

**CAPTURE FISHERIES AND AQUACULTURE IN THE KYRGYZ REPUBLIC:
CURRENT STATUS AND PLANNING**



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CAPTURE FISHERIES AND AQUACULTURE IN THE KYRGYZ REPUBLIC: CURRENT STATUS AND PLANNING

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PREPARATION OF THIS DOCUMENT

This document contains: (i) the Review of Capture Fisheries and Aquaculture in the Kyrgyz Republic; and (ii) the Strategy for Fisheries and Aquaculture Sector Development and Management in the Kyrgyz Republic (2008–2012). Both documents were prepared at the request of the Department of Fisheries of the Ministry of Agriculture, Water Resources and Processing Industry of the Kyrgyz Republic. The preparation of both documents was realized with support from the European Commission (EC) and the Food and Agriculture Organization of the United Nations (FAO) under the Project EC/FAO Facility GCP/GLO/162/EC – Kyrgyzstan – “Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity”.

The Review of Capture Fisheries and Aquaculture in the Kyrgyz Republic was prepared by Ms Mairam Sarieva (Department of Fisheries) and Mr Mukthar Alpiev (National Academy of Science) in close collaboration with Mr John Jørgensen and Mr Raymon van Anrooy of FAO and with support from Ms Mireem Jamalova (national consultant), Mr Kozhogulov Joldubai (Department of Fisheries), Mr Apilbek Uulu Erkin (national consultant), Mr Beisheke Niyazov (Department of Fisheries), Ms Raushan Kozhombaeva (national consultant) and Mr Andy Thorpe (international consultant).

Logistical and operational support in the collection of information was received from Mr Beisheke Niyazov, National Project Coordinator for GCP/GLO/162/EC and staff member of the Department of Fisheries of the Kyrgyz Republic, and Mr Ryspek Apasov, FAO National Correspondent to the Kyrgyz Republic.

The Strategy for Fisheries and Aquaculture Sector Development and Management in the Kyrgyz Republic (2008–2012) was prepared under the supervision of Mr Bayalin Baitemirov, Director of the Department of Fisheries of the Kyrgyz Republic, by staff of the Department, and with technical and policy assistance from Mr Raymon van Anrooy, Mr Andrés Mena Millar and Mr John Jørgensen (FAO).

The strategy should be considered a framework of policy guidance prepared by a core group of Kyrgyz fisheries and aquaculture experts, with inputs from national workshops held in Bishkek in June and September 2007 and on the shores of Lake Issyk Kul in November 2007. The draft strategy was distributed at various stages to all concerned with fisheries and aquaculture in Kyrgyzstan, and additional comments were received from a wide range of officials, experts and producers involved in the sector. These comments were taken into consideration, discussed and (where relevant) incorporated in the final draft strategy.

Following the above-mentioned intensive process of consultation with all relevant fisheries sector stakeholders, the strategy was approved by Minister A. Nogoyev on 25 February 2008. The Director of the Department of Fisheries was instructed to lead the implementation of the strategy.

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Capture fisheries and aquaculture in the Kyrgyz Republic: current status and planning.
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ABSTRACT

Annual fish production in the Kyrgyz Republic (or Kyrgyzstan) has fallen significantly since independence in 1991. In 1991, fish production (inland and aquaculture) was estimated at more than 1 361 tonnes. By 2006, it had decreased to 71 tonnes. In the same period, more than 90 percent of state fish farms were privatized as part of the economic changes that followed the breakup of the former Union of the Soviet Socialist Republics.

In February 2007, the Government of Kyrgyzstan, through the Ministry of Agriculture, Water Resources and Processing Industry (MAWRPI), requested FAO to provide technical assistance for the sustainable development and management of the fishery sector in the country. FAO, through its European Community (EC)/FAO facility for consultancy services, approved Project GCP/GLO/162/EC – Kyrgyzstan – “Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity”.

This FAO Fisheries Circular has two main aims. First, it is intended to inform those interested in fisheries and aquaculture in Kyrgyzstan about the current situation with regard to fishery resources and their utilization in the country. Second, it attempts to provide an example of a consultative and participatory policy framework development process, which might be of use also for other countries in transition in the Central Asian region.

The documents presented here are considered as final versions and cleared as such by the Department of Fisheries (DOF) of the MAWRPI. The documents are also available in Russian language from the DOF in Bishkek.

The Review of capture Fisheries and aquaculture in the Kyrgyz Republic is presented in Part I of this Fisheries Circular. Part II contains the final version of the Strategy for fisheries and aquaculture sector development and management in the Kyrgyz Republic (2008–2012).

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LIST OF ACRONYMS

CBD	Convention on Biological Diversity
CIS	Commonwealth of Independent States
COFI	Committee on Fisheries (FAO)
DOF	Department of Fisheries
EC	European Commission
EU	European Union
GEF	Global Environment Facility
GPS	Global positioning system
GTZ	Gesellschaft für Technische Zusammenarbeit (German development agency)
HFU	Hunting and Fishing Union
ICWC	Interstate Commission for Water Coordination
MAWRPI	Ministry of Agriculture, Water Resources and Processing Industry
MCS	Monitoring, control and surveillance
NGO	Non-governmental organization
RFB	Regional fishery body
SES	Sanitary Epidemiological Service
SWOT	Strengths, weaknesses, opportunities, threats
TAC	Total allowable catch
TIKA	Turkish International Cooperation and Development Agency
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VAT	Value added tax
VPA	Virtual population analysis

Exchange rate:

The average exchange rate applied throughout this document is: US\$1 = som36.

Part I

Review of capture fisheries and aquaculture in the Kyrgyz Republic

EXECUTIVE SUMMARY

The Kyrgyz Republic (or Kyrgyzstan) is a mountainous country in Central Asia. It is rich in water resources compared with the neighbouring countries and regions. However, the fisheries and aquaculture sector is poorly developed. Total annual fish production is 71.4 tonnes. Even when the 3 000 tonnes imported from neighbouring countries is included, annual fish consumption in the country amounts to less than 1 kg per capita, compared with 16.5 kg on a global level.

Kyrgyzstan was part of the former Union of the Soviet Socialist Republics (former USSR) until 1991, and the fisheries sector was much more developed in the 1980s than at present. In the 1980s, national production reached 1 400 tonnes/year and large volumes of affordable fish for the population reached the country from other parts of the former USSR. The dissolution of the former USSR was followed by dramatic increases in prices of imported products including fish feeds and technology needed for aquaculture, causing fish prices to increase considerably for consumers.

The economic difficulties that came in the wake of independence resulted in a dramatic decline in governmental support to fisheries and aquaculture. Most state-owned fish farms were privatized, and there was no longer an adequate budget available to undertake research, gather statistics or monitor the activities of the fisheries.

In regard to capture fisheries, the most important management tool, since Soviet times, has been restocking with various commercial fish species (most introduced from watersheds elsewhere in the Russian Federation and Central Asia). The financial and ecological implications of this management strategy have not received much attention. However, the outcome has been that the fish fauna in most Kyrgyz waterbodies has changed completely, and most fish harvested today are non-indigenous species.

In Kyrgyzstan, as in many other countries, water is managed mainly to secure the needs of the agriculture sector with little regard for the needs of fisheries.

The dire economic situation, especially in rural areas, combined with the low level of enforcement has also led to a sharp increase in the level of poaching for subsistence purposes. There is evidence that the level of illegally caught fish is significantly higher than the official catch figures.

Although there is little tradition of fish consumption in the country, it was much higher in Soviet times than today. Increasing incomes in the capital city are leading to a rising demand for fish and fishery products. Imported and illegally caught fish are often stored and processed under inappropriate conditions. This fish is generally not suitable for human consumption. However, unsafe and poor-quality fish products are still sold, giving the sector a bad image. The current demand for fish far outstrips supply, causing the sale of unsafe product and also leading to high market prices. To provide the population with the health benefits related to increased consumption of good-quality fish, domestic production of, in particular, “cheap” types of fish should be boosted.

Some investors have already recognized the potential for making profits in fisheries and have started to invest in the revival of the fisheries sector. One of the subsectors that have received most attention is the lucrative farming of exotic rainbow trout in cages in the country’s largest lake. This lake is a unique environment and a United Nations Educational, Scientific and Cultural Organization (UNESCO) world heritage site. It has also been designated as a Ramsar site.

It is mandatory that Kyrgyzstan, while encouraging the development and diversification of its fisheries, introduce an appropriate legal and regulatory framework that is in compliance with international and regional agreements and conventions (e.g. the FAO Code of Conduct of Sustainable Fisheries). This is necessary so that an adequate supply of fish can be generated in a sustainable manner in order to meet the needs of the population without jeopardizing biodiversity and to avoid repeating past mistakes.

As Kyrgyzstan has a very considerable high hydropower potential (of which only some 10 percent has been developed), it is most probable that the hydropower sector will develop significantly in the coming years. It is crucial for the fisheries sector to become involved in the planning and operation of hydropower and irrigation projects. Several reservoirs would be suitable for establishing cage culture. These include the Kurpsay, Tash-Kumyr, Shamaldysai and Uch-Korgon reservoirs, and the cascade of reservoirs on the Naryn River.

Chapter I

INTRODUCTION

The Government of the Kyrgyz Republic (or Kyrgyzstan) acknowledges that fisheries is a key sector for rural development in the country. However, since independence, fish production has experienced a serious decline. In 2006, the combined fish production from aquaculture and capture fisheries in the country was estimated at 71 tonnes, compared with more than 1 000 tonnes some decades ago. The available water resources for fisheries, together with the existing demand for fish and fishery products and the current technical experience available in the sector, mean that there is considerable scope for increasing the sector's contribution to food security, poverty alleviation, employment and income generation in rural areas.

The Ministry of Agriculture, Water Resources and Processing Industry (MAWRPI) recognized the need to study the current situation and identify opportunities to increase production in order to meet domestic demand and increase consumption of fish given its importance as a source of animal protein, essential fatty acids, vitamins and minerals.

As a consequence, the MAWRPI (through the Department of Fisheries) requested international technical and financial support from FAO in order to conduct a review of capture fisheries and aquaculture in Kyrgyzstan and to assist in formulating a strategy for fisheries and aquaculture sector development and management in Kyrgyzstan.

FAO responded by offering Kyrgyzstan technical assistance to the country's fisheries sector through the project "Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity" (GCP/GLO/162/EC – Kyrgyzstan), a project supported by the European Commission. This review study was the first step towards the development of the national strategy and intended to provide baseline information on the current situation of the fisheries in the country.

Chapter II

HISTORICAL BACKGROUND

FISHERIES AND AQUACULTURE UP TO INDEPENDENCE

Capture fisheries

In spite of the abundant water resources, the cold and oligotrophic waters that dominate the country limit the fish production potential. Fisheries have never been important in Kyrgyzstan, as fishing has traditionally focused only on supply for local consumption.

Most capture fisheries activities in Kyrgyzstan have focused on Lake Issyk Kul, the largest waterbody in the country. However, commercial fishing only started there towards the end of nineteenth century (Petr and Mitrofanov, 1998; FAO, 1999), when fish catches varied between 17.4 and 104.8 tonnes per year (Berg, 1930).

In 1931, the Issyk Kul Fish Processing Factory (when privatized in 1993, this became Balykchylar Ltd.) was established in Grigorievka village. This led to a considerable intensification of the fisheries and an increase in catches. These reached 1 100–1 200 tonnes/year in the last half

TABLE 1

Capture fisheries production from the most important lakes and reservoirs in Kyrgyzstan up to 1990

Fish landings in Lake Issyk Kul, 1965–1990						
Year	1965	1968	1975	1980	1985	1990
Annual production (tonnes)	1 335	1 090	929	345	166	286
Fish landings in Lake Son Kul, 1976–1990						
Year	1976	1977–78	1979–1981	1982–84	1985–87	1988–1990
Annual production (tonnes)	8	108	42	20	37	40
Fish landings in Toktogul Reservoir, 1978–1989						
Year	1978–1980		1981–83	1984–86	1987–89	
Annual production (tonnes)	43		13	11	10	

Note: More details in Annex 1.

Source: DOF (Undated).

TABLE 2

Annual fish landings in Kyrgyzstan, 1965–1989

Species	1965–69	1970–74	1975–79 (tonnes)	1980–84	1985–89
Pikeperch	28.32	136.38	89.45	34.04	30.94
Trout	3.02	10.34	45.74	24.38	23.66
Osman	0.98	1.30	1.68	1.03	0.16
Whitefish	-	-	3.52	10.58	31.47
Sazan	9.52	2.94	0.51	0.91	1.18
Ide	22.48	54.40	49.55	29.19	23.48
Moroco	1 074.00	915.70	573.64	112.03	126.13
Marinka	3.90	1.60	2.28	3.42	4.42
Tench	4.92	5.14	1.48	1.29	3.46
Silver carp	-	-	-	2.89	1.84
Grass carp	-	-	-	0.39	0.59
Total	1 147.14	1 126.60	765.85	220.15	216.78

Note: Scientific names in Annex 2.

Source: DOF (Undated).

of the 1950s and reached the maximum recorded of 1 335 tonnes in 1965. Since then, there has been a steady decline in catches (Tables 1 and 2). In 1985, the catch from Lake Issyk Kul was 166 tonnes – or 12 percent of the 1965 catch.

In the 1970s, fishing expanded to include the Son Kul and Kara-Suu lakes and the Toktogul, Bazar-Kongor, Orto-Tokoy and Kirov reservoirs. However, the combined catch from these waterbodies was only 10–15 percent of that from Lake Issyk Kul. The latter has consequently attracted most of the attention and much more information is available about the fisheries there.

Fisheries management

In the early twentieth century, fishing was carried out using gill nets of different mesh sizes, sweep-nets and bow nets. The fishery was unregulated, and unsustainable practices prevailed, e.g. setting gill nets at the mouths of the rivers to catch migratory fish ascending the river to spawn, and targeting spawning fish on the spawning grounds in the shallows of the lake.

In the period of planned economy, commercial fish catches were all regulated and carried out by the Office of Fishery of the Ministry Council of the Kyrgyz Republic. The fisheries sector was subsidized by the Ministry of Fishery of the former USSR. At this time, about 300 people, 122 boats and 8 638 nets were employed on Lake Issyk Kul alone (Konurbaev *et al.*, 2005).

In 1940, the coastal zone of Lake Issyk Kul was divided into 40 sections, and quotas were calculated for each section based on production potentials. In 1982, fishing for moroco (*Leuciscus bergi*) was prohibited in Lake Issyk Kul in the spawning season (Konurbaev and Timirkhanov, 2003). In 1986, a total ban on naked osman fishing was imposed (Konurbaev *et al.*, 2005).

The most important management tool used was to enhance the capture fisheries through stocking and restocking. For this purpose, a number of exotic species of higher economic value were introduced. Several of these became established and formed the basis for important fisheries. The Ton hatchery is an example of how this policy was implemented. The hatchery was set up on the Ton River (a tributary to Lake Issyk Kul) in 1956 to reproduce trout and other valuable species artificially for stocking the lake.

