducted mainly by the Uzbek Research Center for the Development of Fisheries (of the MAWR), the Institute of Water Problems, the Institute of Bioecology and the Institute of Zoology (all part of the Academy of Sciences).

According to the law “On State Statistics” of Uzbekistan, capture fishery enterprises and aquaculture farms must submit reports on their activities to the state statistics office where they are registered.

In Uzbekistan, there are no unions, cooperatives or associations of aquaculture and fishery producers at the national level. Non-governmental associations of fish farmers have been created in the provinces of Samarkand and Bukhara and in the Republic of Karakalpakstan.

Uzbekistan does not have an official fisheries and/or aquaculture sector policy or development strategy in place. It is, however, signatory to a number of international conventions and agreements related to fisheries, aquaculture, biodiversity and the environment. It has no specific laws that regulate the fisheries sector, but there are laws in place that regulate the protection of nature and biodiversity conservation, and, therefore, are relevant to the fisheries sector and its development and management.

The management of farms is regulated by codes, laws and decrees of the President of the Republic of Uzbekistan and enactments of the Cabinet of Ministers. More specifically, regulations include:

- The Tax Code;
- The Land Code;
- The Law on Protection of Nature;
- The Law on Water;
- The Law on Farms;
- Presidential Decree No. VII-2086 “On introduction of a single land tax for agricultural producers” of 10 October 1998;
- Regulation No. 21-f “On the improvement of the system of fishery sector management” approved by the Cabinet of Ministers on 20 January 1997 and Enactment No. 289 of 6 July 2001;
- Enactment No. 258 “On improvement of the organization of the activity of the Ministry of Agriculture and Water Resources” approved by the Cabinet of Ministers on 28 June 2003;
- Enactment No. 350 “On measures to remove monopolies and to privatize the fishery sector” approved by the Cabinet of Ministers on 13 August 2003;

- Enactment registered by the Ministry of Justice No. 1292 “On the approval of the regulation of the calculation and levying of rent payment for the use of natural waterbodies by fish farms” of 20 December 2003; and
- The Hunting and Fish Catching Regulations on the Territory of Uzbekistan adopted by the State Committee for Nature Protection of Uzbekistan in May 2006.

Currently, fishery management is very poorly developed in Uzbekistan. The main reasons for this are that (i) the fish-capture sector is very small and only important at the local level and (ii) fish resources are determined by irrigation management, fisheries being considered a much less important user of the water resources.

A strengths, weaknesses, opportunities and threats (SWOT) analysis of the sector revealed that though the sector has a number of weaknesses, it also has considerable strengths. These strengths include the availability of suitable fishery resources and ample opportunities for rehabilitation of fish production by tackling threats through the preparation of a strategic plan for the development of responsible and sustainable fisheries and for improving the socio-economic status of fishers. Uzbekistan has at present a promising potential to increase fish production through the development and application of modern aquaculture systems, diversification of fish species to be cultured, an increase in services to the sector based on financial support mechanisms, and research and training development.

## Chapter 1

### INTRODUCTION

Fisheries is an important sector of food production in the world, providing high quality proteins, fatty acids and minerals to the population to overcome malnutrition as well as food security, while contributing to export earnings and substantial employment generation in rural areas. In 2004, world fisheries produced 106 million tonnes of fish. Fish provides 20 percent of animal protein to 2.6 billion people. Average world consumption of fish reached 16.6 kg/per capita (live weight) in 2004 (FAO, 2007).

In many countries, capture fishery (both in marine and inland waters) has reached its maximum potential. Many fish resources are overfished. Management needs to be more effective. At the same time, aquaculture production continues to increase rapidly in most regions of the world. The annual growth rate of aquaculture was 9 percent in the early 2000s. In 2004, 43 percent of all fish were produced by the aquaculture sector. World trade in fish and fish products was worth US\$72 billion in 2004. About 38 percent of all fish produced was exported. (FAO, 2007).

In the Republic of Uzbekistan (or Uzbekistan), the fisheries sector, composed of inland capture fisheries and aquaculture sectors, has a potentially important role in the development of the rural economy. However, in recent years the sector's contribution to the gross domestic product (GDP) was less than 0.1 percent. In spite of the vast water resources available for fisheries sector development (ponds, reservoirs, lakes, rivers, irrigation canals), fish production declined significantly from 27 200 tonnes in 1991, the year of independence from the former Union of the Soviet Socialist Republics (the former USSR), to 7 200 tonnes in 2006 (Umarov, 2003; Kamilov, 2003; Karimov *et al.*, 2005, 2006; Shohimardonov, 2007). Imports of fish and fish products decreased as well. As a consequence, per capita consumption of fish and fish products decreased to less than 500 g in 2006 (Karimov *et al.*, 2005), which means a reduction of over 90 percent in comparison with the 5–6 kg per capita consumption of fish in the late 1980s.

In July 2007, the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan made a request to the Food and Agriculture Organization of the United Nations (FAO) to develop strategic partnerships to support responsible aquaculture and fisheries development in Uzbekistan and to assist the Government of Uzbekistan in identifying effective livelihood-supporting policy interventions in the aquaculture and inland fisheries sectors through the formulation of a policy and strategic plan for the fisheries sector. In response to this request, FAO provided assistance under its Technical Cooperation Programme through the project “Development of strategic partnerships in support of responsible fisheries and aquaculture development in Uzbekistan” TCP/UZB/3103 (D). The implementation phase of this project started in August 2007.

The **Development objective** of the project is to develop strategic partnerships for and assist the Government of Uzbekistan in the rehabilitation of the national capture fisheries and aquaculture sectors in a structured and responsible manner, with specific emphasis on the achievement of food security and alleviation of poverty in rural areas for which the fisheries sector could play a more prominent role.

The **immediate objectives** of the project are:

- to increase knowledge and understanding among national policy-makers and potential donors on the status of capture fisheries and aquaculture in the country and on the current and potential contribution of these sectors to the achievement of food security and alleviation of poverty;
- to identify effective livelihood-supporting policy interventions in the inland fisheries and aquaculture sectors through the formulation of a fisheries-sector development strategy and implementation programme;

- to develop strategic partnerships among national and international agencies and donors in support of the rehabilitation and responsible development and management of the fisheries sector; and
- to increase the technical and managerial capacity of fishers and aquaculturists in Uzbekistan through training and dissemination of information on sustainable fishery technologies and better management practices.

This report on the fisheries sector in Uzbekistan was a first step towards increasing the understanding of policy-makers on fisheries and aquaculture issues and was intended to provide baseline information on the current situation of the fisheries in the country to the stakeholders involved in the participatory process of formulating a national strategic framework for the sector.

### **STRUCTURE OF THIS REPORT**

This report contains eight chapters. Chapter I briefly introduces the fisheries sector in Uzbekistan. Chapter II provides historical background on the situation of the fisheries sector up to independence in 1991 and from independence in 1991 to 2006. Chapter III offers an overview of the potential of the current natural resources and fisheries sector in Uzbekistan, describing the status of inland capture fisheries and aquaculture. Chapter IV focuses on the developments regarding fish-storage facilities, processing, distribution, marketing and fish consumption. Chapter V describes the fishery administration in the country, with particular attention to training, research and extension, fishery statistics, associations of fishery enterprises and international relations of the fisheries sector. Chapter VI provides an overview of fisheries policy, legal and regulatory frameworks and management issues. Social and economic aspects of the fisheries sector and credit and insurance issues are detailed in Chapter VII. Chapter VIII concludes with a diagnosis of the current situation using a SWOT analysis.