The broodfish were trapped when entering the Ton River and other tributaries to the lake. The Ton hatchery had the capacity to produce 10 million trout and 2 million carp fingerlings annually. At the end of the 1960s, an additional plant was established in Karakol (Przhevalsk), where trout, sig and osman could all be bred for stocking the lake (Konurbaev *et al.* 2005). In addition to fish, invertebrates (primarily mysids) were introduced in a number of cases with the aim of supplementing the food base for the fish. In many cases, the fish introduction and stocking programmes had serious ecological consequences (Part I, Chapter III).

Aquaculture

The decline in capture fisheries production in the 1970s was offset by the establishment of a number of state fish farms. Fish breeding in pond systems rapidly became the most productive subsector of the country's fisheries sector. In the period 1980–1990, when total annual fish production in Kyrgyzstan exceeded 1 400 tonnes, 70 percent of this production originated from pond culture on the state-run farms. However, pond aquaculture was not always a profitable business. For example, the Talas plant only survived by virtue of significant state subsidies (Table 3).

Chui fish-breeding plant

The Chui plant (now the joint-stock company Balyk) was established as a state fish farm in the late 1950s as a regional fish hatchery. It was equipped with standard equipment and managed a total pond area of 370 ha, which included broodstock ponds, grow-out ponds, hibernation ponds and nursery ponds. In addition to the production of table fish, the plant also provided stocking materials of various carp species.

TABLE 3

Aquaculture production and income in Kyrgyzstan, 1985–1990

Plant		1985	1986	1987	1988	1989	1990
Chui	Fish production (tonnes)	241	274	200.2	415.2	390.4	316.4
	Total revenues (thousand roubles)	365.8	462.2	335	719.3	620.4	507.1
	Costs (thousand roubles)	367.1	299.8	368.1	563	570.4	484.7
	Profit (thousand roubles)	-1.3	162.4	-33.1	156.3	50.0	22.4
Uzgen	Fish production (tonnes)	271.1	411.0	408.0	431.0	497.3	380.0
	Total revenues (thousand roubles)	386.5	538.6	535.5	633.8	686.5	546.1
	Costs (thousand roubles)	535.0	461.4	427.7	478.0	617.0	535.8
	Profit (thousand roubles)	-148.5	77.2	107.8	155.8	69.5	10.3
Talas	Fish production (tonnes)	26.7	120.0	132.3	152.0	270.0	274.0
	Total revenues (thousand roubles)	38.1	167.0	149.2	207.4	277.2	287.6
	Costs (thousand roubles)	150.1	235.6	242.0	282.6	272.2	360
	Profit (thousand roubles)	-112.0	-68.6	-92.8	-75.2	5.0	-72.4

Note: US\$1 = 0.637 roubles in 1987.

Source: DOF (Undated).

Uzgen fish-breeding plant

The Uzgen plant was built in 1968 in the town of Uzgen in the Osh region, where the climate and environment provide optimal conditions for fish production. The plant was constructed to produce up to 500 tonnes of sazan, grass carp and silver carp per year. In addition to a hatchery, the plant administers 290 ha of ponds of all categories: grow-out ponds (224.3 ha), nursery ponds (47.1 ha), broodstock and quarantine ponds (9.7 ha), hibernation ponds (4.6 ha), spawning ponds (3.6 ha), and water storage ponds (0.6 ha).

Talas fish-breeding plant

The Talas plant was established in 1975, in the Bakay-Atin area of the Talas region. The plant has the capacity to produce 600 tonnes of sazan, grass carp and silver carp per year. The total pond area is 364 ha, including grow-out ponds (296 ha), nursery ponds (68 ha), and hibernation ponds (0.2 ha).

FISHERIES AND AQUACULTURE 1991–2004**Institutional setting for fisheries**

When Kyrgyzstan became independent, fisheries was included in the Republican Industrial Association Kyrgyzrybhoz (later renamed Kyrgyzbalygy) under the Agroindustrial Committee. The Central Asia Production and Acclimatization Station was given the responsibility for stocking and species introductions.

In 1997, the Department of Fisheries (DOF) was created following a governmental resolution, but it was abolished in July 2000 by presidential decree. Its functions were handed over to the MAWRPI, and a new unit called the Sector of Fishery Industry was created in the ministry. Its main mandate was to improve fisheries management (FAO, 2003). The creation of the Sector of Fishery Industry markedly improved the state of the fisheries through increased attention to research, reproduction, conservation and management. In 2001, the Sector of Fishery Industry was abolished, and its functions were turned over to the Fisheries Inspection Service. This inspectorate introduced various measures to improve the situation of the fisheries, including outlawing whitefish and trout fishing in 2003. Weak enforcement of management measures resulted in an increase in poaching, and the ban on whitefish and trout did not result in any improvement in stocks. The licences for catching fish were issued by the Fisheries Inspection Service of the Ministry of Agriculture until 2004.

Aquaculture and fisheries production

The difficult economic situation in Kyrgyzstan during the initial stages of transition to a market economy had severe impacts on both aquaculture and capture fisheries. Government subsidies to the fisheries sector ceased, forcing the sector to become economically independent. The breaking of economic ties with many of the former Soviet republics led to a shortage of hatchery equipment and quality fish feed that had previously been brought in at low cost from other parts of the former USSR (FAO, 2003).

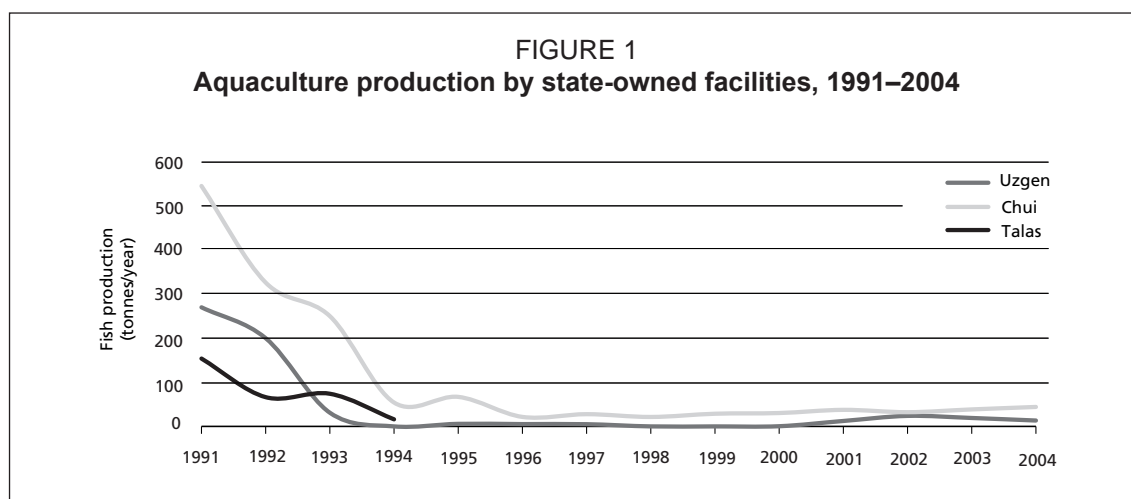
To improve profit margins, all aquaculture ponds with low fish production were taken out of production and the areas were used instead for growing crops (FAO, 2003). Talas fish farm was not operated after 1994. Production only restarted when it was leased out to private entrepreneurs in 2005. Among the state-owned facilities, only the Uzgen farm continued to produce fish, but at an insignificant level. There was a slight rise in productivity from 2001 onwards, and production reached 24 tonnes in 2002 (Figure 1).

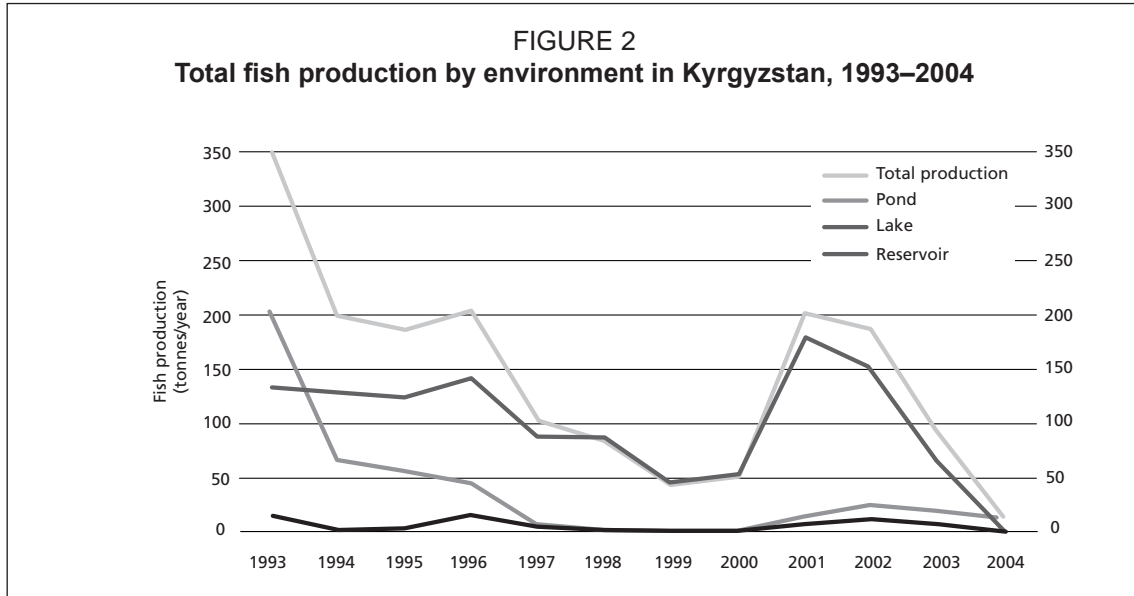
Except for the Ton hatchery, the state-owned hatcheries were privatized in the period 1991–2004. The Chui fish-breeding plant (now Balyk JSC), which was the only fish farm and only producer of stocking material in the Chui region, and the Issyk Kul fish-processing plant (which became Balykchylar Ltd. in 1993), the only well-equipped processing factory at Lake Issyk Kul, were the main privatized facilities. The result of this development was that aquaculture production fell to 5 tonnes in 1997 – 0.5 percent of production levels a decade earlier (Figure 2).

Capture fisheries production from Lake Issyk Kul dropped dramatically through to 1999, when it was only 44 tonnes (Figure 2 and Annex 1). In 2001 and 2002, catches rose to 180 and 151 tonnes, respectively, but then fell to 67 tonnes in 2003.

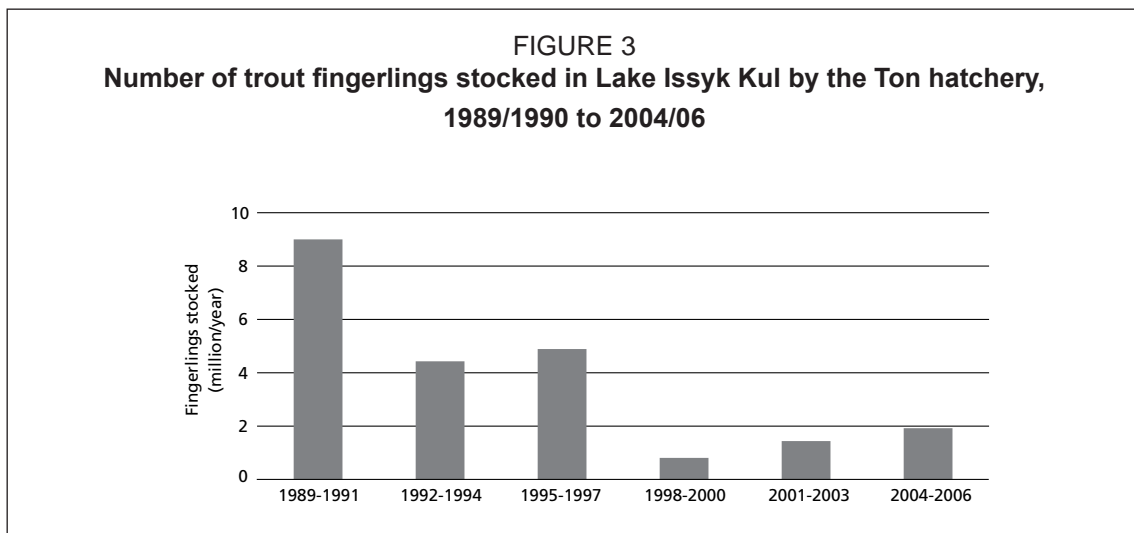
A combination of unsustainable fishing practices, competition within the food chain from introduced species, and unfavourable water resource management led to this collapse in the fishery. In 2000, more effective monitoring of fish farms began, and from then onwards some extension services were provided (which may explain the increase in production from 2000 to 2001).

Since 2000, the fishing rights in the 40 sections in Lake Issyk Kul have been leased out to 17 commercial enterprises. Apart from catching fish for sale, these enterprises have been authorized to capture broodfish in the spawning season with a view to restocking the lake. However, there remains little control as to whether the enterprises observe regulations and their quotas. Short-term leases encouraged overexploitation and what had been the most productive sites in the past became degraded and unproductive (Konurbaev *et al.*, 2005).





Source: Data provided by the DOF.



Source: Data provided by the DOF.

The dire economic situation and soaring unemployment rates led to an increase in the number of poachers (and thus the level of unreported catches). Enforcement of management measures and regulations was weak owing to a lack of financial resources for monitoring compliance. In an attempt to combat illegal fishing activities, controls of fish sales and market controls were introduced in 2000 (FAO, 2003), but these have had limited success.

The level of restocking in Lake Issyk Kul fell from 9 million trout fingerlings in 1990 to fewer than 1 million trout fingerlings ten years later (Figure 3 and Annex 1). While the Ton hatchery had initially been established to produce fingerlings for stocking of Lake Issyk Kul, the ministerial demand that the Ton hatchery should generate part of its income from other sources forced the facility to reorient itself. At the beginning of the twenty-first century, the Ton hatchery started to supply stocking material to private fish farms and reduced the number of fingerlings produced for stocking. Intensification of poaching practices in river mouths also reduced the number of broodfish available for reproduction. Moreover, water abstraction for irrigation led to reduced

water-levels and the drying-up of many of the streams that the traditional indigenous fish species had previously used for spawning.

Fish consumption

During the period of planned economy, the directorate Kyrgyzrybpromsbyt provided the population of the republic with fish and fish products in the necessary quantities, including freshwater and marine fish and processed seafood. During that period, Thursday was “fish day”, and all restaurants and cafes served fish dishes. After independence, this tradition gradually disappeared as fish became scarcer and more expensive; the diversity of products diminished and quality deteriorated.

Chapter III

THE CURRENT STATUS OF FISHERIES AND AQUACULTURE

NATURAL RESOURCES AND POTENTIAL OF THE FISHERIES SECTOR

Geography and climate

Kyrgyzstan (full name: the Kyrgyz Republic) is a landlocked country situated in the northeast part of Central Asia among the mountain systems of Pamiro-Alay and Tian-Shan, between longitude 69–80 °E and latitude 39–43 °N (Annex 3). The country is mountainous, with almost 75 percent of the territory lying at more than 2 000 m above sea level. Kyrgyzstan is contiguous with Kazakhstan in the north and northwest, China in the east and southeast, Tajikistan in the south, and Uzbekistan in the west. The total area of the country is 199 900 km² (National Statistical Committee of the Kyrgyz Republic, 2007).

Kyrgyzstan has an estimated 5 190 million inhabitants, corresponding to an average density of 26 people/km². However, one-third of the population is concentrated in Chui Oblast, with the capital Bishkek.

The climate is dry continental with average temperatures between -1 and -8 °C in January and between 15 and 27 °C in July. However, in the mountains, January temperatures fall to -27 °C, and July temperatures reach only 5 °C.

Rivers

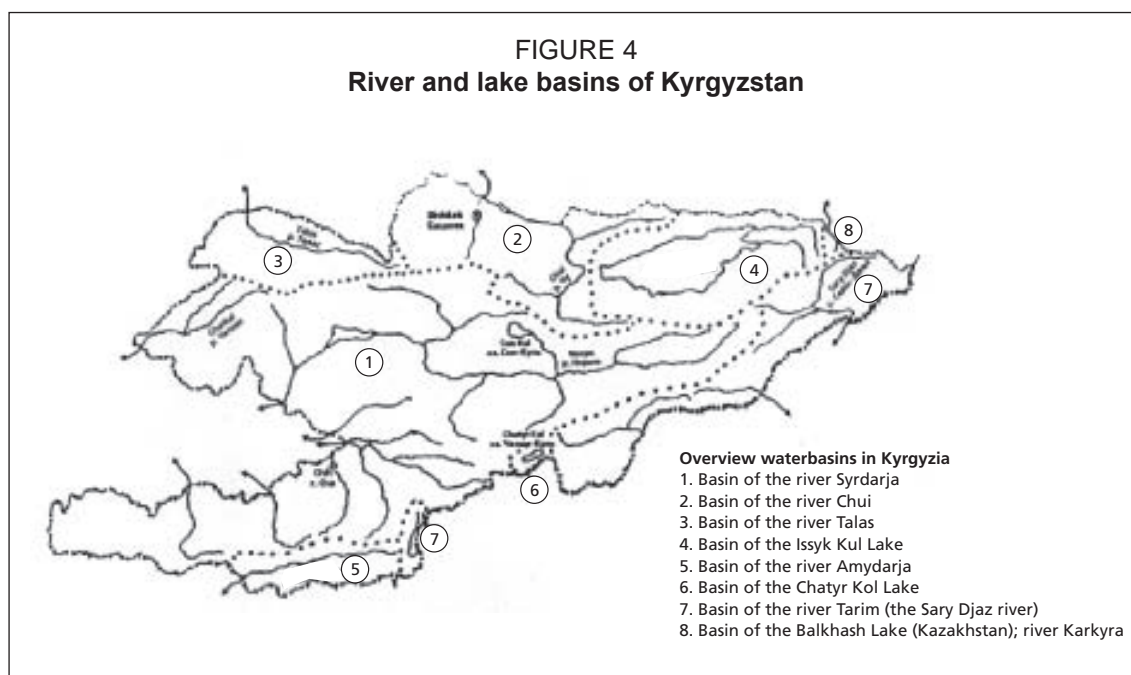
There are almost 30 000 rivers and streams longer than 10 km in the country (National Statistical Committee of the Kyrgyz Republic, 2007). Most of them originate in the mountains, fed by melting snow and ice from the 8 200 glaciers that cover 4.2 percent of the country (Mamatov, Cusupov and Raimcanov, 2007).

The Naryn River basin, which covers more than 50 000 km², is by far the largest. The Naryn and Chatkal both belong to the Syr Darya basin, which drains to the Aral Sea. The Chui (22 600 km²) and Kara-Djaz basins (18 200 km²) rank second and third, respectively, in terms of basin area (Figure 4 and Table 4).

River flow changes considerably during the year and may increase 10–15 times in summer, with the highest water-level normally occurring between June and August. The water is cold, clear and nutrient poor. The current of most rivers is very strong, and both biomass and biological productivity are low. The rivers are currently of no importance for commercial fisheries although annual landings in the upper part of the Chu River may have reached 4–5 tonnes in the 1930s (FAO, 1999). The rivers are of increasing importance for recreational fisheries (particularly angling), and have potential for future ecotourism. Many rivers also are potentially suitable for the establishment of trout culture systems.

Lakes

There are 1 923 lakes in the country, with a total area of 6 836 km² (Mamatov, Cusupov and Raimcanov, 2007). However, only 16 lakes are larger than 1.5 km² (Konurbaev and Timirkhanov, 2003), and most lakes are situated at high altitudes in the mountains without road access. The difficult access to many of these lakes makes exploitation by commercial fisheries non-profitable or impractical. Although their clear, cold, oxygen-rich water is favourable for trout and other cold-water fish species, the low availability of food resources makes culture-based fisheries less



Source: Konurbaev and Timirkhanov (2003).

TABLE 4
The most important rivers and river basins of Kyrgyzstan

River	Length (km)	Basin area (thousand km ²)	Average discharge (m ³ /s)
Naryn	616	50.1	421.0
Talas	294	10.8	33.0
Chui	221	22.6	53.0
Kara-Darya	189	18.2	62.7
Sary-Djaz	165	12.1	126.0
Chatkal	144	6.9	66.0
Kyzyl-Suu (Alay valley)	128	7.8	39.0
Ak-Buura	58	2.5	20.7
Soh	127	2.5	42.1
Keke-Meren	108	8.3	82.0
Chon-Kemin	107	2.0	21.0
Tjup	105	1.1	10.6
Djergalan	81	2.1	22.5
Isfara	85	2.3	14.7

profitable. In addition, small lakes situated at high altitudes may also frequently freeze to the bottom, killing the fish that have not reached commercial size during the productive period in the summer season.

Lake Issyk Kul

Lake Issyk Kul in the northeast of Kyrgyzstan (76–78.15 E and 42 ° 10' – 42 ° 40' N) is the largest waterbody in the country, and the second largest high-altitude lake in the world. The lake is of tectonic origin and is situated between the ridges of Terskey Ala-Too in the south and Kungey Ala-Too in the north at a height of 1 609 m above sea level. It is 178 km long, 60 km wide and has a surface area of 6 292 km². Until 1 200 years ago the lake was connected to the Chui River, but there is now no longer any outlet from the lake (FAO, 1999) and it has become

slightly saline (5.9–6.1 ppt) and alkaline (pH = 8.3–9.0). In the recent past, 102 rivers used to flow into the lake. However, only the Tyup and Jergalan rivers are sizeable with discharges of 10 and 22 m³/s, respectively (Konurbaev and Timikhanov, 2003). Many of the smaller streams have dried up. Most of the about 50 rivers currently reaching the lake have greatly reduced flows owing to water abstractions for irrigation, and many of them run completely dry for part of the year (FAO, 1999).

The lake is deep, with 63 percent of the lake deeper than 100 m and a maximum depth of 668 m. The lake is oligotrophic and the water is highly transparent with Secchi depths of 30–47 m in the open lake. There is a diverse planktonic community consisting of 299 species of phytoplankton and 117 species of zooplankton, and also the benthic community is rich with 146 species of zoobenthos (FAO, 1999).

Fish are mainly found from the littoral down to a depth of 100 m. This means that two-thirds of the lake has few or no fish. Natural fish production reflects the nutrient-poor status of the lake and is only 1.5–2.0 kg/ha/year (Konurbaev *et al.*, 2005).

Lake Son Kul

Kyrgyzstan's second largest lake, Lake Son Kul, is a mountain lake. It is situated 3 016 m above sea level in a small hollow of the inner Tian-Shan, between 41 °47'–41 ° 55' N and 75–75 ° 20' E, between the mountain ridges of Sonkul-Too in the north and Moldo-Too with the spurs of Boor-Albas in the south. The lake has an area of 273 km² and a mean depth of 9 m (FAO, 2003).

Until 1959, there were no fish in Lake Son Kul. However, a number of commercial fish species have since been stocked in the lake (FAO, 2003). In the past (when the fisheries law was better enforced), landings were 140–300 tonnes/year. However, in recent years, up to 600 tonnes have been landed yearly, and this level is not sustainable (Konurbaev and Timikhanov, 2003).

In 1978, the lake was accidentally polluted with an insecticide used for locust control. A considerable part of the fish and other aquatic organisms died, and it took ten years for catches to reach the amounts obtained in the early 1970s.

Lake Kara-Suu

Lake Kara-Suu is a small lake (40 km²) situated in Jalal-Abad region of the Naryn River basin. The lake is deep (up to 100 m), the water is cold, and the nutritional base of the lake is quite poor. Syrok (*Coregonus peled*) was introduced in the lake in 1988. Although it reproduces naturally, it has never become abundant. It is estimated that the productivity could be increased by 1.5–2.0 times though annual restocking with young syrok.

Lake Chatyr-Kul

Lake Chatyr-Kul is a fishless lake situated in the south of Tian-Shan at 3 530 m above sea level (40 ° 37' 51.00" N, 75 ° 17' 13.24" E). Some 52 rivers and brooks flow into the lake, which is slightly saline and extends over an area of 170.6 km². In the early 1970s, the potential for developing a fishery was studied. Lake Chatyr-Kul was found to be very nutrient rich, with an average biomass of zoobenthos of 39.7 g/m² and an environment suitable for whitefish.

However, the lake is now protected under Kyrgyz law (Konurbaev and Timikhanov, 2003), and it was declared a Ramsar site in 2005. Therefore, introducing fish would be illegal.

Reservoirs

There are 13 large reservoirs in the country (Table 5), all state-owned. These represent 38 percent (377 km²) of the total water area covered by all the reservoirs in Kyrgyzstan (more than 988 km²).

TABLE 5
The major reservoirs of Kyrgyzstan

Reservoir	Year built	Area (km ²)	Purpose	River basin	No. of fish species	Type of fishery	Fish production potential (tonnes/year)
Chui Oblast							
Nizhnee Ala-Archa	1989	13.0	Irrigation	Chui	21	Recreational	100.0
Chumysh	1956	0.6	Irrigation	Chui	13	Recreational	5.6
Kara-Baltin	1964	1.5	Irrigation	Chui	14	Recreational	4.9
Mekhaniche	1963	0.4	Irrigation	Chui	15	Recreational	4.2
Jeken-2	1933	0.3	Irrigation	Chui	13	Recreational	3.3
Ak-Bashat	–	0.4	Irrigation	Chui	13	Recreational	4.0
Stepnin	1963	0.3	Irrigation	Chui	15	Recreational	3.4
Erictuu	1957	0.2	Irrigation	Chui	15	Recreational	2.0
Ak-Suu	1982	0.5	Irrigation	Chui	11	Recreational	4.5
Spartak	1978	5.1	Irrigation	Chui	25	Recreational	51.0
Makachi	1932	0.3	Irrigation	Chui	15	Recreational	2.5
Kara-Tuma	1987	2.2	Irrigation	Chui	14	Recreational	24.0
Panfilov-1	1964	0.6	Irrigation	Chui	15	Recreational	5.7
Panfilov-2	1964	0.6	Irrigation	Chui	15	Recreational	6.2
Puchuk	1989	0.6	Irrigation	Chui	14	Recreational	6.0
Agermen	1986	34.0	Irrigation	Chui	14	Recreational	3.4
Sokuluk	1968	1.8	Irrigation	Chui	15	Recreational	18.0
Djalgach	1954	0.4	Irrigation	Chui	13	Recreational	3.9
Jalal-Abad Oblast							
Toktogul	1973	265.0	Irrigation & energy	Naryn	18	Commercial	132.0
Bazar-Korgon	1962	2.7	Irrigation	Kara-Darya	8	Recreational	1.0
Kurpsay	1981	12.0	Irrigation & energy	Chui	6	Recreational	4.5
Tash-kumyr	1988	7.8	Irrigation & energy	Naryn	6	Recreational	2.9
Shamaldysai	–	2.4	Irrigation & energy	Naryn	6	Recreational	0.9
Uch-Korgon	1962	4.0	Irrigation	Naryn	11	Recreational	8.5
Osh Oblast							
Naiman	1966	4.5	Irrigation	Kara-Darya	5	Recreational	12.7
Papan	1987	7.1	Irrigation	Kara-Darya	5	Recreational	2.1
Kampravat	–	540.0	Irrigation & energy	Kara-Darya	4	–	16.0
Batken Oblast							
Tortkul	1977	0.4	Irrigation	–	5	Recreational	8.0
Talas Oblast							
Kara-Burin	–	26.5	Irrigation	Naryn	14	Recreational	79.5
Kirov	1975	28.0	Irrigation	Talas	16	Commercial	168.0
Naryn Oblast							
Orto-Tokoi	1956	25.0	Irrigation	Chui	9	Commercial	1.9
Total		988.2	–		–	–	690.6

Sources: Pelli (2005) and DOF (Undated).

They were all established between 1930 and 1990. Some were constructed for storing water for irrigation, others for both irrigation and hydropower production. In addition, there are more than 300 small irrigation reservoirs, mainly in the Chui Valley.

Although the fishing rights in the reservoirs are commonly leased out, little or no attention has been given to the interests of fisheries when planning or managing the reservoirs. This prioritization has serious consequences for fish production because of the fluctuating water-levels.

A rapid drop in water-level during the spawning period sometimes leads to the drying-up of suitable spawning grounds and eggs already spawned. For this reason, the majority of the reservoirs are not suitable for commercial fishing and are, therefore, only used for recreational fisheries. The main species are: carp, pike, roach, osman, marinka and herbivorous species.

However, several reservoirs would be suitable for establishing cage culture, e.g. the Kurpsay, Tash-Kumyr, Shamaldysai and Uch-Korgon reservoirs and the cascade of reservoirs on the Naryn River.

Fish fauna

There are currently 66 fish species and subspecies in the country. Of these, 49 are indigenous (one of these, Schmidt's dace (*Leuciscus schmidti*) is endemic) while the remaining 17 have been introduced either on purpose or by accident. A further six exotic species at least have failed to establish themselves (Konurbaev and Timikhanov, 2003; and Annex 2). The species introductions took place in lakes, rivers and reservoirs throughout the country as part of a strategy to build larger and more valuable fish stocks. However, this had severe impacts on the ecosystems, and did not yield the expected results in terms of fish production. It led to changes in both the quality and sizes of fish stocks and the gradual disappearance of indigenous fishes in the catches (Box 1).

Fish fauna in lakes

Most lakes in Kyrgyzstan are rather species poor, with generally only two or three species present (Konurbaev and Timikhanov, 2003). The indigenous lake species are generally small and of little commercial value. Most lakes in the country, including the most-species-rich (Lake Issyk Kul with 12 indigenous species), have consequently been subject to intensive stocking programmes (mainly with exotic species).