## Chapter II HISTORICAL BACKGROUND

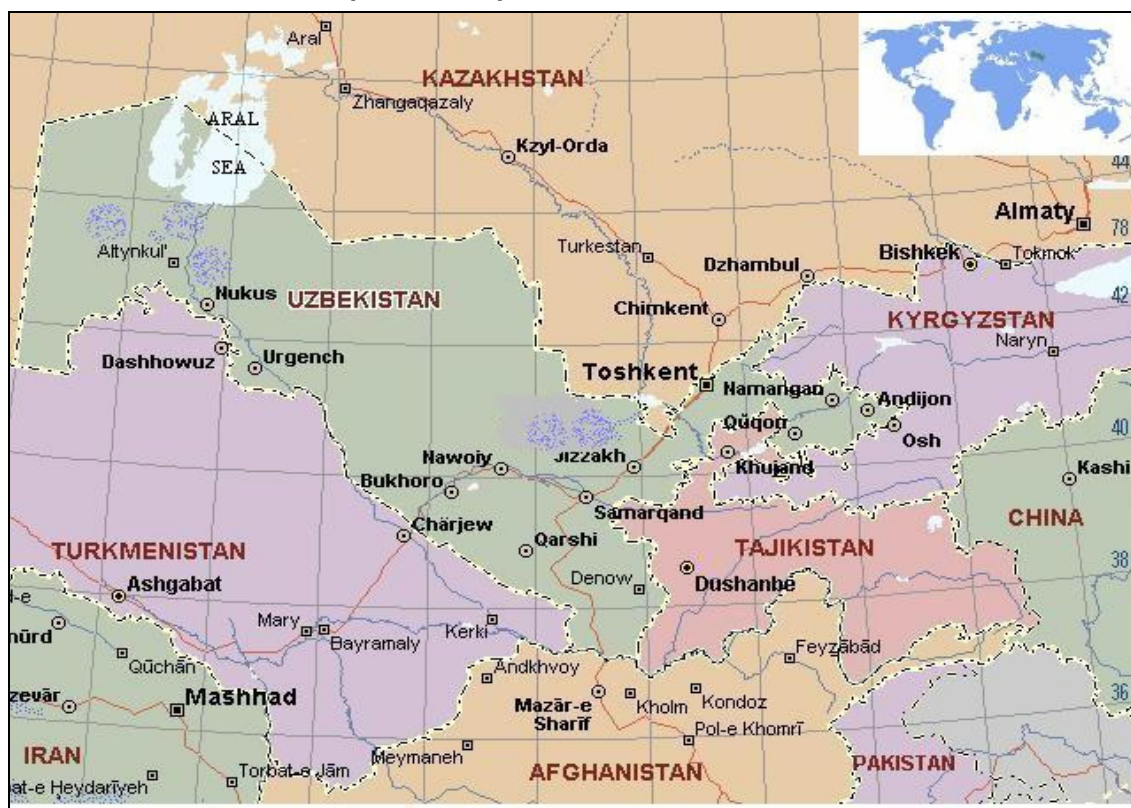
This chapter provides some background information on fisheries-sector development in Uzbekistan up to 2006. The chapter is divided into two parts, the period before independence and the period from independence in 1991 to 2006.

Uzbekistan is situated in Central Asia between latitude 37–11 °N and longitude 37° 10'–56 °E. It spans 1 400 km from east to west and 925 km from north to south. The Turan plain is in the northwestern part of Uzbekistan and occupies an area of more than 35 500 km<sup>2</sup>. The Tien-Shan mountain system is in the eastern part of Uzbekistan and covers about 9 600 km<sup>2</sup>. The latitudinal range of Uzbekistan is from –10 m (Sarikamish cavity) to +4 643 m (Western Tien-Shan) above sea level.

Uzbekistan is bordered by the Republic of Kazakhstan to the north, Turkmenistan and the Islamic Republic of Afghanistan to the south, and the Kyrgyz Republic and the Republic of Tajikistan to the east. The total area of the country is 447 400 km<sup>2</sup>, and is divided into 12 main administrative areas (oblasts) and the Republic of Karakalpakstan (or Karakalpakstan). It has a population of about 26.5 million people.

Uzbekistan is bound on the northwest by the Aral Sea, whose basin is the concern of the entire country. The main rivers, the Syrdarya River and the Amudarya River, flow into the Aral Sea. These two rivers flow through the countries of Central Asia. Other rivers like the Kashkadarya River and the Zarafshan River dry up on the plains.

FIGURE 1  
Geopolitical map of Central Asia/Aral Sea basin



### FISHERIES AND AQUACULTURE UP TO INDEPENDENCE IN 1991

Under former Soviet rule, the fisheries sector in Uzbekistan was established as a branch of industries. Before 1961, only captured fish mainly from the Aral Sea was available on the market. State and private fisheries units/cooperatives operated around the Aral Sea. This landlocked sea was rich in fish species and Uzbekistan fishers captured on average 25 000 tonnes of valuable fish per year.

In the Aral Sea basin the irrigated area increased from 2.0 million ha to 7.2 million ha between 1925 and 1980. The huge and extensive network of irrigation and drainage canals created in those years has become the main cause of the ecological crisis in the basin. The Aral Sea has dwindled and now has an extremely high salinity (74–90 g/litre<sup>-1</sup> compared with 10–11 g/litre<sup>-1</sup> during the years of a more favourable ecohydrological regime). As a result, the lake is of only minor fishery importance today. During the 1970s, fishery operations were transferred to the other inland waterbodies (Tleuov, 1981; Kamilov *et al.*, 2004).

Irrigation and drainage systems link various river basins into one network in Uzbekistan. Irrigation systems include reservoirs, irrigation canals, drainage canals and lakes for residual water. In fact, there are no waterbodies with natural fish-stock regimes on the plains in the country; all rivers are used as part of the irrigation system.

Under the former Soviet Union planned economy, the basin of the Aral Sea region was important for the production of agricultural crops (mainly cotton) and extensive technologies using large-scale irrigation networks prevailed. The flow of waters that empty into the Aral Sea basin was heavily regulated. As a result of the development of the large-scale irrigation system during the period from 1960 to 1990 in Central Asia, the volume of water flowing into the Aral Sea dropped from 50–53 km<sup>3</sup> to 0–10 km<sup>3</sup> per year. The water inflow from the Amudarya and Syrdarya Rivers into the Aral Sea almost ceased. A catastrophic shrinking of the Aral Sea, deterioration of the water quality and the rapid desertification that unfolded during the last decades caused the United Nations in 1992 to declare the Aral Sea basin a zone of ecological crisis (Figures 3 and 4).