The Sevan trout was introduced in Lake Issyk Kul from Lake Sevan, Armenia, in 1930–36 by the Department of Fishery Administration of the former USSR. The fingerlings were stocked in the mouths of rivers and streams flowing into the lake. The trout adapted well to the new environment and developed some differences from the Sevan trout. Indeed, some consider it a separate subspecies. A specialized hatchery was built in the Ton region, and as a result of continued stocking with artificially reproduced trout, the population in Lake Issyk Kul grew. In 1971, it was possible to commence commercial catching of trout.

In the 1950s and 1960s, bream (*Abramis brama*), sazan (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), tench (*Tinca tinca*), syrok (*Coregonus peled*) and Baikal omul (*Coregonus migratorius*) were introduced into Lake Issyk Kul (Turdakov, 1963), and 1 400 broodfish of pikeperch (*Sander lucioperca*) were brought from rivers of the Ural region. This last species was introduced into the gulf of Rybachie town and soon spread throughout the lake. In the 1960s, whitefish was introduced into the lake, and the fertilized spawn of another whitefish, *Coregonus luttoka*, were brought to the Ton hatchery. Between 1966 and 1988, more than 90 million whitefish larvae were stocked in the lake, and an experimental whitefish fishery started in 1980.

Lake Son Kul was without any fish fauna (Konurbaev and Timikhanov, 2003), until syrok and Baikal omul larvae were stocked in the lake in 1972–73. Both the stocked species showed good

Box 1

Species introductions in Lake Issyk Kul

In Lake Issyk Kul, introduced trout and especially pikeperch have preyed heavily on populations of indigenous fish species and caused severe declines in stock sizes of several of them. Serious damage has also been caused through the accidental introduction of ide, striped riffle minnow (*Alburnoides taeniatus*) and other species of low commercial value that eat spawn and otherwise harm the endemic fishes. In some cases, diseases and parasites have been introduced together with the new fish species.

Before exotic fish species were introduced into Lake Issyk Kul, catches were dominated by ide (*Leuciscus idus*), Issyk Kul moroco (*L. bergi*), sazan (*Cyprinus carpio*), Issyk Kul marinka (*Schizothorax pseudoaksaiensis issykkuli*) and naked osman (*Gymnodiptychus dybowskii*). In the 1930s, when no more than 100 tonnes of fish was caught per year, Issyk Kul moroco was the most common species and made up 90 percent of the catches. It is still the most important species, but its abundance has declined dramatically (Konurbaev and Timikhanov, 2003).

In 1941–45, the annual catch of Issyk Kul marinka, naked osman and sazan totalled 36.0 tonnes. However, in 1962, these volumes began to fall sharply, and in 1972 only 6.2 tonnes of these three species were caught.

The fate of the naked osman

Overfishing and poaching led to a serious decline in the abundance of the endemic naked osman in Lake Issyk Kul. Therefore, the capture of this species was prohibited in 1986. However, the ban has not led to any improvement in the conditions of the stock, and naked osman has now become an extremely rare species in the lake. However, part of the decline is probably related to fishers not reporting the true level of their catches.

In 2005, both naked osman and Issyk Kul marinka were recommended for inclusion in the Red Book of Kyrgyzstan as rare and vanishing species. A programme for the conservation of these species through artificial reproduction is under development.

growth rates. However, the environmental conditions were not suitable for spawning of the latter species owing to its migratory habit, and it did not become established.

In Lake Kara-Suu, the local fish fauna is represented by marinka, scaled osman, Tibetan stone loach, and grey stone loach.

Fish fauna in rivers

Compared with the lakes, the rivers are relatively species rich. However, there are marked differences in the diversity between upper and lower courses of the basins. Mountain streams host 5–7 species, while 40 species and subspecies of fish are known from the lower courses of the Chui basin, 28 from Naryn, 16 from Kara-Darya, and 18 from Talas. The fish fauna in the rivers generally consists of small-sized indigenous mountain species such as loaches. In the 1970s, valuable species of fish, such as Amu-Darya trout (*Salmo trutta oxianus*), osman and common marinka (*Schizothorax intermedius intermedius*), were introduced in most Kyrgyz rivers, but their stocks have never reached a level that would permit commercial exploitation because of the low food supply. However, the Amu-Darya trout has become established and is a now desirable trophy for recreational fishers.

Fish fauna in reservoirs

In reservoirs, the original riverine fish fauna tend to do poorly because of the change from a flowing to a standing water habitat. Dams are threatening the survival of migratory fish species in the river basins of Central Asia (FAO, 2004). As an example, the installation of a hydropower plant/dam on the Jergalan River prevented migrating fish from reaching their spawning sites and

also caused massive mortality among downstream-migrant young fish and mature fish – leading to the disappearance of some of the previously most abundant fish in the river. Hence, exotic species that are better adapted to a lacustrine environment have often been introduced to fill the vacant niches. These species will gradually spread to other waterbodies in the river basin, and may harm the local fauna.

INLAND CAPTURE FISHERIES

Fleet

The size and type of vessels have not changed since independence, and fishing enterprises continue to use vessels constructed in the period of planned economy.

Fishing vessels are generally of three types:

- The most common are made of glass fibre, with a capacity of 5 tonnes, and equipped with an inboard fixed engine of 30 hp.
- Another type of vessel is the duralumin type, with a capacity of 400–600 kg. These vessels are equipped with outboard motors of 10–30 hp.
- Finally, local fisherfolk also use wooden boats, with a capacity of up to 1.5 tonnes. The smaller ones are equipped with rowing oars, and the larger ones are engine-powered.

Overall, private companies are better equipped.

The exact number of fishing vessels operating in the country's waters is not known owing to a lack of data registration of vessels active for private fishing companies.

Lakes and reservoirs

The fishing rights in the 40 sections of Lake Issyk Kul are currently leased out to a number of commercial enterprises (Table 6), all of which receive annual catch quotas. Some of them have the right and obligation to capture broodfish for artificial reproduction, with the purpose of restocking the lake with the fry produced. For example, Balyckchylar Ltd. is permitted to catch 1 500 female and 4 500 male chebak during the spawning period.

In 2005, the hatcheries produced *inter alia* 26 million whitefish eggs and 6.6 million syrok eggs. Fishery reservoirs were stocked with 9.3 million small syrok, whitefish, carp and trout, which is about 3 million more than in previous years.

Lake Kara-Suu has recently been leased to Ladaga Ltd. for 15 years. The company is currently stocking the lake with whitefish and several other species of fish.

Toktogul has been leased to New-Tek Ltd. In April 2007, the company, based on the advice of the DOF, stocked the reservoir with 6 million fingerlings (1 million grass carp, 4 million common carp, and 1 million big-head carp [*Aristichthys nobilis*]).

Current production of capture fisheries

For the reasons mentioned above, fish catches are currently very low (Table 7). In order to let the fisheries recover, moratoria on fishing were imposed on the Issyk Kul and Son Kul lakes in 2003 and 2006, respectively. Apart from the capture of limited quantities of broodfish, all fishing is now banned in the two major waterbodies of the country. Most fish that is legally caught in the country now originates from the Toktogul, Kirov and Orto-Tokoy reservoirs and from small lakes such as Lake Kara-Suu.

TABLE 6
Commercial fishing companies at Lake Issyk Kul: staffing, equipment, quotas and incubation capacity

Name	Boats	Nets	Annual catch quota (kg)	Incubation capacity (million eggs)
Balykchylar Ltd.	10 motor boats	500 gill nets 10 seine nets	Chebak 3 000 Pikeperch 1 000 Bream 1 000 Chebachok 3 000	0.3
Karakol Balygy Ltd.	10 motor boats	220 gill nets	Chebachok 5 000 Pikeperch 3 500 Bream 1 500 Chebak 2 000	0.4
Ton hatchery	–	–	–	Trout 10 Carp 3 Osman 1
Eleman-Kol Ltd	6 motor boats	140 gill nets 1 seine net	–	
Cholpon-Ata Balygy		100 gill nets 3 seine nets 300 traps	Chebachok 1 000 Bream 500 Pikeperch 500 Chebak 200	–
Balyk	–	–	–	–
Issyk Kul	5 motor boats 5 rowing boats	–	Unlimited pikeperch	–
Presidents Adm. of the K.R.	11 motor boats	100 gill nets 1 seine net	Trout 300 Pikeperch 100 Sig 500 Chebachok 500	–
Telim Ltd	–	–	–	–
Darkhan Ltd	–	–	–	–
Dolon	3 motor boats	182 gill nets	Pikeperch 3 500 Bream 2 000 Chebachok 2 000	–

Source: Konurbaev *et al.* (2005).

TABLE 7
Production of capture fisheries in Kyrgyzstan

	Production of capture fisheries		
	2005	2006 (tonnes/year)	2007
Lakes	13.5	8.1	1.2
Reservoirs	12.7	29.1	13.1
Total	26.2	37.2	14.3

Note: Data for 2007 refer to the first nine months of the year.
Source: official figures of DOF (Undated).

TABLE 8

Estimated number of illegal fishers

	Issyk Kul	Son Kul	Reservoirs	Rivers and ponds
Estimated number of poachers	150–200	15–20	70–90	40–60
The share who catch fish illegally only for own household consumption (%)	70–80	60	50–70	80–90

Illegal, unreported and unregulated fishing

The desperate economic situation with high levels of unemployment in rural areas combined with weak enforcement have led to a situation where poaching is becoming increasingly rife. The situation has not improved since the moratoria came into effect as most fishers continue as before.

In 2006, more than 100 fishers were caught poaching, and more than 1 000 nets were confiscated. In a ten-day-period in 2006, more than 188 nets were found at Lake Son Kul, the sum value of the penalties was about som45 000 (about US\$1 250). In the period June–September 2006, the total number of legally placed nets (in accordance with catch permits issued by the State Agency on Environment Protection and Forestry) was 1 191. In 2006, the penalties for illegal fishing at Lake Issyk Kul amounted to som12 000 (about US\$330). These statistics were obtained with the help of the DOF and the Office of the Special Prosecutor. The unit for fish-stock protection and fishery regulation of the DOF estimates that 150–200 poachers are active part-time on a daily basis at Lake Issyk Kul, with a similar number on all the other waterbodies combined (Table 8). However, the extent of poaching is probably much larger as many poachers are not caught or are not reported as being caught because they bribe state employees.

Some people believe that illegal fishers set some 10 000 nets in Lake Issyk Kul every day in December, which is the breeding season for many fish species (Rakhimdinova, 2005). Nets and traps are often set both near river mouths where the fish must pass to reach the spawning grounds and on the spawning grounds themselves. The mesh sizes generally used are so small (14–16 mm) that all fish longer than 11 cm are caught. Thus, fish mortality rates are very high.

The DOF estimates that there are currently 500–1 000 poachers in the Issyk Kul region and that they are able to catch 10–50 kg of fish per person per day. However, even a conservative estimate of 100 poachers catching 25 kg of fish a day each for 100 days a year gives an annual catch of 250 tonnes, which is much more than the volume caught by licensed fishers.

The fish-stock protection service considers that the vast majority of the poachers are fishing for subsistence purposes only (Table 8).

One fisher interviewed at Lake Issyk Kul in September 2007 stated that 3 000 m of set gill nets were necessary to feed one household.

In sum, a large part of the fish caught is caught illegally, is unreported, and the fishing takes place in an unregulated environment. Although there are regulations in place in certain circumstances, their weak enforcement is of concern to the DOF.

RECREATIONAL FISHERIES

Recreational fishing takes place in rivers, ponds and irrigation reservoirs in all regions of the country. River fishing is done by recreational fishers (anglers) in 33 rivers of the basins of Chui, Naryn, Talas and Kara-Darja, especially in the submountain regions. The reservoirs of the plains (Chui Valley, Talas region, and Fergana Valley) all have well-developed recreational fisheries for warm-water species including common carp, crucian carp (*Carassius gibelio*), perch (*Perca fluviatilis*), snakehead (*C. argus*), and roach (*Rutilus rutilus*).

TABLE 9

Reservoir stocking and catches in 11 reservoirs by members of the Chui Bishkek Hunting and Fishing Union in Chui Oblast, 1999–2006

Years	Stocking (kg fingerlings)	The fish catch (kg)	Reservoir visitors (no.)	Catch rate (kg/visitor)
1999	1 264	13 865	3 119	4.4
2000	1 423	13 868	4 851	2.9
2001	1 756	10 896	5 228	2.1
2002	1 410	6 586	3 787	1.7
2003	1 042	15 535	6 096	2.5
2004	1 555	16 237	5 269	3.1
2005	1 719	12 658	4 042	3.1
2006	856	23 630	4 726	5.0
2007	1 618	18 245	3 649	5.0

All rivers and reservoirs where fishing is without commercial importance and where recreational fishing is possible are leased to the Hunting and Fishing Union (Kyrgyzohotrybolovsoyuz). To obtain a long-term or annual fishing licence, recreational fishers must be members of the association, or they can buy a day licence. A recreational fisher is allowed to use up to five fishing rods and to catch up to 5 kg of fish per day. However, in order to catch osman and river trout, the main target species, it is necessary to buy an additional permit that will allow the capture of up to five fish and is valid for three days (Konurbaev and Timikhanov, 2003). The association issues permits annually to catch 1 000 river trout and 6 500 river osman.

In Chui Oblast, the Chui Bishkek subdivision of Kyrgyzohotrybolovsoyuz stocked 11 tonnes of fish in 11 waterbodies at a cost of som2 million (about US\$55 000) over an eight-year period (1999–2006). The main reservoirs stocked were the Nizhnee Ala-Archa, Chumysh and Sokuluk reservoirs. More than 37 000 people visited these reservoirs, catching a total of 113 tonnes of fish (Table 9). The total value of this catch is estimated at som7 million (about US\$195 000).

The available data suggest that about 100 recreational fishers catch fish once or twice a week, and that their daily catch is 3–4 kg, equal to an annual catch of 25–30 tonnes. In the most recent period (2006 and 2007), the highest catch rates per recreational fisher were reported, which suggest a successful stocking programme.

AQUACULTURE

Pond aquaculture in Kyrgyzstan as an independent form of fishery has been functioning since 1950, with pond farms such as the Frunzenski, Uzgen and Talas state fish farms. Most of the ponds, a total of 1 000 ha, are located in the Chui Valley, which owing to the prevailing climate conditions (length of vegetative season and temperatures) is the most productive zone. Here, it is possible to produce an average of 2 500–3 000 kg/ha in intensive and semi-intensive aquaculture.

Aquaculture in Kyrgyzstan is currently in a poor state. This is because of the limited investment in the subsector since independence, and the high prices of feeds (especially compound feeds) and equipment necessary for breeding fish. These high costs mean that farmers continue to use worn-down and outdated equipment and techniques. The high costs for these necessary inputs have further increased in recent years owing to the limited cooperation with the other countries in the region (and elsewhere) on education and the limited sharing of aquaculture experiences.

As the DOF does not have sufficient funds to equip the state fish farms, reservoirs are increasingly leased out to private investors, especially in rural regions. Private enterprises are

becoming increasingly dominant in the fishery industry in Kyrgyzstan. In 2006 and the first nine months of 2007, the private sector produced 89.1 percent of all fish (76.2 percent in 2004).

Production by state-owned farms, which before independence produced a total of about 1 000 tonnes of fish per year, decreased to 16.5 and 34.2 tonnes in 2005 and 2006, respectively.

In the process of privatization, many ponds located in the territory of kolkhozes and sovkhoses have been transferred to private ownership as land shares. Currently, many ponds are under the jurisdiction of Aiyl Okmotu (village councils).

Private-sector fish farmers in Kyrgyzstan generally grow commercially attractive fish species (carps and trout), and maintain broodstock in small volumes in their ponds. They sometimes also organize recreational fishing in their ponds. On average, recreational fishing in their ponds costs som150 per day (about US\$4.20), plus an additional payment per kilogram of caught fish of som100 (about US\$2.75) for common carp and som80 (about US\$2.20) for herbivorous fish species (grass carp and silver carp).

There are about 20 registered private-sector pond operators and an unknown number of unregistered small-scale producers (Tables 10 and 11).

The information on production capacity, methods and systems used by the private-sector pond farmers is very limited. However, it is estimated that if modern intensive technologies were used, it would be possible to produce 2 500–3 000 kg/ha under the prevailing conditions in the Chui Valley in the south of the country. Some private-sector pond fish farmers are producing carp at a level of about 1.0–1.2 tonnes/ha. However, the difficulties in obtaining sufficient good-quality fry and fingerlings in recent years mean that it is no longer possible to achieve these production levels. As a result, total production, particularly by the small-scale carp farmers, is declining.

In most cases, production relies on broodfish from the wild or, for the more valuable species, the import of eggs from abroad. Table 12 provides a list of the species currently being cultured in Kyrgyzstan.

Apart from pond aquaculture, there are three privately-owned trout farms:

- Restbase,
- Ekos International Ltd.,
- AquaDa Ltd.

Restbase

This private farm is 30 minutes drive from Bishkek. The farm was established as a state farm in the early 1990s but privatized in 2000. The current farm is small with a production capacity of 20 tonnes/year.

Currently, Issyk Kul trout and rainbow trout are farmed using raceways. Estimated investment in the tanks and other facilities has been about US\$100 000. Induced spawning was tried, but the costs were considered too high. Eggs are now imported from Denmark or obtained from the Ton hatchery. About 300 000 eggs are purchased in March each year. The survival rate is 30–40 percent. The main problems encountered in the culture of the trout are the high water temperature in summer (more than 20 °C) and low temperatures in winter (ice cover for 2–3 months). Feed is imported from Finland. In 18–24 months, trout grow to 500–600 g, which is the preferred size at the local market.

The farm also provides a recreational fishery. The fee is som500/kg (about US\$14/kg). No fee is payable if nothing is caught. It is also possible to feed the fish (som25 [about US\$0.70] per cup of feed). The fish caught can be prepared at the farm restaurant for an additional fee. The farm also functions as a hotel (six guest rooms).

TABLE 10
Pond area by rayon or oblast, 2007

	Alamedin Rayon	Djail Rayon	Kant Rayon	Moskovski Rayon	Panfilov Rayon	Sokuluk Rayon	Issyk Kul Oblast
	(ha)						
Pond area	482+	163.2	10.0	228.5	14.0	72.5	77.5

Source: DOF.

TABLE 11
Aquaculture production facilities in Kyrgyzstan

Name	Activities	Year it became operational	Production	
			2006	2007 ³
			(tonnes)	
Uzgen ¹	Pond culture of carp	1968	Carp: 13	Carp: 7.7
Talas ²	Pond culture of carp	1975	Carp: 21.2	Carp: 15.0
Ekos international	Cage culture of trout	2006	Trout: 3.1	Trout: 53.0
Peasant farm Abyl	–	2007		
Balykchylar Ltd	Reproduction of Issyk Kul trout	1994	Trout/whitefish: 0.2	
Karakolbalygy Ltd	Reproduction of Issyk Kul trout, whitefish, carp; fishery	1994	Carp: 0.8	Carp: 1.3
New-Tek Ltd	–	2007		
Incubatory Plant Ltd	Reproduction of whitefish; fishery	2005		
Ladoga Ltd	Fishery	Not yet in operation		
Dolon Ltd	Fishery	–	Carp: 1.0	
Toktogul Tuzu Ltd	–	Not in operation	Trout/whitefish: 1.5	
Balyk farm	Pond aquaculture	1994	Carp: 3.5	Carp: 3.0
Aura Agricultural Production Cooperative	Fishery	In operation		
Jetymen Service Agricultural Production Cooperative	Pond aquaculture	2007	0	Carp: 12.0
Janysh & Co Ltd	–	Not yet in operation		
Kolpoch Company Ltd	–	Functioning	Carp: 15.0	
AquaDa Ltd	Cage aquaculture	Not yet in operation		
Forel Camp	Trout fishery	In operation		
Chui-Bishkek	–	–	Carp: 26.3	Carp: 13.1
Balyk JSC ⁴	–	–	Carp: 35.0	Carp: 3.0
Restbase ⁵	Trout production in raceways	2000		

¹ Uzgen is currently the only state-owned farm producing commodity fish. Income was som1 867 700 (US\$52 000) in 2006, and som843 000 (US\$23 000) for the first nine months of the 2007.

² Since 2005, the ponds belonging to Talas fish farm have been leased out to private entrepreneurs. Income for the first nine months of 2007 was som1 675 000 (US\$46 500).

³ Figures for 2007 are for the first nine months of the year.

⁴ The state owns 49 percent of the shares in the company.

⁵ While the production capacity of this farm is 20 tonnes per year, it produced only a few tonnes in 2006–07 as a result of mortality caused by excessively high water temperatures in summer and excessively cold temperatures in winter.

TABLE 12
Fish species currently cultured in Kyrgyzstan

Species	Cultured since	Culture system	Current production (tonnes)
Rainbow trout	1980	Cage	53.0
Issyk Kul trout	1932	For stocking in lakes	1.4
Amu-Darya trout	1950	For stocking in rivers	–
Common whitefish	1966	For stocking in lakes and reservoirs	2.0
Bream	1872	For stocking in lakes	0.4
Syrok	1966	For stocking in lakes	1.5
Sazan carp	1852	Pond culture, and for stocking lakes and reservoirs	24.0
Grass carp	1962	Pond culture	21.0
Silver carp	1962	Pond culture	–
Chebak	–	For stocking in lakes	–
Chebachok	–	For stocking in lakes	–
Marinka	–	For stocking in lakes and rivers	–
Scaled osman	–	For stocking in lakes and rivers	–
Pikeperch	1958	For stocking in lakes	1.8

Ekos International Ltd

Ekos International Ltd. was the first company to start cage culture of rainbow trout in Lake Issyk Kul. The company based its production system on the scientific and experimental work carried out by the Biological Station of the National Academy of Science using intensive fishery technologies developed by the Russian Federation, Norway and Turkey. The cages used are fully submersible so that they can be submerged during storms that would otherwise destroy them. The company is currently experimenting with cages of various designs.

Eyed eggs are imported from Denmark. They are incubated at the Ton hatchery, where the fry/fingerlings are nursed in special trays until they reach a weight of 25–30 g after about six months. The company pays som200 000 (about US\$5 500) to the Ton hatchery for this service. The fingerlings are then transferred to cages in a sheltered bay of Lake Issyk Kul. After a further eight months in the cage, the trout have grown to about 1 kg – retailing at som150–200/kg (about US\$4.85). The first sale (30 tonnes) of commercial fish was in 2006. In 2007, 53 tonnes were sold. For the future, the company envisages cultivation of trout from the incubation period to 200–400 g for restaurants, and to 1–3 kg for home kitchens.

The production capacity is 225 tonnes/year, but there are plans to install up to ten production systems with a total capacity of 1 000 tonnes/year in the near future using self-generated funds.

A major constraint on development is that commercial trout diets are not available locally and have to be imported from abroad.

The agreement under which the company is allowed to use the lake was made at local level with the rayon (district).

AquaDa Ltd

Inspired by the success of Ekos International Ltd., AquaDa Ltd. has recently started similar operations – placing cages in Lake Issyk Kul. This company also has an agreement with the rayon, and the area used is located in the same bay as Ekos International Ltd. on the southern shore.

Production of ornamental fish

Ornamental fish are not bred commercially in Kyrgyzstan. Fish used for ornamental purposes are imported from other countries and sold in a retail chain and at some markets. However, Konurbaev and Timikhanov (2003) mention at least two indigenous species (the short-tailed minnow [*Phoxinus brachyurus*] and the striped bystranka [*Alburnoides taeniatus*]) that are also used as aquarium fishes. Several Kyrgyz loach species may also have potential as ornamental fish, but no efforts have been made to reproduce these fish for commercial purposes.

FACILITATING INDUSTRIES

All the advanced (and most of the basic) equipment needed for aquaculture is imported from abroad, *inter alia* cages, polyester tanks, dippers, barrows, tables for prophylaxis and sorting, baths for fish treatment, and incubatory devices. Glass and plastic trunks and tanks used for breeding are imported from the Russian Federation, Turkey and China.

Commercial feed production for aquaculture is not undertaken in Kyrgyzstan. Feeds for carp are generally home-made or farm-made. For trout, the feeds are imported. Fingerling and fry production are also not well developed as also for the hatchery and nursery operations good-quality feed has to be imported, which makes these activities less attractive as investments.

For capture fisheries, the currently used seine and gill nets were imported from the Russian Federation and China.

Fishing vessel construction is non-existent in Kyrgyzstan. Even the smaller boats of a few metres in length and with limited tonnage were imported from abroad. Vessel repair and maintenance is still conducted in some places (e.g. Lake Issyk Kul), but spare parts are often not readily available and have to be imported, causing long delays in the repair process.

As common onboard fishing vessel equipment, such as radar, depth meters, fishfinders and global positioning system (GPS) are little used in Kyrgyzstan, these are not available on the local market.

Chapter IV

PROCESSING, MARKETING AND TRADE OF FISH AND FISHERY PRODUCTS

FISH PROCESSING AND STORAGE

Finfish is the only fisheries sector product produced and processed in Kyrgyzstan. The fish is generally transported and sold fresh because the volumes produced are so small that commercial-scale processing would not be profitable. Fish imported from Kazakhstan (the main source of imports) is mainly traded and sold in the markets in Bishkek and elsewhere in fresh form (with some smaller amounts sold gutted and frozen).

The processing and cold storage of fish was previously the main domain of the Issyk Kul Fish plant. Its successor, the private enterprise Balykchylar Ltd., can still perform the initial processing of fresh fish into fillets and some frozen products (including fillets). However, production levels have been low in recent years. Until recently, the fresh fish from Lake Issyk Kul was brought to fish-receiving stations, stored in refrigerators and transported to towns all over the country. The transportation to Bishkek did not take more than five hours.

At present, the fish caught in Kyrgyz waters is often purchased directly by wholesalers/intermediaries from the fishers and transported to storage rooms of speciality retail shops, where the fish is frozen in industrial refrigerators for onward selling in the speciality retail shops and at markets. Fish-receiving stations do not exist anymore.

Some wholesalers/intermediaries also buy fresh fish in order to do some processing with it, such as salting, smoking and in a few cases also drying.

As there is no electricity available at Lake Son Kul, it is not possible to use ordinary refrigerators. The fish wholesalers/intermediaries purchasing the Son Kul fish are generally poor and cannot afford the purchase or hire of self-contained/generator-powered refrigerators. In spring, autumn and winter, the fish is cooled only by the cold air and transported to the markets. In summer, the fish is generally transported at night. If that is not possible, the fish is salted before being transported in an effort to maintain at least some freshness.

Species that are sometimes salted and dried include Sevan trout, whitefish, ide and moroco caught in Lake Issyk Kul. The moratorium on these species means that they cannot be sold through formal channels. However, the marketing of these species continues. The wholesalers purchase the illegally caught fish, gut and pickle it under poor sanitary conditions, and sell it on the same market as the legally caught fish.

The Government of Kyrgyzstan is responsible for enacting legislation concerning marketing standards of various products, including fish and fishery products. The Veterinary Department of the MAWRPI is responsible for the implementation of market standards for fishery products in accordance with Kyrgyz law and regulations.

All fish and fishery products sold in speciality retail shops and in the fish halls of the city markets are subject to quality control by the Veterinary Department. Control of fish quality, including on-site checks of wholesale and storage sites, is carried out by inspectors of the Sanitary Epidemiological Service (SES). The Fisheries Inspection Service of the MAWRPI is responsible for implementation of established requirements for the transportation of fresh and frozen fish and for enforcing compliance with the related articles from the Fisheries Rules (Livinets, 2007).

DISTRIBUTION AND MARKETING OF FISH AND FISH PRODUCTS

Most of the fish sold in Kyrgyzstan is imported from Kazakhstan. Deliveries of imported fish from Kazakhstan are made on a daily basis. It is estimated that about 70 percent of all fish sold in Bishkek is marketed at the central market (Osh Bazar), the place where also most imported Kazakh fish is marketed. The bulk of the domestically produced fish is caught in the lakes and reservoirs and is taken to the markets of Bishkek. Part of the fish caught in distant waterbodies, such as Toktogul, Bazar-Korgon, Kirov, the Orto-Tokoy impoundments and Lake Kara-Suu, is marketed in local towns and villages because the small amounts do not make it profitable to transport it to Bishkek.

Every large food market in Bishkek (e.g. Osh, Alamedin and Orto-Say) has a special fish hall equipped with refrigerators for fish storage. At the markets, fresh fish is sold from stands.

There are about 70 persons selling fish at Osh Bazaar, using 35 stands (which are in effect just tables). Fees for the tables are som100/day (about US\$2.50), and som10/day for testing fish quality and safety (testing takes place twice a week). The infrastructure of the market is poor, electricity is scarce, tap-water is not everywhere available, no ice is available, no industrial large freezers are available, but each table has a refrigerator behind it (purchased by the users). The fish corners of Osh Bazar have roofs, but one of the two is particularly cold in winter, which makes life hard for the women working there.

The margin on fish sales at the market is som5–10 per kilogram of fish (about US\$0.20). Purchase by the retailers at the market is generally from intermediaries. Some ten intermediaries deliver to the market; there is no direct delivery from fisherfolk or fish farmers to Osh Bazar.

The preferred species at Osh Bazar in Bishkek are sazan, sold as whole 2–3-kg fish, of which about 500 kg is sold per day, and pikeperch (about 200 kg/day in winter). The total quantity of other species sold is about 200 kg/day. Daily total market sales are estimated at 1 tonne in winter, and about 700 kg in summer. Sales are generally higher on Sundays, when about 2 tonnes of fish is sold. Live fish are available at the market on some days in summer.

The limited production of fish in Kyrgyzstan itself limits the market opportunities for fish retailers in the various markets in Bishkek. The lack of good electricity and water supply make the working conditions for the retailers inappropriate. In the other markets, only fresh fish is sold, no frozen products.