FIGURE 2  
Hydroecological map of Central Asia/Aral Sea Basin

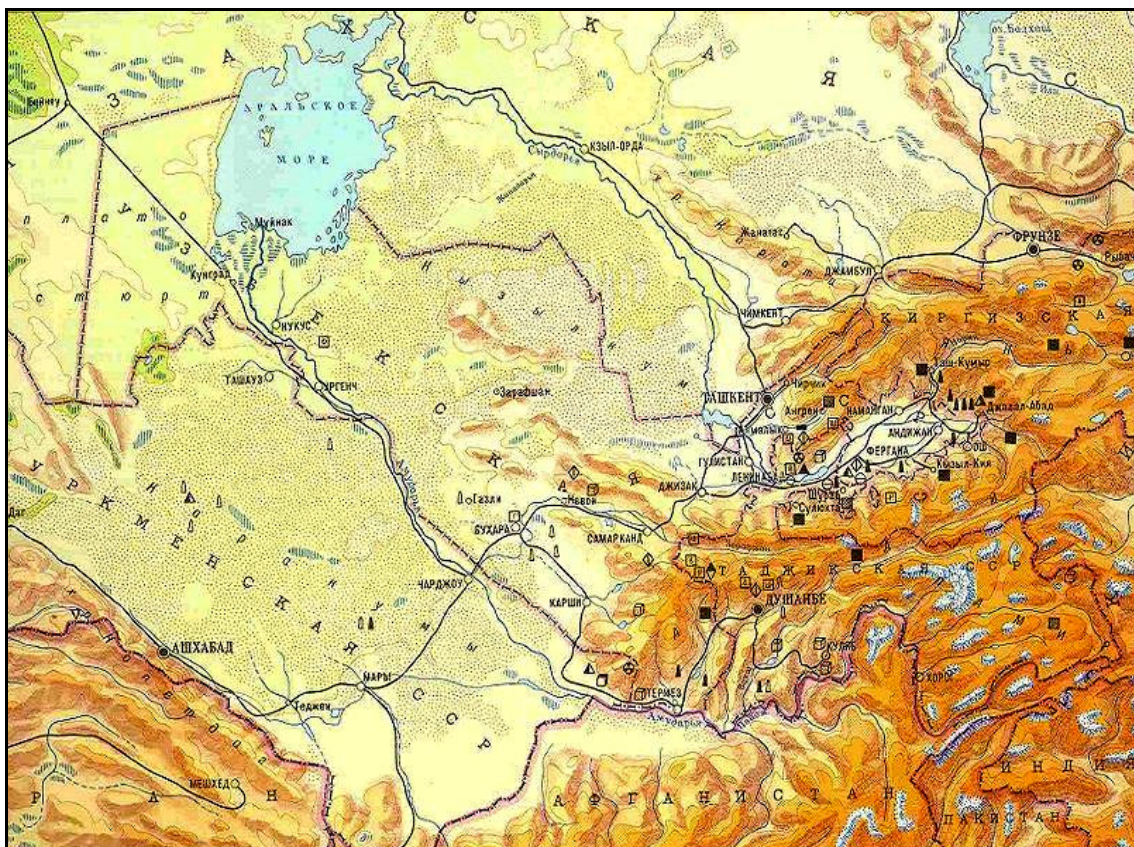


FIGURE 3  
Degradation of the Aral Sea ecosystem

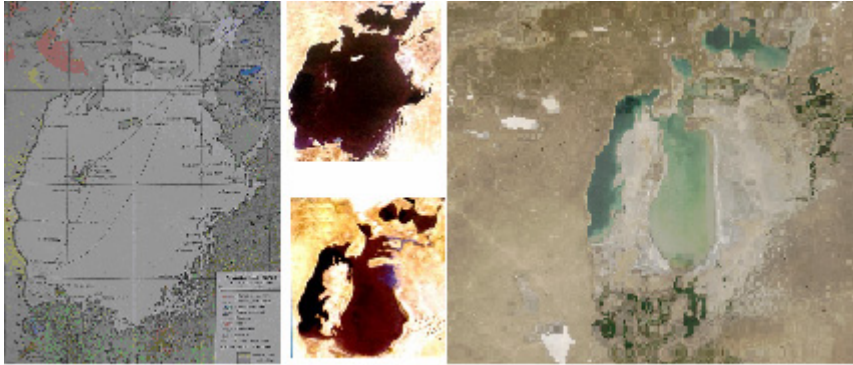


FIGURE 4  
Remainder of the Aral Sea fishing fleet at Sarbas Bay in 2006



Photo courtesy of Mr B. Karimov.

With the diversion of growing volumes of water since the 1960s and a gradual decline in the flow of rivers, changes took place in every aspect of the Aral Sea regime. Water that evaporated was no longer compensated by the waters of the Amudarya River and the Syrdarya River: the flow of the rivers declined from 5 km<sup>3</sup> to 11 km<sup>3</sup> per year. Eventually, the Aral Sea began to dry up (Barkhanskova *et al.*, 1963; Kamilov, 1973). In the 1960s, the water level fell on average by 27 cm per year, while from 1970 to 1980 it fell by 71 cm per year. By the late 1980s, the area of the Aral Sea had split into the Bolshoe (Great) Sea and the Maloe (Small) Sea. By the late 1990s, the area of the Aral Sea decreased by 30 000 km<sup>2</sup> and the volume of the Aral Sea decreased by 260 km<sup>3</sup>. The average depth in the remaining parts of the Aral Sea dropped to as low as 6 m in the Bolshoe Sea and 8 m in the Maloe Sea. The salinity increased dramatically. The local fauna degraded and vanished. In the 1960s, the salinity of water of the Aral Sea increased by 1.84 percent per year; in the 1970s by 5.5 percent; and in the 1980s by 16 percent. Currently, various sources claim that the salinity of the Aral Sea ranges from 70 percent to 100 percent (Tleuov, 1981; Letolle and Mainguet, 1993; Joldasova *et al.*, 2004; Karimov *et al.*, 2005).

### **Traditions in capture fisheries and aquaculture**

As mentioned above, before 1960 fishery activities in Uzbekistan consisted only of fish capture in the Aral Sea and production averaged 25 000 tonnes/year (Tleuov, 1981). During the 1960s and 1970s, fish yields of the Aral Sea sharply decreased. In 1983, the last catch officially recorded was 50 tonnes (Karimov, 1995; Kamilov *et al.*, 2004). The fish industry in Uzbekistan had to find new water resources to supply fresh fish to the markets. In the 1970s, fish-capture activities were largely transferred from the Aral Sea to the other inland lakes, reservoirs, and lakes intended for residual water storage. The average natural fish productivity of waterbodies was 5–10 kg/ha in submountain reservoirs and 10–20 kg/ha on the plains. In the 1970s and 1980s, up to 6 000 tonnes of fish were caught annually in inland waters (excluding the Aral Sea).

However, specialists understood as early as the 1960s that fish capture in the reservoirs and lakes could not produce enough fish to meet the demand of the Uzbek population. The sectoral specialists (together with policy-makers) gradually turned their attention to aquaculture development. In the early 1960s, the government initiated a large-scale programme of fish-culture development with the establishment of about 20 fish-culture farms (with a total pond area of about 20 000 ha) located throughout all the regions of Uzbekistan. Development of new technologies and the establishment of research centres and educational programmes in fisheries and fish-culture were key components of the programme. The main technology promoted was polyculture of cyprinids in earthen ponds under semi-intensive conditions. As a result, in the 1970s and 1980s fish farms produced 20 000–25 000 tonnes/year. Productivity in Uzbekistan was the highest of all the regions in the former USSR, averaging 3–3.5 tonnes/ha in Uzbekistan and as much as 4 tonnes/ha in the Tashkent region.

Aquaculture also served as a basis for the development of the culture-based fisheries. Local ichthyofauna in the inland waters of Uzbekistan is generally rather poor with commercial fish species. According to scientists, the ecological niche for herbivorous fish was not fully occupied. This is why artificially reproduced fry of Chinese carp (silver carp, bighead carp and grass carp) were stocked (on an annual base) in lakes used for residual water storage, in reservoirs and in drainage channels in all the regions of Uzbekistan. The cycle between stocking and capture lasted two or three years. Waterbodies were also stocked with cultured common carp fry. As a result, in the main capture fisheries waterbodies, productivity increased from 10–15 kg/ha to 20–27 kg/ha. In the Zhizak region, special culture-based fishery enterprises were created on Lakes Aydar, Tuzkan and Arnasay.

### **Production systems**

#### *Capture fishery*

In the twentieth century, capture fishery was conducted by fishers' brigades working for the state fishery enterprises. Each brigade had its own fishing territory or zone. Usually from 5 to 25 fishers worked in one brigade. Brigades were equipped with five to ten motor boats, 100 to 200 gillnets of various meshes and/or one to five seines. Some brigades had one or two cutters. The two main fishing gears used in Uzbekistan were gillnets and seines.

Each year the state enterprises sent applications for a quota to the State Committee for Fisheries. This Committee sent a general, comprehensive application on behalf of all fishery enterprises to the Uzbekribvod (the commission for the protection of fish resources). The Uzbekribvod assigned an annual quota to each brigade based on its own studies or the assessments of the fish stocks in specific waterbodies by the research institutes. The quota protected fish stocks from becoming overfished. The amount of fishing gears (nets, seines) with marked mesh sizes, the number of boats and the number of fishers per brigade were indicated in the assigned quota. Fishing activities were also regulated by the "Regulations on fish capture", which were based on the All-Union standards: a ban on fishing during fish spawning, limitation on net mesh sizes (usually minimum mesh sizes of 27 mm or 36 mm), areas prohibited for fishing (spawning areas of the main commercial fishes), lists of protected species and fines for illegal catches. The fines were very high; several USSR roubles for each fish caught illegally, irregardless of fish size. In some cases the Uzbekribvod closed down a brigade's activities and withdrew its assigned quota if many breaches of the regulations on fish capture occurred. In summary, the state plans and budgets assigned to the state enterprises determined the volume of fish

to be caught, as well as the type and amount of equipment, the number of staff and many related issues.

### *Aquaculture*

The one prevailing fish-culture technology used in Uzbekistan since the 1960s was the polyculture of cyprinids in gigantic earthen ponds. The cultured species were common carp, *Cyprinus carpio*, silver carp, *Hypophthalmichthys molitrix*, bighead carp, *H. nobilis*, and grass carp, *Ctenopharyngodon idella*. The growing season for fish in these ponds lasted from late March–early April to October–November. Market-sized fish were produced in two-year cycles. During the first year, small fry were raised in fingerling ponds (10–50 ha each) to the size of 25 g; after the winter season they were transferred to so-called “fattening” or grow-out ponds (70–150 ha) where they grew to marketable sizes of 500 g–1 kg. The average productivity of ponds in Uzbekistan was 3–3.3 tonnes/ha in the 1970s and 1980s, which is high in comparison with 1.5–1.7 tonnes/ha on average in the former USSR during the same period. Aquaculture produced 20 000–25 000 tonnes/year (Kamilov *et al.*, 2004).

Liming and fertilization were common practices in pond management and lime and fertilizer were frequently applied before and during the vegetation season. The lime and fertilizer in the waterbody stimulated the growth of plankton for silver carp and bighead carp and the growth of plants for grass carp. Supplementary feeds were given for the growth of common carp and, in part, for grass carp. Commercial fish feeds were prepared in special animal-feed producing factories. These feeds were of good quality, with protein levels of 28–32 percent for fry and early fingerlings and 24–28 percent for the grow-out of the fish. All fish farms had well-equipped laboratories and were able to test the fish-feed quality, the quality of the water and the health of the fish. The heads of these farm laboratories and the main specialists at the farms were generally highly educated.

A special broodstock programme was conducted in the country as part of the All-Union broodstock programme. Broodstocks were produced and strains of the most suitable stocks for fish production were kept in hatcheries called “special reproduction centers”. Artificial reproduction practices, using hormonal stimulation of maturation, fertilization and egg incubation, were applied. Larvae from several hatcheries (Balikchy Fish Farm, the State Regional Fish Hatchery) were transported to all the regions of Uzbekistan and other republics of Central Asia, and to the former USSR.

Fish production and reproduction technology were detailed in manuals and other documents in the form of norms for fish culture with quantitative and qualitative indicators (broodstock formation, egg and larvae production, raising of fingerlings, wintering, table-fish raising and other cycles). The financing of fish-farm activities was based on the degree to which norms were applied and the farms’ annual reports. New methods developed by research institutes were tested for two to three years in working environments, and if successful, the general norms and related budgets were changed accordingly. This mechanism in support of aquaculture development was considered effective.

As mentioned above, fish farms generally had well-educated specialists. Each year the State Committee for Fisheries requested from the Ministry of Higher Education and the Tashkent State Agrarian University a specific number of highly educated students required for fish-farm activities. Generally, the requests were met. As a consequence, all the chief specialists of the State Committee for Fisheries, the fish farms, the research institutes, the Uzbekribvod and other organizations active in the sector had access to highly qualified people. It can be argued that aquaculture production was determined mainly by state plans and related state budget allocations, as was the case for capture fisheries. Funds were allocated to fish farms based on pond area and the degree to which technological norms were applied.

Only carp culture was well-developed in Uzbekistan. There was only one small trout farm named Tavaqsay, which produced 20–50 tonnes/year (1970s and 1980s). Some experimental projects were carried out, including one project to develop cage culture in Uzbekistan in the 1980s. Another series of research projects concerned the introduction of new species. Small experiments were carried out with channel catfish (*Ictalurus punctatus*), Siberian sturgeon (*Acipenser baieri*), three species of buffalo (*Ictiobus cyprinellus*, *I. bubalus*, *I. niger*), some strains of rainbow trout (*Oncorhynchus mykiss*) and some other species. However, even when research projects were successful in introducing

new species, the mentality of those persons in the All-Union Ministry of Fisheries of a centrally planned economy prevailed and the orientation towards carp culture remained unchanged. Uzbekistan was one of the biggest carp producers in the former USSR. The promising results of the experimental projects proved that some areas in Uzbekistan were suitable for channel catfish, sturgeon and trout culture development. Technologies for channel catfish reproduction, fingerling raising and grow-out fish production in semi-intensive conditions were developed in the mid-1980s. Broodstock was kept and small volumes of marketable fish were produced (up to 40 tonnes/year) at the Balikchy Fish Farm (Tashkent region). A small volume of broodstock is to this day being kept there, while a small number of Siberian sturgeon is still being kept at the Tashkent trout farm Tavaqsay.

#### *Culture-based fisheries*

Fry and sometimes fingerlings of silver carp, bighead carp, grass carp and common carp, produced at the State Regional Fish Hatchery, the Balikchy Fish Farm (both located in the Tashkent region) and some regional fish farms were used to stock lakes used for residual water storage, lakes, reservoirs and drainage channels, with the aim of occupying empty ecological niches and of increasing fish productivity. Norms for stocking were recommended by the state research institutes. Stocking was financed by the state budget. There were norms also with regards to commercial catches of stocked fish over several years: for example, 0.1 percent from larvae stocked, 1–2 percent from fry, 2–5 percent from fingerlings and 5–8 percent from yearlings. The stocking and restocking activities were quite successful in the most important waterbodies. Special culture-based fishery enterprises were established in the Aydar-Arnasay lake system and lakes in the lower Amudarya River.

#### **Fisheries-sector structure**

In the former USSR, Uzbekistan fisheries formed a part of the All-Union Ministry of Fisheries. Primarily three branches of the central Ministry of Fisheries operated in Uzbekistan: the Uzbekribvod for fish resources protection, the State Committee for Fisheries for local fish production, and the Ribsbitt for fish trade. They were independent from one another at the national level.

#### *Uzbekribvod*

The Uzbekribvod (Uzbekistan commission on fish resources and fish reproduction protection), created in the early 1960s, was responsible for the protection of waterbodies and fish resources to ensure sustainable fish production. Uzbekribvod had branches in all the regions of Uzbekistan. It had divisions for fish protection inspection, fish reproduction, and fish stock monitoring and water quality monitoring. It had extensive authority and could fine and even close a factory or enterprise of a ministry that polluted water or negatively impacted fish reproduction and fish stocks. All chemical factories, for example, had to use filters or some type of water filtering or cleaning mechanism before returning water to a river basin. The Uzbekribvod was responsible for the adoption of the All-Union standards for fish protection (regulations on fish capture) that would be suitable for the conditions of the Aral Sea basin.

#### *The State Committee for Fisheries*

In the early 1960s, the State Fisheries Department was created under the Ministry of Agriculture of Uzbekistan. Towards the end of the 1960s, it was renamed the State Committee for Fisheries of Uzbekistan and officially came under the Cabinet of Ministers, but in fact came under the administration of the former All-Union Ministry of Fisheries. This implied that the financing of new enterprises (both fish capture and fish culture) and the budget allocations for these new enterprises came from the former All-Union Ministry of Fisheries. All waterbodies and their fish stocks belonged to the state, as well as all enterprises involved in fishing, aquaculture, processing, trade, manufacture of equipment and production commercial feeds, research, engineering and construction. Together, these enterprises constituted the State Committee for Fisheries of Uzbekistan.