There are six speciality shops for fish in Bishkek. In general, the diversity in fishery products in these shops is much higher than in the market and in supermarkets. Some shops sell live fish from fish farms (including common carp and trout), and crayfish and grass carp (*Ctenopharyngodon idella*) from capture fisheries. The main species sold are Issyk Kul trout and pikeperch. Daily sales of live, fresh and frozen fish amount to some 50 kg in winter and 25–30 kg in summer. Apart from caviar, smoked sturgeon fillet from the Russian Federation is the most expensive product available in the market.

Some speciality shops have several freezers, refrigerators and some basins and aquaria to present live fish. As import taxes are minimal, most of the fish on sale originates from Kazakhstan. Trout from Lake Issyk Kul and frozen fish from Lake Son Kul are the main domestic fish products on sale.

Considering the fish sales in the market, speciality shops and supermarkets in Bishkek, total average daily sales of fishery and aquaculture products in Bishkek are estimated to be about 1.5 tonnes (500–600 tonnes per year). The consumer demand for fish in general is higher, but limited supply and high product prices are constraining the development of the market.

The range of fish prices depends on the type of fish and the season (Table 13).

TABLE 13
Average prices for the most common fish species and fish products marketed
in Kyrgyzstan

Species	Price (som/kg)	Price (US\$/kg)
Bream	35–40	1.0
Roach	25–35	0.8
Crucian carp	35–40	1.0
Pike	40–45	1.2
Pikeperch	200	5.2
Carp	60–70	1.6
Grass carp	130	3.0
Rainbow trout	550	15.0
Brook trout	300–500	7.8–13.0
Smoked mackerel	230	6.2
Salmon fillet	660–750	18.0–20.3
Salted herring	60–70	1.6

Note: Prices were collected twice in 2007 – the average is based on these. Variations seen in product prices were minimal. The wholesale prices are 30 percent lower than the prices quoted.

TABLE 14
Exports and imports of fish products in Kyrgyzstan, 2005

	Exports	Imports (US\$1 000)	Net trade
Fish, frozen, whole	0	1 181	-1 181
Crustaceans	0	51	-51
Fish, cured or smoked, and fish meal fit for human consumption	0	36	-36
Molluscs	0	31	-31
Fish, fresh, whole	0	6	-6
Fish fillets and pieces, fresh, chilled or frozen	0	6	-6
Prepared/preserved fish & caviar	0	687	-687
Crustaceans & molluscs, prepared/preserved	0	14	-14
Total fish products	0	2 012	-2 012

FISH TRADE

According to the International Trade Centre, fish products worth about US\$2 million were imported in 2005 (Table 14). It is estimated that about 3 000 tonnes of fish and fish products for a total value of US\$2.3 million were imported by Kyrgyzstan in 2006. In 2007, 6 500 tonnes, worth US\$3.1 million, were imported, while 10.3 tonnes of mainly smoked and salted fish (valued at US\$18 500) were exported.

A large share of the formal fish imports in recent years has originated from the Russian Federation. Products imported from the Russian Federation include: herring, mackerel, walleye pollack, pacific salmonids, and smoked sturgeon. Fresh fish is imported from Kazakhstan under the Agreement on Common Economic Area between Kazakhstan, Kyrgyz and Uzbekistan, which complicates an assessment of the actual volume of fresh fish imported. From the Baltic and other countries outside the region, canned products, including fish, black and red caviar, and seaweed (laminaria), are imported.

FISH DEMAND AND CONSUMPTION

Fish does not play an important role in the diets of most people both because the population of Kyrgyzstan has little tradition in fish consumption and because of the low access to and availability of supply. As fishing in the large waterbodies is prohibited, 75–85 percent of the fish sold at the markets is imported from Kazakhstan despite the fact that the local fish is considered to be of better quality. The highest consumption levels of fish and fishery products occur in autumn and winter.

Traditionally, in the periods when the fish species are spawning, they can be caught more easily as they concentrate in certain areas of the most important lakes and reservoirs (Issyk Kul, Son Kul and Toktogul). In these periods, the fish supply is greater, which results in larger availability and higher consumption levels.

There is not much difference in fish consumption between urban and rural populations. People living near the major waterbodies consume fish more regularly because it is more easily available to them.

The high prices of fish compared with beef and chicken mean that fish is regarded as a luxury item. Therefore, fish consumption is related directly to people's incomes. People with an income not exceeding US\$100 prefer to buy cheap fish species (canned products and fresh carp), while those with incomes of more than US\$500 prefer more valuable fish species (salmon, trout, etc.).

Recently, fish consumption has been rising among the wealthier part of the urban population. These people have started to consume slightly more fish as their incomes allow them to do so. Fish dishes in restaurants and cafes are so expensive that they are considered affordable only for the most prosperous 5 percent of the population.

The limited supply of fish causes high prices, but the demand cannot be met. If supply increased, it might take some time before prices decreased as there is some unsatisfied demand in the market. There is a particular high demand for fresh fish.

Based on official statistical data, 71 tonnes of fish was produced in 2006. With an added 3 000 tonnes of officially imported fish, average fish consumption was about 0.5 kg per capita. Assuming that some 500 tonnes of fish is caught illegally in the country and that under the free trade agreement another 2 000–3 000 tonnes of fish is imported, which should be added to the official figures, then the amount of fish available for consumption to the Kyrgyz population would still not exceed 1 kg/capita/year.

By comparison, global average annual fish consumption is 16 kg/person (33 kg/person in China). In view of its positive impacts on the health and longevity of the population, it is highly desirable to increase fish consumption in Kyrgyzstan. However, even if illegally caught and imported fish is taken into consideration, this is far short of the more than 60 000 tonnes of fish needed each year to provide the Kyrgyz population with the 12 kg of fish products per person per year recommended by the nutrition institute of the Academy of Science of the former USSR in the past.

The highest consumption of fish in absolute terms can be found in the capital and Chui Oblast – 80 percent of the imported fish arrives and remains here. Fish consumption is also relatively high in Issyk Kul Oblast (where Lake Issyk Kul Lake). More than 200 tonnes of fish products are imported by tourist resorts along the shores of the lake.

NUTRITIONAL ASPECTS OF FISH CONSUMPTION

Fish provides a healthy contribution to people's diet. In some respects, fish and fishery products can be regarded as healthier than beef, chicken or pork products. Therefore, they should be included on the menu on a more regular basis than at present.

TABLE 15
Fat and omega-3 content of fish species occurring in Kyrgyz waters

Species	Scientific name	Fat content (%)	Omega-3
Cod ²	<i>Gadus morrhua</i>	< 2.5	Low
Crucian carp ²	<i>Carassius carassius</i>	< 3	–
Perch ¹	<i>Perca fluviatilis</i>	< 3	Low
Hake	<i>Merluccius</i> sp.	< 3	–
Pike ¹	<i>Esox lucius</i>	< 3	Low
Humpback salmon ²	<i>Oncorhynchus gorbusha</i>	2.5–5	High
Chum salmon ²	<i>Oncorhynchus keta</i>	2.5–5	Medium
Catfish ¹	Siluriformes	2.5–5	–
Rainbow trout ¹	<i>Oncorhynchus mykiss</i>	2.5–5	Medium
Carp ¹	<i>Cyprinus carpio</i>	3–8	–
Kilka ²	<i>Clupeonella</i> sp.	3–8	–
Horse mackerel ²	<i>Trachurus</i> sp.	3–8	–
Herring ²	<i>Clupea harengus</i>	5–10	High
Whitefish ¹	<i>Coregonus</i> sp.	5–10	High
Salmon ²	Salmonidae	8–20	–
Sturgeon ²	<i>Acipenser</i> sp.	8–20	–
Greenland halibut ³	<i>Reinhardtius hippoglossoides</i>	8–20	–
Sardine ²	Clupeidae	8–20	–
Starry sturgeon ²	<i>Acipenser stellatus</i>	8–20	–
West Pacific sardine ²	<i>Sardinops sagax</i>	8–20	–
Mackerel ²	<i>Scomber scombrus</i>	8–20	–
Inconnu ²	<i>Stenodus leucichthys</i>	20–30	–
Lamprey ³	Petromyzontidae	20–30	–
Eel ³	<i>Anguilla</i> sp.	20–30	–

¹ Species occurring in Kyrgyz waters.

² Species available on the market in Kyrgyzstan.

³ Species available occasionally on the market in Kyrgyzstan.

Sources: Bazhenov (1951); Lukjainenko (1967).

The population of Kyrgyzstan currently prefers to consume meat and meat products. However, in order to improve their diet, increased diversity in foodstuffs (including fish) should be promoted.

The principal components of fish are: water (66–84 percent), proteins (15–24 percent), fats (0.1–22 percent), and minerals (0.8–2 percent). These components vary depending on various factors, including the age of the fish, the species, and the time of year the fish is caught.

Fish proteins are of excellent quality. The amino acids in the fish proteins are essential components for human health. Fish proteins are of similar quality to those in milk and eggs. In addition, fish proteins are often more easily absorbed than other animal proteins.

The fats in fish are also good for human health. Fish contain omega-3 fatty acids and oils that are hard to obtain from other types of food (amounts of omega-3 vary between the types of fish). Omega-3 fatty acids are believed to be beneficial to the heart. Regular fish consumption can reduce the chances of stroke and heart attack.

Fish also contains vitamins:

- vitamin A: good for skin and vision;
- vitamin D: good for bones;
- vitamin E: an anti-oxidant;
- vitamin B: good for appetite and the functioning of the nervous system.

Fish is also a good source of minerals that are found in limited quantities in other foodstuffs. These minerals include: iodine (which helps to prevent crop and delays in growth); iron (which is important in preventing anaemia); and calcium and phosphorus (which are necessary to strengthen bones and teeth).

However, there are large variations in terms of the fat and omega-3 contents (Table 15) between the fish species available on the Kyrgyz market.

FOOD SAFETY AND FISH

Fresh fish such as trout, pikeperch, common carp and grass carp as sold in the markets in Kyrgyzstan often comes from the country's own clean rivers, lakes and reservoirs. It has grown in the pristine waters flowing down from the mountains. Sturgeon, herring, sprat, anchovy, salmon, kilka and many other species from abroad can be found in the markets, fish speciality shops and supermarkets. The quality of both domestic and imported fish is generally high.

However, consumption of fish that originates from water polluted with sewage or industrial waste can be harmful to health. While most domestic waterbodies are unpolluted and cultured fish has been raised in unpolluted mountain waters, fish can still be harmful to health if it has been handled, processed, sold or prepared under unhygienic conditions.

Fish is a perishable commodity and it should only be consumed when fresh or when it has been properly processed and stored. Fish products produced under unhygienic conditions, wrongly salted or smoked or cured may cause the development of various pathogenic micro-organisms, and their toxins may cause acute food poisoning. There is a risk of becoming infected with parasites through the consumption of fish products that have been poorly salted or not properly cooked. Although there are no poisonous fish species in Kyrgyzstan, the eggs of the naked osman and Issyk Kul marinka are toxic to humans (Konurbaev and Timikhanov, 2003) and may cause gastroenteric upset.

In the regions with a tradition of eating *stroganina* (fresh frozen fish that is sliced, salted, peppered and eaten), there is a high risk of becoming infected with parasites. Fish pies can also pose a danger if the fish has not been properly soaked (allowing tapeworm eggs to survive). Transmission of tapeworms (*Diphyllobothrium* spp.) to humans can be the result of consuming raw, half-raw fish and undersalted or soft-salted freshwater fish. The tapeworm larvae (which may be present in the flesh of the fish) settle in the intestine, where they may grow to a length of 2–12 m.

Similarly, consumption of raw, half-raw fish and undersalted or soft-salted freshwater fish may result in the transmission of liver flukes (*Opisthorchis* spp.). Liver flukes are small trematodes (4–13 mm long) that invade the human liver. This parasite can live in the human body for up to 20 years and may cause considerable damage to the health of the host.

People who eat raw fish are also in the danger of becoming infected with the nematode *Diocotophyme renale*. The larva of the nematode is encapsulated in the flesh of fish. The adult nematode can become 1 m long, and it develops in the human kidneys.

Toxic elements, such as heavy metals and certain pesticides, may accumulate in the aquatic food chain even where they are found only in low concentrations in the waterbodies. They may ultimately end up in the human body and affect its health. For warm-blooded animals and fish, the following metals are most dangerous, in decreasing order of toxicity: silver, mercury, copper, lead, cadmium, gold, aluminium and zinc. Of these, mercury and lead pose the greatest danger to the waters of Kyrgyzstan. As the salts of the metals do not evaporate, they only disappear from contaminated soils by being washed out. For example, after abundant rainfall, mercury, which is used in various pesticides in Kyrgyz agriculture (e.g. Fuzarnol, Fungolit, and Garmizan),

can enter lakes and reservoirs, where it may accumulate in the fish. However, cases of mercury poisoning through fish products are rare in Kyrgyzstan.

Lead enters the water by way of the cheap Chinese nets that have become the main type of fishing gear in the last 10–15 years. The nets are of a poor quality and have lead sinkers. The nets are often lost as it is cheaper for the fishers to buy new nets rather than consume expensive petrol looking for missing ones. Thus, there are many lost nets in the waterbodies where fishing is most intensive. All these waterbodies are characterized by soft water and a high carbon dioxide concentration, which increases lead solubility.

The enormous volume of water in Lake Issyk Kul dilutes dissolved lead to a concentration that will not become dangerous for aquatic organisms for a long time. Water exchange in the Toktogul reservoir ensures that heavy metals (including lead) are washed out. However, for shallow lakes, e.g. Lake Son Kul, with a comparatively smaller volume of water, lead accumulation can easily reach harmful levels.

The lead accumulated in fish is dangerous for humans, but it has its initial effects on the fish. Even at low concentrations, lead may negatively influence the fecundity of the fish, thereby diminishing their reproductive success. All fishers should realize that the savings made by using cheap nets containing lead cannot be compared with the damage caused to human and animal health and to the aquatic ecosystem. Such nets should be prohibited, and this measure should be applied through legislative instruments.

Chapter V

GOVERNANCE AND INSTITUTIONAL FRAMEWORKS

FISHERIES ADMINISTRATION

In 2006, the catastrophic state of the country's fisheries sector led the Parliament to reinstitute the DOF under the MAWRPI. The mandate of the new department is to develop and manage the fisheries sector in its widest meaning in accordance with the 1997 Fishery Law. The DOF establishes the rules and conditions under which fish are caught, bred and stocked. The DOF is currently financed exclusively from the national budget. The national programme for fisheries until 2012 was developed and submitted to the Government of the Kyrgyz Republic for its approval. It is currently undergoing a process of government approval. The total budget of the programme is expected to be some 50 million (about US\$1.4 million for a period of five years). It will be financed through government investment.

Licences for commercial fishing in major reservoirs and lakes are issued by the State Agency on Environment Protection and Forestry, which collects the fees for these licences.

The Hunting and Fishing Union (HFU) is in charge of recreational and small-scale fisheries in rivers and smaller waterbodies.