The State Committee for Fisheries was headed by a chairperson and under the committee's direction were departments of fish pond culture, fish capture, feed supply and equipment, fish

processing and economics, each headed by a deputy chairperson. The committee was responsible for fish production and the processing of fish produced in the republic.

Uzbekistan had the capacity to can fish and to process fish into various other forms. Fish canning was done at the Muynak Fish Cannery (Figure 5). Raw fish, including sprat, saury and capelin, was imported from other republics. However, in the early 1990s, the factory began processing silver carp from ponds because of a shortage of marine fishes. This resulted in the loss of links with suppliers from abroad and, together with the transition to a free market economy, resulted in the closing of the fish canning factory in 2004.

FIGURE 5  
Main entrance of the Muynak Fish Cannery in 2003



Photo courtesy of Mr B. Karimov.

Fish-storage and small-scale processing facilities (mainly smoking facilities) were established in all aquaculture and fish-capture enterprises to maintain the freshness of fish. The volume of processed and stored fish was hundreds of tonnes per year, thus a rather small-scale industry.

There was also a large commercial fish-feed producing factory in the city of Chinaz (Tashkent region), which had all the necessary facilities to produce balanced feeds used for various fish diets and various sized fish. Production capacity was from 60 000 tonnes/year to 80 000 tonnes/year. Feeds were distributed domestically and to the other republics of Central Asia. Currently, the factory no longer belongs to the sector, but it still has the facilities to produce commercial fish feeds.

#### *Ribsbit*

Ribsbit (fish distribution) was responsible for imports and for the distribution within Uzbekistan of fish products from other republics of the former USSR. In order to meet the health norms for fish consumption (12 kg/person/year), the All-Union Ministry of Fisheries imported fish from the coastal regions of the former USSR. Every year 50 000–80 000 tonnes of frozen, salted and smoked marine fishes and canned fish products were imported by Uzbekistan. Large industrial cold storage facilities operated in all the regions of Uzbekistan. The cold storage facilities had the capacity to store 500–2 500 tonnes of frozen fish. Ribsbite also had the facilities to process marine fish (mainly production of salted and smoked herring) and to distribute to institutional users (the army, the police, correctional institutions). Distribution branches were located in all the regions of Uzbekistan. After independence in 1991, all regional enterprises became trade companies and generally ceased activities in the fisheries sector.

*SAO Gidroribproekt*

SAO Gidroribproekt (a Central Asian engineering organization for fisheries) was responsible for the development of engineering projects for fisheries in Uzbekistan, the Kyrgyz Republic, the Republic of Tajikistan and Turkmenistan. Projects included pond construction, construction of fish-capture facilities, fish-processing facilities and aquaculture facilities (including hatcheries), manufacture of fishery equipment and construction of fish-storage and marketing facilities.

*The Central Asian Laboratory of Ichthyopathology*

The Central Asian Laboratory of Ichthyopathology (inspection) was responsible for the control of fish health and for aquatic animal disease treatment in Uzbekistan and the neighbouring countries.

There was a strong link among Uzbekribvod, the State Committee for Fisheries, Ribsbit, SAO Gidroribproekt and the Central Asian Laboratory of Ichthyopathology, all operating at the national level and through the All-Union Ministry of Fisheries.

**Education and research***Former Tashkent State Agrarian University*

A special Department of Hydrobiology and Ichthyology was created at the former Tashkent State Agrarian University in the early 1960s, when the All-Union Ministry of Fisheries developed its large-scale programme for aquaculture and fisheries development in Uzbekistan in order to compensate for the reduction in fisheries production in the Aral Sea. The department provided fishery enterprises and research institutes with highly qualified specialists for some 40 years. Even today, most specialists who are active in the sector were educated in the department. Strong links were established among the department in Tashkent and similar departments and research institutes in Moscow, Leningrad and other regions of the former USSR. In a special agreement between the former All-Union Ministry of Fisheries and the Ministry of Education, every year one or two postgraduate students of ichthyology and hydrobiology from Uzbekistan would study at the central universities. The main focus of these students was aquaculture. All graduates and PhD students were sent to the State Committee on Fisheries of Uzbekistan. The Department of Hydrobiology and Ichthyology was generally considered for 40 years a strong research centre.

*Institute of Zoology and Parasitology*

The Laboratory of Ichthyology and Hydrobiology, under the direction of the Institute of Zoology and Parasitology of the Uzbekistan Academy of Sciences (UzAS), supported the fisheries sector. The focus of the laboratory was on the fauna of rivers, reservoirs and irrigation channels. In the mid-1960s, the part of the laboratory dealing with fish culture was closed at the Institute of Zoology and Parasitology and a new laboratory was created at the All-Union Institute of Pond Fish Culture. However, this laboratory was too small to significantly assist fish-culture development in Uzbekistan (at that time fish-culture farms in Uzbekistan had the highest productivity in the former USSR). That is why in the early 1970s, the Institute of Fisheries in Inland Water Bodies of Uzbekistan was created. Although this new institute was officially under the Uzbekistan State Committee on Fisheries, all research programmes were approved by the All-Union Institute of Pond Fish Culture.

*Institute of Fisheries in Inland Water Bodies*

The Institute of Fisheries in Inland Water Bodies coordinated research programmes in capture fisheries as well as in fish culture. Research programmes that were important for aquaculture and fisheries were financed by the state, and the Institute of Fisheries in Inland Water Bodies was the coordinator of these activities. Usually grants were awarded the Department of Hydrobiology and Ichthyology of the former Tashkent State University, the Institute of Zoology and Parasitology and the Research Institute of Bioecology in Karakalpakstan. Sometimes other research laboratories and departments were granted support: from example, the teacher training institutes in Bukhara province and Ferghana province.



*Moscow State University*

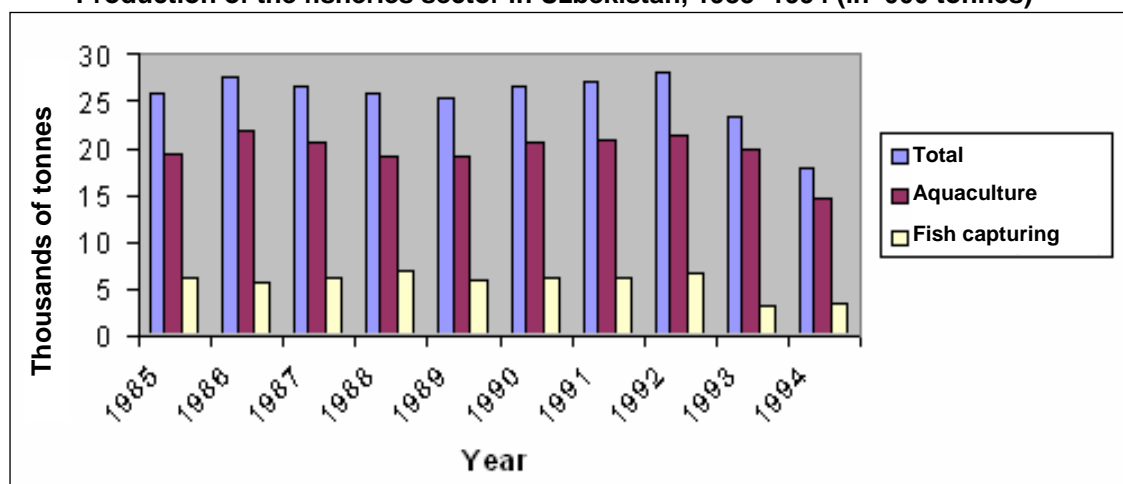
For over 40 years, special missions from Moscow State University worked in Uzbekistan (mainly at the Balikchy Fish Farm). Collaboration among the local education and research centres and the missions was excellent. Often the missions were given grants by the All-Union Institute of Pond Fish Culture and by the Uzbekistan Institute of Fisheries. It can be argued that the Uzbek fisheries sector had a good educational and research programme during the Soviet era. After the collapse of the former USSR, the structure in support of the fisheries sector could no longer be maintained and its restructuring was unavoidable.

### **Fish production**

Total fish production in Uzbekistan is presented in Figure 6. Until 1994, aquaculture was the main fish producing sector (Table 1). Fish-capture data include culture-based fisheries. It should be noted that some regions were more important for fisheries than others. The most important regions were the lakes of the lower Amudarya River (situated primarily in Karakalpakstan) and the Aydar-Arnasay lake system (Tables 2 and 3).

Fish was sold live or fresh and processed. Products such as salted and smoked fish, canned fish and fish oils and fats were prepared from fish produced in Uzbekistan (Table 4). It should be noted that the Muynak Fish Cannery also canned fish using imported herrings and other marine fishes and that the statistics on this production are not shown.

FIGURE 6  
Production of the fisheries sector in Uzbekistan, 1985–1994 (in '000 tonnes)



Source: The State Committee for Fisheries.

TABLE 1

**Fish produced by aquaculture and capture fisheries in Uzbekistan, 1985–1994 (in percentages of total production)**

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Aquaculture	76	79	77	73	76	77	77	77	85	81
Capture fisheries	24	21	23	27	24	23	23	23	15	19

Source: The State Committee for Fisheries.

TABLE 2  
Fish catch in regions of Uzbekistan and Karakalpakstan in selected years (in tonnes)

Republic/regions	Type of waterbody	1991	1993	1994
Rep. Karakalpakstan	Lakes	2 835	364	396
Zhizak region (Aydar-Arnasay lake system)	Culture-based fishery enterprise	1 650	833	710
	Other parts of the lake system	890	740	690
Other parts of Rep. of Uzbekistan	Lakes	560	560	820
	Reservoirs	423	799	744
Total		6 358	3 296	3 360

Source: The State Committee for Fisheries.

TABLE 3  
Volume of fish stocked in natural waterbodies in Uzbekistan in the early 1990s (in millions of fry)

Fish species	1992	1993	1994
Common carp	5.12	4.31	1.97
Silver carp and bighead carp	4.88	3.16	0

Source: The State Committee for Fisheries.

TABLE 4  
Fish and fish products using fish produced in Uzbekistan, 1985–1994 (in tonnes)

Type of fish product	1985	1987	1989	1991	1992	1993	1994
Live & fresh (filets, steaks)	16 055	17 801	15 485	18 428	19 957	16 997	14 119
Frozen fish	576	361	449	630	361	861	105
Smoked or salted fish	2 743	2 404	2 903	2 160	2 872	1 993	1 459
Canned fish & other fish preparations	5 255	5 456	5 626	5 950	4 907	3 016	2 061
Fish oils and fats	620	328	364	0	0	453	256
Fish processed for other than human consumption	512	246	485	0	0	29	0
Total fish and fish products	25 761	26 596	25 312	27 168	28 097	23 349	18 000

Source: The State Committee for Fisheries.

### Employment

In the 1980s, more than 70 farms and enterprises were active in the fisheries sector and 5 600–5 800 people were employed by the enterprises of the State Committee for Fisheries, the Uzbekribvod and the Ribsbit. Under the conditions of the planned economy, all workers were full-time employees. Moreover, about 100–150 specialists worked at SAO Gidroribproekt and the Central Asian Laboratory of Ichthyopathology.

### Recreational fishing

Recreational and sport fishing was organized in societies of hunters and fishers (hunting and fishing clubs) on the base of voluntary membership. Regional branches of these societies were located in the various regions. In the Tashkent region, recreational fishers were members of a Uzbekistan society named Uzbekokhotribolovsoyuz, a society originally established by the former USSR Central Asian military forces headquartered in Tashkent. Uzbekokhotribolovsoyuz was a very rich organization. It also had an independent society of hunters and fishers with well-equipped bases on sites of large waterbodies (e.g. Lake Arnasay and Lake Aydar).

Members paid annual contribution fees. Societies had their assigned and registered hunting and fishing territories, often in very convenient places. Members could go fishing when they liked, using membership cards and (if needed) fishing permits. Each recreational fisher was allowed to catch 5 kg of fish at no charge and an additional 10 kg of fish for a certain fee. The maximum catch was limited

to 15 kg per person for each fishing foray. Societies had their own staff to monitor and control fishing by their members.

## **FISHERIES AND AQUACULTURE AFTER INDEPENDENCE (1991) AND UNTIL 2006**

### **Changes in institutional arrangements, policies, planning and legal framework**

After Uzbekistan proclaimed independence in 1991, reforms in the fisheries sector were started and aimed at the privatization of state property.

Before 1994, the enterprises involved in aquaculture, capture fishery, fish processing, trade in fish and fish products, research in fish production, design and construction of fish production facilities, and fish-feed production were all state properties. The government financed their activities, including the (re-)stocking of natural waterbodies. After the former USSR collapsed and from 1993, the state ceased funding the sector, which eventually resulted in the decline of fish production and fish imports.

One of the first changes to occur was the closing of Uzbekribvod. Some of its functions were transferred to the newly organized State Committee for Nature Protection and its special agency Gosbiokontrol for the control of the biological resources. The agency is responsible for the protection of fish, but important functions were lost, namely the use of fish resources and the exploitation of the potential of waterbodies to produce fish. Currently, no institution is responsible for the exploitation or utilization of such an important resource as fish. Gosbiokontrol only protects fishes and has no goal or interest to develop fish capture and to increase fish production.

#### *The first stage of privatization*

The first step taken towards privatization was the issuance by the Cabinet of Ministers of Decree No. 427 “On the establishment of the Uzryba corporation” of 18 August 1994. Uzryba was comprised of 62 enterprises, namely the Karakalpakbalyk association with its 27 capture-fish farms, 18 pond farms, 11 trade unions, 2 construction/maintenance enterprises, a project design institute, an ichthyopathology centre, the fish cannery in Muynak, and a fish-feed production plant in Chinaz. Large enterprises obtained the status of joint-stock companies with 30 percent state ownership (Uzryba was the stockholder on behalf of the state), 55 percent workers’ collective ownership and 15 percent ownership by private investors. Small enterprises became collectively owned. The buyout by investment capital of the shares owned collectively by the workers weakened the financial situation of many enterprises. The high interest rate loans (100–106 percent interest rate per annum) used for the buyouts further aggravated the financial situation of many enterprises.

#### *The second stage of privatization*

By Enactment No. 289 “On the improvement of the system of fishery sector management” issued by the Cabinet of Ministers on 6 July 2001, the Uzryba corporation was transformed into the joint-stock company named Uzbalyk. Trade unions were withdrawn from Uzbalyk, leaving 28 enterprises under its wings, including 15 pond farms, 5 capture-fish farms, the Karakalpakbalyk association (with 27 capture-fish farms), 2 construction/maintenance enterprises, 2 project design institutes, 2 fish-processing enterprises (the fish cannery in Muynak and the Baliksavdo), and the fish-feed production plant in Chinaz. In the statutes of the enterprises, state ownership was reduced to 25 percent, ownership of the workers’ collective was reduced to 10 percent, and the remaining 65 percent ownership was sold to private entrepreneurs.