Compliance with laws and regulations is monitored by the Fisheries Inspection Service of the DOF. In each region, the inspectorate is represented by a head and several fishing inspectors. Limited financial resources for the activities of the inspectorate as well as for the payment of the salaries of staff are a great concern and reduce the work undertaken by the inspectorate. Currently, part of the salaries of the inspectors is covered through the sale of confiscated catches and equipment (of which the inspectors receive 30 percent).

The Fisheries Research Centre is situated in the Issyk Kul region, in the Biological Station of the National Academy of Science. Its functions are scientific research and fish stock assessment studies.

Registration and monitoring of the fish farms are also among the responsibilities of the DOF. Apart from the Ton hatchery (on the southern shores of Lake Issyk Kul), Uzgenski fish farm (in the south) and Talasski fish farm (Talas Oblast), which still are subsidized by the state, all fish farms are now privatized.

FISHERY RESEARCH, TRAINING AND EXTENSION

Some fishery or aquaculture research has been carried out in the country in the last 15 years, but the financial resources available have been very limited. The National Academy of Science has an ichthyology laboratory, inherited from the Soviet era, but it is not operating owing to the absence of financial resources. In addition, the DOF, through an agreement with the National Academy of Science, established a fisheries research centre in 2001, but it has never functioned owing to the same problem.

Some limited fisheries research is being conducted by the ichthyologists and hydrobiologists of the Lake Issyk Kul Biological Station of the Institute of Biology of the National Academy of Science, the Fisheries Research Centre and the Department of Zoology of the Kyrgyz State National University. The funding of research projects is very limited as research projects are supported by state funding. No international-donor-funded projects are currently supporting research in the sector.

Education in fishery and aquaculture subjects (mainly ichthyology and aquatic biology) is taught at the following colleges, institutes and universities:

- Department of Biology, Kyrgyz State National University;
- Institute of Ecology and Nature Management, Kyrgyz University of I. Arabaev;
- Department of Ecology, Kyrgyz Agriculture Academy;
- Department of Biology, Karakol University;
- Department of Fishery, Kyrgyz Agriculture Technical School.

However, the number of students is very small and no fully-fledged aquaculture or fishery management capacity building programmes are available at present.

The students of these colleges, institutes and universities who study ichthyology and hydrobiology (5–10 persons at the department) prepare term and diploma papers on some topics of fishery and ichthyology. Subjects also include fish-breeding and capture fisheries technologies. However, the main focus is on methods of restoring fish stocks through culture-based enhancements, and on issues of biodiversity conservation and the reasonable use of fish stocks. Annually, a practical training course is organized at the Lake Issyk Kul Biological Station of the National Academy of Science.

FISHERY STATISTICS

The DOF collects information on, and analyses the fish catch in, all reservoirs and lakes of Kyrgyzstan on a quarterly basis. However, the DOF relies largely on the fishing companies own reports on the amount of fish caught. Similarly, for aquaculture, registered companies are obliged to report their production to the DOF. No active fishery and aquaculture data collection, through field visits and surveys, is being undertaken by the DOF as financial and human resources are limited.

Based on the statistics collected, the DOF prepares a report for the National Statistics Committee of the Kyrgyz Republic according to the “Form 28 Fish” on a quarterly basis. The National Statistics Committee reports annually to FAO, which incorporates the data provided in its database.

FISHERIES-RELATED ASSOCIATIONS

The Hunting and Fishing Union

Kyrgyzohotrybolovsoyuz, the HFU, is the only national-level organization that brings together hunters and recreational and small-scale fishers. Its members pay an annual membership fee of som200 (about US\$5.50). In return, they receive the right to fish as amateurs and for recreation. Other people can buy a day licence.

The HFU brings together 335 organizations. In 2007, it had 23 656 members throughout the country. The association also issued 2 523 one-day licences in that year. The fish catch in the waterbodies managed by the HFU is regulated by the Rules of Amateur and Sport Fishing in the Reservoirs of Kyrgyzstan and the Regulations of Amateur and Sport Fishing. These specify the quantity and size of fish allowed and the fishing gear permitted. Most rules date back to the time of the former USSR. The proceeds from the sale of licences are used for paying wages to fishing inspectors, for stocking fish in reservoirs, and for financing various nature conservation measures.

Kyrgyz Association of Pisciculturists

The Kyrgyz Association of Pisciculturists, Balyk Resources, was founded in May 2007 as a voluntary union of legal entities with the objective to coordinate the activities and protect the

interests of fish farms and their members, and to provide legal, informational and other services to the members. It is led by a supervisory board elected by the general assembly of the association by a simple majority of votes of the members present. Annex 4 presents the charter of the association.

Chapter VI

POLICY, REGULATORY AND MANAGEMENT FRAMEWORKS

POLICIES AND PLANNING

In 2007, the DOF started preparing the “Strategy for fisheries and aquaculture sector development and management in the Kyrgyz Republic (2008–2012)”. This strategy provides an outline for the development of the sector up to and including 2012. It was prepared by the DOF and representatives of many fisheries and aquaculture sector stakeholder groups, with support from the European Commission (EC) and FAO under the Project EC/FAO Facility GCP/GLO/162/EC – Kyrgyzstan “Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity”.

The strategy was the subject of an intensive and complex policy development and planning process. It included: recognition of the need for policy development; adoption of a process approach; the current review study of the sector and consultations; and discussions with all relevant fisheries and aquaculture sector stakeholders. The strategy was approved by Minister A. Nogoyev on 25 February 2008, and the director of the DOF was instructed to head its implementation.

As stated in the strategy, the development objectives are:

- Review and update fishery legislation to introduce reforms enabling modern fishery and aquaculture management and development.
- Ensure the protection and responsible management of fishery resources.
- Ensure the implementation and further development of the restocking programme.
- Develop diversified and multipurpose fisheries and aquaculture enterprises.
- Improve the market supply chain and processing of fishery products, and ensure the safety and quality of these products.

The DOF also developed the Fishery Development Programme for 2007–2010, which details its own work plan for this period and accounts, with limited funding from the ministry budget.

On 6 December 2005, the Government of Kyrgyzstan approved a decision to remit the value added tax (VAT) on imports of equipment for fish processing.

In November 2007, several normative acts regulating the introduction of new fish species in reservoirs (in order to prevent damage from further species introductions) were submitted to the Government for approval. They are currently under consideration.

Under the Ramsar **Convention on Wetlands**, Lake Issyk Kul was included in the wetlands of special importance of the former USSR in 1975. The territory of the reserve was enlarged in 1986. Some areas of the lake of particular importance for natural fish reproduction have been designated protected areas.

LEGAL AND REGULATORY FRAMEWORK

In chronological order, the relevant laws and regulations for capture fisheries and aquaculture in Kyrgyzstan are:

- Veterinary Law of the Kyrgyz Republic, 6 March 1992, No. 805–XII.
- Law KR “On Natural Areas of Preferential Protection”, 28 May 1994, No. 1561–XII:
 - The law regulates relations in the organization, protection and use of protected natural areas in order to conserve common and unique natural environments and objects, genetic

bases of flora and fauna, and the assessment of natural processes in the environment and monitoring of changes. An example of an important article for the fisheries sector in this law can be found in Article 3, which states that biosphere territories or reserves are areas of water and ecological systems providing a sustainable balance of ecological and landscape diversity.

- The decision of the Government of the Kyrgyz Republic on the national plan of the Kyrgyz Republic on nature preservation, 29 January 1996, No. 43.
- The Fishery Law, 1997:
 - This law (Annex 5), and the amendments to it (1998), can be considered as the main body of the legislative framework for the fisheries sector in the country. However, the law and the amendments do not address all aquaculture matters typically considered in similar legislation worldwide, nor do they consider transboundary issues related to migration of fish. The legislation needs to be updated to bring it into line with the FAO Code of Conduct for Responsible Fisheries and other international standards.
 - An important article is Article 17 of the law, which regulates the introduction of new species into the waterbodies of the country: “Acclimatization of specific species of fish in fish farming reservoirs of Kyrgyzstan, putting in new species of fish into these reservoirs shall be allowed only where there is the scientific justification and approval of the government veterinary service.”
- Law KR “On Environmental Assessment” 13 May 1999, No. 53:
 - This law is important for fisheries as it regulates environmental assessment issues and aims to prevent negative ecological implications as a result of business or other activities (including fisheries).
- Law KR “On Biosphere Territories” 9 June 1999, No. 48:
 - Important articles for the fisheries and aquaculture sector are Articles 2 and 5. Article 2 states that biosphere territories are areas of land and water ecological systems providing a sustainable balance of biological diversity. According to Article 5, the introduction (acclimatization) of new species of plants and animals is prohibited in buffer zones.
- Law KR “On Fauna” 17 June 1999, No. 59:
 - Article 15 relates to the prohibition of import of animals that can harm natural biocenoses. Article 24 mentions that the unwarranted transfer, acclimatization and hybridization of fauna is prohibited. Article 29 mentions the deterioration of the ecological state of the fauna and environment. These three articles can affect the development of fisheries and aquaculture in the country.
 - Article 34 describes capture fisheries as follows: “The fishery is done through commercial catch of fish and water invertebrates, as well as recreational fishing in fishery waters. Relations in fishery, protection of fish resources and water invertebrates are regulated by correspondent legislation of KR”.
 - The referred-to relations are poorly regulated because the legal basis is presented only in the law “On Fishery”, which is already out of date.
- Law KR “On Environmental protection” 4 February 2002, No. 22 – Articles 13, 16, 18 and 44:
 - Article 13 provides that limits on exploitation of natural resources be established by the authorized body on environmental protection in accordance with standard volumes of natural resources exploitation. Article 16 mentions that environmental assessment is to be conducted with the aim of preventing a possible negative impact from planned business activities or other activity on environment. Article 18 stipulates that exploitation

of hydroelectric stations should be done in accordance with the requirements on fish resources protection, and should prevent negative impacts on the environment. Article 44 prohibits the release, production, and introduction of animals and plants that can cause damage to fauna and flora.

- The Steady Development of Ecologic and Economic System of Lake Issyk Kul, Law of 13 August 2004, No. 115.
- The Water Code of KR, 12 January 2005:
 - Article 21 of the Water Code states that “use of water resources includes use of water for fishery and aquaculture”. Article 23 establishes that “among activities requiring a water use licence, pond utilization or water accumulation for fishery and aquaculture or other business activities are also included.” Licences are granted for 15 years by the State Water Administration. Article 24 mentions that use for fishery and aquaculture purposes is included in the list of priority water usages.

INTERNATIONAL CONVENTIONS

Kyrgyzstan is currently not a party to any international agreement that deals specifically with fisheries. However, the country has signed a number of agreements that are concerned with biodiversity in the broader sense and also involve the aquatic environment:

- World Heritage Convention: UNESCO Convention on the Protection of the World’s Cultural and Natural Heritage (accepted in 1995). Six sites have been nominated (including Issyk Kul), but none based on its value as natural heritage.
- Convention on Biological Diversity (CBD): Kyrgyzstan joined the CBD in 1996. The country received funding from the Global Environment Facility (GEF) to prepare its Biodiversity Strategy and Action Plan in 1998 (Ministry of Environmental Protection, 1998). The strategy included an integrated action plan for conserving biodiversity (outlining mechanisms to deal with current issues regarding the protection and sustainable use of natural resources) and provided precise details, time scales, budgets and targets. The objectives included:
 - to restore and conserve threatened species (inter alia seven species of fish), ecosystems and landscapes;
 - to increase protected areas to 4.8 percent of the territory;
 - to reduce pollution;
 - to improve ecological legislation by 2003;
 - to improve public awareness on environmental issues;
 - to enhance public institutions and non-governmental organizations (NGOs) through capacity building;
 - to attract internal and external investors;
 - to assist in the conservation and sustainable use of biodiversity while implementing a poverty reduction programme.
- Ramsar Convention on Wetlands: Its mission is: “the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.” One of the obligations of the signatories is to designate at least one wetland to be included in the “Ramsar List” and to “promote its conservation, and wise use.” The selection of wetlands for the Ramsar List should be based on its significance in terms of ecology, botany, zoology, limnology or hydrology. Kyrgyzstan effectively joined the Ramsar Convention in 2003 and designated Lake Issyk Kul as a Ramsar Site in 2002. Lake Issyk Kul was already recorded as a Montreux Record in 1990, before independence, and discussions are underway with

Kyrgyz authorities about its present status vis-à-vis the Montreux Record. Lake Chatyr Kul was designated as the second Ramsar site in the country in 2005.

- The Cartagena Protocol: Kyrgyzstan ratified the Cartagena Protocol on biosafety in 2005. The protocol seeks to protect biological diversity from the risks posed by organisms modified by modern biotechnology. The protocol states that it shall apply to the transboundary movement, transit, handling and use of all living modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account also risks to human health.

Although Kyrgyzstan has ratified more than ten international conventions on environmental protection, they are all of a declarative character as there are no national laws and regulations for their implementation, particularly in relation to the fisheries development. Kyrgyzstan has produced a significant number environmental laws and regulations, but weak enforcement, low capacity among responsible government institutions, and funding shortages remain serious constraints for the protection and sound management of the country's natural resources and the safeguarding of environmental quality (ADB, 2004).

There is a need to “mainstream” environmental considerations into government policies and programming (ADB, 2004). The international agreements already signed by the country may give the DOF the opportunity to press for the incorporation of sound environmental and natural resources management into the legislation.

The United Nations Environment Programme (UNEP) details on its Web site that multilateral environmental agreements can be incorporated into national law by re-enactment or reference. Incorporation by re-enactment means that international law is implemented through development of a detailed national law. Incorporation by reference means that national laws ensure compliance with an international agreement by referring to it, without “translating” all details in the national law.

REGIONAL AGREEMENTS

In the period 1992–2006, more than 15 interstate, intergovernmental and interministerial agreements on the conservation and use of water resources were signed by officials of Central Asian countries. In these agreements, the value of water as a regional ecoresource and its importance for irrigation purposes is highlighted, but nothing is said about its role in aquaculture or as an environment for fish. At regional level, there are no practical measures in place for the protection and sustainable use of fishery resources. This relates to the fact that there are no major lakes or reservoirs that are shared between Kyrgyzstan and any of its neighbouring countries, and no important commercial fisheries on any of the rivers. Therefore, inland fisheries are considered internal matters and of concern only to the state itself. However, there are migratory fish stocks in shared rivers. Kyrgyzstan is situated in the Aral Sea catchment area, and as an upstream country, it has a responsibility not to act in a way that may damage biodiversity and fisheries further downstream.

Regional agreements of relevance to fisheries include:

- The agreement between the Governments of Kazakhstan, Kyrgyzstan and Uzbekistan on collaboration in the field of biodiversity preservation of the western Tian-Shan (17 March 1998, Bishkek).
- The agreement between the Governments of Kazakhstan and Uzbekistan on collaboration in the field of nature preservation and reasonable nature management (17 March 1998).
- The agreement on collaboration in the field of nature preservation (Almaty Declaration of Central Asia Presidents, 1997).