#### *The end of privatization of the fisheries sector*

Enactment No. 350 “On measures to remove monopolies and to privatize the fishery sector” adopted on 13 August 2003 (Annex 4) formalized the end of the privatization of the fisheries sector. Uzbalyk and the Karakalpakbalyk were liquidated: fish-breeding and fish-capture enterprises were completely privatized. The Main Administration for the Development of Animal Husbandry, Poultry Farming and Fisheries was established within the central apparatus of the Ministry of Agriculture and Water Resources. Departments for the development of animal husbandry, poultry farming and fisheries were established in regional administrations for agriculture and water resources. These departments were responsible for the development of fisheries.

Unfortunately, privatization had a negative impact on education, research and the services infrastructure in the fisheries sector. The Department of Hydrobiology and Ichthyology of Tashkent State University (now named the National University) was closed. SAO Gidroribproekt was of no interest to private investors and also closed. All the enterprises that provided various services to aquaculture changed their business focus and left the sector. As a result, only some capture fisheries and aquaculture private enterprises survived to the present.

The Research Center for the Development of Fisheries, of which the State Regional Fish Hatchery became a part, was created (2003) within the Uzbek Research-Production Center for Agriculture under the Ministry of Agriculture and Water Resources.

The Fund for the Development of Fisheries was created (2003) with the funds obtained from the sale of state shares of joint-stock companies within Uzbalyk. The funds obtained from the rental of natural waterbodies are allocated as follows: 60 percent to the local state budget; 25 percent to the Fund for the Development of Fisheries under the Uzbek Research Center for the Development of Fisheries; and 15 percent to the State Committee for Nature Protection of Uzbekistan for measures aimed at the protection and sustainable use of fish resources. Natural waterbodies are assigned to capture fishery enterprises on a competitive basis.

### **Organizational structure of the fisheries authorities**

Until 1994, the capture fishery was virtually run only by the state-owned enterprises of the State Committee for Fisheries of Uzbekistan. Enterprises in any form other than state-owned property did not exist in fisheries. Fish resources protection and ecological control were tasks of the government.

After the independence of Uzbekistan in 1991, fisheries was organized into two fields/departments:

- protection and control of wild fish stock use
- capture fisheries

#### *Protection and control of wild fish stock use*

All fish stocks that had formed under natural conditions in waterbodies belonged to the state and were declared aquatic biological resources. The use of these fish stocks for fisheries, as well as the control of the ecological conditions of waterbodies, is regulated by a number of laws on nature protection. The enforcement of the laws was assigned to the State Committee for Nature Protection (1991). The basic law on the use of biological resources in Uzbekistan is the Law on Nature Protection adopted by the Uzbekistani Parliament on 9 December 1992. In Uzbekistan, waterbodies and fish resources inhabiting them (except the fish bred in aquaculture) are the property of the state.

In conformity with Enactment No. 95 of the Cabinet of Ministers of Uzbekistan adopted on 14 April 1991, state protection of animals and state inspection of the work of departmental protection is the task of a special inspection agency called Gosbiocontrol (in full: the Republican State Inspection for the Protection and Sustainable Use of the Animal and Plant Worlds) set up under the State Committee for Nature Protection. Gosbiocontrol develops instructions on the protection of the animal and plant worlds. All ministries, state committees, agencies, organizations and citizens must observe these instructions. In addition, Gosbiocontrol develops the “rules of fisheries”. The current rules of fisheries (i.e. Instruction on the Utilization of Fish Stocks) were adopted by the State Committee for Nature Protection on 15 April 1997 and registered at the Ministry of Justice on 1 May 1997.

Up to 2003, juridical and physical persons who managed capture fisheries, based fisheries operations on: (1) state ecological expertise of projects in fish areas; (2) information on stock size; (3) quotas for the exploitation of aquatic animals; and (4) contracts which showed the registration of waterbodies, the measures being taken for their protection, and the fish-breeding and stocking practices to be applied.

According to Enactment No. 350 (2003), natural waterbodies are to be assigned to fishery enterprises on a rental basis. The fishery enterprises that concluded rental/lease contracts for a period of more than ten years operate the capture fisheries. These enterprises catch fish on a quota-free basis, but the catch is based on the carrying capacity of the available biological resources and on customer

demand. They are obliged to also take measures to conserve the productivity of waterbodies and maintain the reproductive capacity of fish stocks at proper levels.

#### *Capture fisheries*

Capture fisheries is practiced in freshwater reservoirs and in lakes used for residual water storage. Two groups of such lakes are of major importance for capture fisheries (Table 5). One group of lakes is in the Amudarya delta and provides about 1 500 tonnes of fish annually. This group is composed of 20 lakes with areas varying from 4 000 ha to 15 000 ha and covering a total of 97 000 ha (some sources report a total of as many as 150 000 ha) (Director of the Nukus Branch of the International Fund to save the Aral Sea (IFAS), personal communication, September 2007). The second group of lakes is composed of the Aydar-Arnasay lake system situated midway along the course of the Syrdarya River (Figure 7 and Figure 8). In 1994, 760 tonnes of fish were captured and in 2000, 1 600 tonnes of fish were captured. The problem is that the water level and the water quality of these lakes are strongly influenced by irrigation needs and waterbody size, and water depths can fluctuate by year and within a season. This restricts fisheries development, especially as water-level fluctuation has a negative impact on the reproduction of fishes (Karimov and Razakov, 1990; Borodin *et al.*, 1998; Karimov *et al.*, 2004).

TABLE 5  
Fisheries main landing places in Uzbekistan

Lakes	Area (ha)*	Quantity of harvested fish 1998-2001 (tonnes)
Lakes in the Amudarya delta	97 000	550–1 200
Aydar-Arnasay lake system	400 000	1 500–2 000

\* Surface area can change every year due to the natural hydrological regime, irrigation goals and water balance.

Source: Authors.

FIGURE 7  
Flooded area on the shoreline of Lake Tuzkan in the Aydar-Arnasay lake system in 2005



Photo courtesy of Mr B. Karimov.

Of regional importance are also the fishery activities in lakes and reservoirs in the lowland parts of the Kashkadarya and the Zarafshan Rivers. Together the fishery activity on these rivers provides for less than 10 percent of the national fish catches.

Until 2003, the state financed the stocking of waterbodies with silver carp, common carp and grass carp. The aim was to increase the productivity of the waterbodies. When it became practice to assign the use of the natural waterbodies on a rental basis (Table 6), the state stopped financing the stocking of natural waterbodies. Now the stocking of waterbodies is supposed to be carried out by the private sector. However, the private entrepreneurs generally do not carry out (re)stocking because fry and fingerlings are either not available or the costs are considered too high. The exception to this rule is the joint venture Akva-Tudakul working on the Tudakul reservoir.

### **Fish production after independence and reforms**

The official total fish production from all resources, i.e. ponds, reservoirs, lakes and rivers, was reported at 26 500 tonnes in 1990. Production declined to 4 300 tonnes during 2004. Total production in 2004 of both capture fisheries and aquaculture is depicted in Figure 9 and shown as Table 23 in Annex 1.

**FIGURE 8**  
**Fishers sorting harvested fish in the Aydar-Arnasay lake system**



Photo courtesy of Mr B. Karimov.

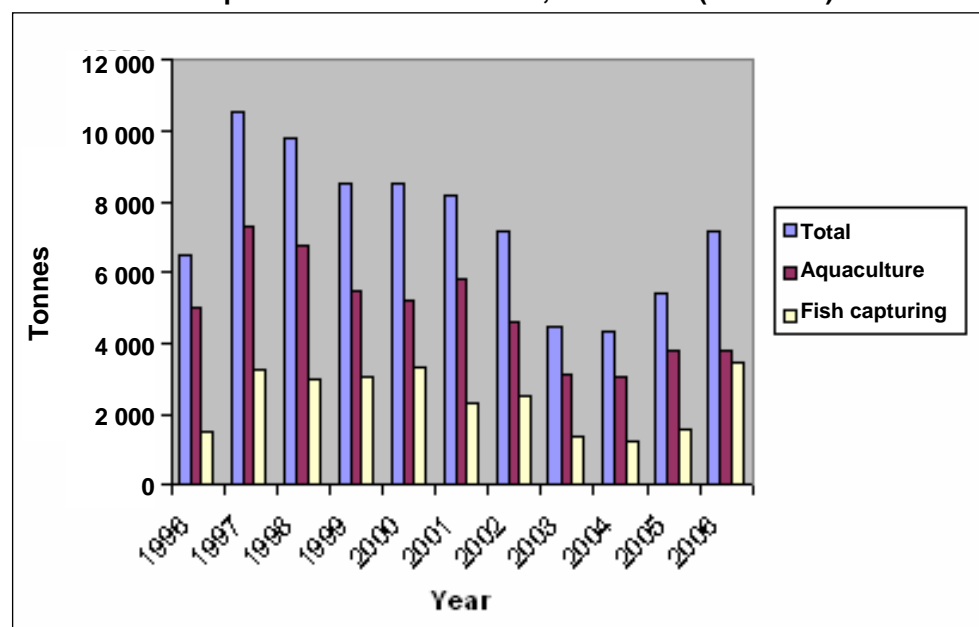
TABLE 6  
Assignment of natural fishery waterbodies in 2007

Republic/province	No. of waterbodies	Area of waterbodies (in '000 ha)	No. farmers renting waterbodies	Area given on rental basis (in '000 ha)
Rep. of Karakalpakstan	31	113 597	69	77 275
Zhizak province	3	205 000	78	186 590
Navoi province	3	150 489	78	114 292
Bukhara province	8	101 321	16	101 321
Kashkadarya province	11	26 094	21	17 253
Khorazm province	10	68 330	9	4 117
Samarkand province	6	10 680	4	1 274
Surkhandarya province	6	13 186	5	10 858
TOTAL	78	688 697	280	512 980

Source: Authors.

There are several reasons for the decrease in fish production, including: the general economic crisis in the country; broken links with the fisheries institutions of the Soviet era; problems with fish feed quality and availability; problems with availability and quality of equipment and supplies; and a decline in the quality and availability of education and research in fisheries (Kurbanov, 2007). Moreover, during the first stages of privatization, the fisheries sector was not preferred among the various investment alternatives. Traditional carp culture and small-scale fish-capture facilities with low profitability were not interesting to investors. Because of the above-mentioned factors, fish production as well as fish processing and trade decreased. Privatization also had a negative impact on education and research in the fisheries sector. Enterprises that provided aquaculture with various services (e.g. fish feeds, chemicals, equipment and gears) closed their doors or changed their business activity. At present, few private-sector fish-capture and fish-culture enterprises remain active in the fisheries sector.

FIGURE 9  
Fish production in Uzbekistan, 1996–2006 (in tonnes)



Source: The State Committee for Fisheries.

From a technological point of view, aquaculture production largely decreased because of the reduced use of fish feeds. In 1992, the fish feed sector produced 40 000 tonnes of fish feeds, in 1994 only 24 000 tonnes and in the new millennium not more than 2 000 tonnes of fish feeds were produced.

In terms of the share of total production contributed by aquaculture and by capture fisheries, the share produced by capture fisheries decreased in recent years (Table 7). This decrease is because of reduced investments. Private-sector entrepreneurs who took over the state enterprises since 2003 generally do not have sufficient financial backing to invest in new technologies.

#### *Analysis of fish production of aquaculture and capture fisheries*

Table 7 shows the results of a year-by-year analysis of the fish catch of capture fisheries in waterbodies such as lakes, reservoirs and rivers, as reported in a paper on the use of irrigation systems for sustainable fish production in Uzbekistan (Kamilov, 2003).

TABLE 7

#### **Fish produced by aquaculture and capture fisheries in Uzbekistan, 1996–2005 (in percentage of total production)**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aquaculture	77	69	70	65	61	71	64	70	72	70
Fish capture	23	31	30	35	39	29	36	30	28	30

Source: Uzbekik and the Research Center for the Development of Fisheries.

During the period from 1996 to 2005, aquaculture produced between 61 percent and 77 percent of the fish in Uzbekistan, while the estimated value of the total fish production realized by aquaculture was between 90 percent and 95 percent. During the same period, aquaculture produced on the average of 4 200 tonnes of fish annually with an estimated farm-gate value of US\$4 200 000.

Analysis of the available data shows that about 60 percent of catches for the last few years originates from lakes used for residual water storage and 40 percent of catches originates from reservoirs (Table 8). The catches from rivers are negligible.

TABLE 8

#### **Capture fisheries production by type of waterbody (in '000 tonnes)**

Year	Fish catch from lakes	Fish catch from reservoirs	Fish catch from rivers	Total
1980–1990 (average catch for a decade)	5.5	1.0	0.5	7.0
1994	2.0	0.8	0.3	3.1
1996	1.2	0.3	0	1.5
1999	3.1	0.4	0	3.5
2000	2.7	0.3	0	3.0
2005	2.6	0.3	0	2.9
2006	2.1	1.3	0	3.4

Source: Authors.

#### *Fish processing*

The decrease in fish production also brought about changes in fish processing in Uzbekistan. The gap between demand and supply of fish has been widening, with demand increasing and supply decreasing. In recent years, there has been a deficit of fish in the market. During the month of Ramadan in the winter–autumn period of 2007, the Moslem people increased their fish consumption. The farmed fish was harvested during the same period as the pond fish farms supplied the market with live fish. Farms could easily sell/distribute live and fresh fish and did not need to arrange for any processing. As a result, the volume of processed fish products decreased. Only specific institutional consumers (army, hospitals, rehabilitation facilities) ordered frozen fish. In recent years, many farms did not even present statistics on fish processing. The available data are presented in Table 9. The



increase in fish-freezing activities can be explained by the fact that the Balikchy Fish Farm and some other farms renovated their freezers and refrigerators in the last few years.

TABLE 9  
**Fish and fish products used in fish processing in selected years (in tonnes)**

Type of fish product	1996	1997	2006
Live and fresh fish (filets)	6 120	9 913	6 292
Frozen fish	222	267	885
Smoked and salted fish	158	385	12
TOTAL	6 500	10 565	7 200

Source: Uzbekik and the Research Center for the Development of Fisheries.

Up to 2003, the state financed the restocking of waterbodies, although the restocking was in fairly modest quantities (Table 10).

TABLE 10  
**Fry and fingerlings stocked in natural waterbodies in Uzbekistan, 1996–2002 (in millions)**

Fish species	1996	1997	1998	1999	2001	2002
Common carp	6.0*	2.72	1.7	0.6	1.0	1.6
Silver carp & bighead carp	1.7	1.97	2.8	2.0	1.5	4.9

\* Millions of larvae instead of fry/fingerlings.

Source: Data from Uzbekik and the Research Center for the Development of Fisheries.

In the 1990s, the number of boats used by capture fishery enterprises sharply decreased. In the mid-1990s, no new boats were built or purchased, and only the fleets remaining from former years were used. In total, not more than 340 boats were used for fishing activities, including 12 cutters with engines of 130 hp, 32 cutters with engines of 20–60 hp and between 280 and 300 motor boats. After privatization came to a close, the new owners started to equip the brigades with boats again (refer to Chapter III).

### Changes in employment in the fisheries sector

During the period from 1994 to 2003, many changes took place in the fisheries sector, job security and salaries were low, and there were no new entrants. At the beginning of privatization, the trade companies left the sector. Other enterprises followed suit and only some fish farms and capture fishery enterprises remained active in fisheries. As a result, the number of people employed in the sector decreased significantly, particularly in the early years of privatization (Table 11).

Table 11  
**Employment in the fisheries sector, 1996–2003**

Year	1996	1997	1998	1999	2001	2002
No. of employees	5 800	4 500	4 500	4 450	4 400	4 400

Source: Uzbekik and the Research Center for the Development of Fisheries.