- Tashkent Declaration of the Special UN Programme for Central Asia, 1998.
- Agreement on Cooperation in Joint Management, Use and Protection of Interstate Sources of Water Resources. This agreement was signed between Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan in 1992. It deals with the collaboration in the field of the collateral use and preservation of interstate water resources. In 1993, the countries formed the Interstate Commission for Water Coordination (ICWC) of Central Asia.
- The Commonwealth of Independent States (CIS) Agreement on rational management and protection of transboundary waterbodies between Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. This agreement was signed on 11 September 1998. The treaty covers all transboundary waterbodies that delimit, cross or are located within the boundaries of two or more parties and is valid for ten years. Article 8 concerns fish and reads: “The Parties shall carry out arrangements for the protection of young fish by installing fish protection works.”
- The Chu and Talas Commission: Kazakhstan and Kyrgyzstan signed the bilateral agreement on “The Commission of the Republic of Kazakhstan and Kyrgyzstan on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas” in 2000. The commission coordinates maintenance and use of water management infrastructure on the Chu and Talas rivers. The agreement obliges Kazakhstan to pay part of the operating and maintenance expenses for Kyrgyz dams and reservoirs in the two basins.

FISHERY MANAGEMENT

Management

There are no detailed fishery management plans in place for any waterbody in Kyrgyzstan. Stocking and catch plans are made by private companies together with the DOF, but these cannot be considered management plans as they do not contain the main management options and tools, and they were made without the involvement of the other waterbody users. Community-based management of fishery resources is non-existent in the country.

As in Soviet times, capture fishery in Kyrgyzstan relies largely on the stocking of fingerlings, as natural reproduction of valuable fish species is limited. However, while in the past the state was responsible for both the stocking and catching of fish, these practices have been transferred almost entirely to the private sector. Private-sector companies that have leased certain waterbodies for fisheries and aquaculture purposes are obliged to stock these waters as well. However, there is little control as to whether these companies are complying with this obligation. In addition, short-term lease contracts have until recently discouraged sustainable stocking and management of the resources by the private sector.

The enterprises that lease fishing rights in Lake Issyk Kul are required to conclude agreements with the DOF on the production of fry and fingerlings for restocking during the spawning period (October–December). Based on the agreed number of fry to be produced, the DOF prepares a plan for stocking in the various sectors of the lake and determines the catch quotas. The private-sector companies have to provide documentation on both fish catches and reproduction activities to the DOF.

The collapse of the fishery in Lake Issyk Kul led to the implementation of a moratorium on fishing in 2004. However, the fishery for broodfish is still carried out so that the fishing companies can artificially reproduce and stock whitefish, syrok and trout in the lake. A similar ban was imposed in Lake Son Kul in 2006.

To restore fish stocks to a level that can again be exploited commercially, it has been calculated that it would be necessary to prohibit the catch of all fish except pikeperch and bream for 3–

5 years. Such a period would be sufficient for endemic species with a short life cycle, such as ide and moroco, to restore their populations through natural reproduction.

However, the stocks of the larger and slower growing species (Issyk Kul naked osman, marinka, whitefish and sazan) have been depleted. This makes it necessary for natural reproduction to be supplemented with the stocking of several million eggs or fry annually in order to rebuild their populations.

Licences and quotas

Since 2004, the licences for commercial capture fisheries and for catching broodfish for artificial reproduction and stocking in the major reservoirs and lakes of Kyrgyzstan have been issued by the State Agency on Environment Protection and Forestry. The management (meaning stocking in its narrow meaning) and conservation of fish stocks in these lakes and reservoirs is the responsibility of the Fisheries Inspection Service of the DOF regardless of the form of property.

With support from the National Academy of Science and the State Agency on Environment Protection and Forestry, the DOF determines the total allowable catches (TACs) for each species of fish. Stock sizes are assessed through experimental fishing. However, owing to the lack of financial resources for this purpose, it has not been possible to conduct field surveys every year, and in such cases, estimations have been made based on earlier assessments and survey results from similar waterbodies.

The proposed TACs are presented to the Scientific Production Council (also called the Fisheries Board) for its consideration and the development of recommendations. The council consists of the representatives of the National Academy of Science, the State Agency on Environment Protection and Forestry, and the heads of fishing companies. The fish-breeding, fishing and processing division of the DOF then allocates the determined TACs as quotas among the various fishing companies, signs lease agreements on fishing regions, and issues fishing licences. The fishing companies that receive a quota are obliged to stock the waterbodies each year.

The State Agency on Environment Protection and Forestry manages the smaller waterbodies. For these waterbodies, the Kyrgyzzhotrybolovsoyuz, with the help of scientists of the National Academy of Science, determines the catch quotas.

Enforcement

As mentioned above, the lack of financial resources allocated for fisheries inspection has seriously constrained the enforcement of the fisheries law in the country. Therefore, the DOF decided that fisheries inspectors would receive 30 percent of the catch and sale of equipment they confiscated from poachers, and that no uniform or transportation would be provided by the DOF. Under these conditions, 40 inspectors were appointed: 20 at Lake Issyk Kul, 7 at Lake Son Kul, and the rest in the south and west of the country. While this approach encourages inspectors to catch illegal fishers, it may also tempt them to make “alternative arrangements” with offenders. In their defence, it is difficult for inspectors to keep up with the poachers, some of whom possess much more modern equipment than the inspectors, including good binoculars, night vision equipment and modern speedboats, while the inspectors have rowing boats. There are also reports of violent encounters between poachers and inspectors (Rakhimdinova, 2005).

Where private-sector enterprises have fishing concessions, illegal fishing and illegally placed gear is often reported to the fisheries inspectors, and controls and monitoring of rules and regulations are more frequent and more effective.

Chapter VII

SOCIAL AND ECONOMIC ASPECTS OF FISHERIES AND AQUACULTURE

EMPLOYMENT

In Soviet times, up to 1 000 people worked in the fisheries sector. When the sector collapsed after independence, this number fell to 72 people in the early years of this century. However, the establishment of the new private-sector enterprises and an increased interest in aquaculture from private-sector small-scale farmers has meant that since 2007 the total number of people working in the fish sector has increased to 396 (Tables 16 and 17). The limited number of people involved in the commercial capture fisheries is a consequence of declining fish stocks and the moratorium on the Issyk Kul and Son Kul lakes for the period of 2004–2010.

Both state and private farms hire additional fishers who work on a seasonal basis.

TABLE 16
Employment in fisheries-related sectors in Kyrgyzstan, 2007

Staff	DOF		Research institutes, universities	Lake & pond reproduction & fishery	Lakes & reservoirs (commercial fishery)	Sport & recreational fishery	Marketing & distribution of fish
	Central staff	Structural subdivision					
Men							
Full-time	7	53	5	175	43	37	5
Part-time	0	0	4	2	0	0	-
Women							
Full-time	4	7	2	29	0	8	13
Part-time	1	0	1	0	0	0	0
Total state sector	12	60	12	74	24	5	0
Total private sector	0	0	0	132	19	40	18

TABLE 17
Employment at some of the larger fish farms and for fishing companies in Kyrgyzstan, 2007

Name	Oblast	People employed
Balykchylar Ltd.	Issyk Kul	15
Karakol Balygy Ltd.	Issyk Kul	5
Ton hatchery	Issyk Kul	8
Eleman-Kol Ltd.	Issyk Kul	6
Cholpon-Ata Balygy	Issyk Kul	10
Issyk Kul	Issyk Kul	10
Presidents Adm. of the K.R.	Issyk Kul	11
Dolon	Issyk Kul	5
Uzgen fish farm	Osh	15
Talas	Talas	10
Son Kul	Naryn	5
Bazar-Korgon fish farm	Djalal-Abad	5
Uch-Terek	Djalal-Abad	10
Toktogul fish farm	Djalal-Abad	10

Note: Small-scale companies / family enterprises are not included.

SOCIAL SECURITY OF FISHERFOLK, AQUACULTURISTS AND OTHERS ENGAGED IN THE SECTOR

State-owned

The state fishing companies and the fish-breeding plants supported by the state budget have obligatory social insurance and pension allocations. For all workers with health insurance cards, contributions (corresponding to 8 percent of their salaries) are made to the Social Fund.

The DOF provides its employees with quarterly one-time payments, bonuses, and benefits valued at som187 560 (about US\$5 200, or 30.3 percent of the annual wage fund established for employees of central government offices). The working pensioners at the DOF receive, in addition to their salary, monthly pensions of som1 800–2 000 (about US\$53). No other social support is provided to DOF employees.

The Ton hatchery provides the same social support as the DOF for its staff. In addition, there are payments for its workers for health hazards and to cover the specific working conditions in the field, allowing for additional purchases of food, which was som60 000 (about US\$1 670) in 2007 and som29 300 (about US\$815) for the first nine months of 2007. In 2006, contributions to the Social Fund totalled som56 300 (about US\$1 565), and som39 600 (about US\$1 100) for the first nine months of 2007.

The Uzgen fish farm contributes 29 percent of the wage fund to the social insurance fund. In 2006, it contributed som93 900 (about US\$2 600), and som83 000 (about US\$2 300) for the first nine months of 2007. The farm also provides transportation for its employees' children to school and back, which cost the farm about som36 000 (about US\$1 000) in 2006, and som21 100 (about US\$585) for the first nine months of 2007. Most fish farms that are related to the DOF (Son Kul, Toktogul, Bazar-Korgon, and Talas), as well as the Uzgen fish farm, make payments to the social insurance fund of about 29 percent from the total wages.

The Research Institute on Biology and Soil of the National Academy of Science of the Kyrgyz Republic and its biological station, as well as other state enterprises and organizations, make monthly contributions to the social insurance fund of 29 percent from the total wages of each scientific worker.

Private sector

Social security and insurance arrangements for fisherfolk in the private sector depend on the terms of agreement signed by the fisherfolk and their employers. The latter are generally those who lease the reservoirs, or the owners of reservoirs and their parts. In general, the employers contribute to a social insurance and pension fund.

ECONOMICS OF FISHERIES AND AQUACULTURE

State-owned companies

The state hatcheries used to pay 20 percent VAT and 15 percent of customs duty on imports of fish-breeding material and feed.

On 6 December 2005, the Government of Kyrgyzstan issued Resolution No. 554 under which fish-farming subjects that import fish-processing equipment are be exempted from VAT.

All state employees receive their salary according to the official salary scale, and they pay 10 percent income tax and contribute 8 percent to the pension fund.

Funds from the state budget are being provided only to the Ton hatchery. The Ton hatchery has received the following funds:

- som422 700 (about US\$11 740) in 2005;
- som665 500 (about US\$18 485) in 2006;
- som511 600 (about US\$14 210) in 2007.

Other state hatcheries are self-supporting and do not receive contributions/support from the state budget.

Private sector

Private-sector fishing and aquaculture companies are obliged to pay a variety of taxes, including VAT, land tax, water tax and custom charges.

The private-sector companies control their budgets independently, and the salaries of their employees are generally higher than those of public-sector employees. Some companies let wages depend on the income and profit made.

CREDIT AND INVESTMENT IN FISHERIES AND AQUACULTURE

In recent years, fisheries-sector companies in Kyrgyzstan have had limited access to credits, loans, insurance and (foreign) investment services. A few private fish entrepreneurs (e.g. Kolpoch Company Ltd.) have managed to obtain small, short-term bank loans for the production of commercial high-value fish. Although many banks and financial organizations are active in Kyrgyzstan, and microfinance tools for agriculture are well developed, microfinance and rural credit arrangements for the fisheries sector are still lacking. The main reason for the limited access of the sector to credit lines is that banks believe that the risks involved in investments in fisheries are too high compared with the rates of return made in fisheries.

The small-scale farm Abyl plans to increase internal investments to US\$20 000 in the near future. This amount will be spent on equipment, pontoons, cages and other expenditures related to the establishment of cage farm production systems for the production of rainbow trout.

The private-sector company New-Tek Ltd. invested som701 000 (about US\$19 470) in the Ton hatchery in 2007, including som441 000 (about US\$12 250) in equipment, and som260 000 (about US\$7 220) for the construction of the base and walls of a laboratory for growing fingerlings. It is planning to invest a total of som3.5 million (about US\$100 000) in the reconstruction of the Ton hatchery and the reproduction of fish stock of Lake Issyk Kul in the period 2007–2012.

The DOF has requested the MAWRPI to invest som40 million (about US\$1.1 million) in the development of fishery infrastructure, reproduction of high-value fish species, and nature preservation. However, this funding has not been allocated.

The MAWRPI has submitted official requests for financial and technical assistance to a number of donor countries, including Japan, Turkey, various CIS countries, and international organizations such as FAO and the EC. An agreement on the rehabilitation of the Ton hatchery is being discussed with the Turkish International Cooperation and Development Agency (TIKA).

THE ROLE OF FISHERIES AND AQUACULTURE IN FOOD SECURITY AND POVERTY ALLEVIATION

In 2005, the poverty level in Kyrgyzstan was 43.1 percent (Annex 6), and 11.1 percent of people were considered extremely poor. The poverty level was highest in rural areas (51 percent), where two-thirds of the Kyrgyz population live. Among the oblasts, poverty exceeds 50 percent in Batken, Issyk Kul, Jalal-Abad, Osh and Naryn, while the poverty level in Bishkek, Chui and Talas oblasts is 11, 22 and 44 percent, respectively. From 2000 to 2005, the incidence of poverty declined, in spite of the moderate economic growth rate, mainly owing to an expansion in production sectors using low-paid labour as well as an increase in state pensions, social payments and cash remittances.

The most important source of livelihoods for the Kyrgyz people is agriculture. Locally, there are areas where fisheries are important for the rural economy and the livelihoods of the rural communities. A significant number of fisher families can be found around Lake Issyk Kul Lake, fewer at the Son Kul and Kara-Suu lakes and the Toktogul, Orto-Tokoi, Kirov reservoirs, and also some at the Bazar-Korgon reservoir.

The incidence of poverty has also led to an increase in subsistence and/or recreational fishing. It is difficult to distinguish between these two fishing purposes as many recreational fishers also

catch fish to support their households. Subsistence and recreational fishing is a widespread activity in the rivers of Chui Oblast and in some parts of Naryn Oblast.

Many people are also involved in the retail and distribution of fish, which is mainly concentrated in the Bishkek, Chui and Issyk Kul oblasts.

However, at national level, the importance of fisheries as a sector that contributes to national food security and poverty reduction is low. One reason for this is the decline in fish stocks and the moratorium on commercial fish catches in the Issyk Kul and Son Kul lakes. These factors have further reduced the role played by fisheries. On the other hand, the private-sector aquaculture farms that have started to expand around the country not only facilitate access to fish proteins for the Kyrgyz population, they also create the much-needed alternative employment opportunities in the rural areas. From this point of view, the current trend in aquaculture development should receive full support from the government.

The role of the fisheries sector in the future reduction of rural poverty will to a large extent depend on the country's ability to attract investment from domestic and foreign sources. This will mainly depend on whether a stable political and economic environment can be provided.

FISHERY AND BIODIVERSITY CONSERVATION PROJECTS IN KYRGYZSTAN

The recent project of the EC and FAO – GCP/GLO/162/EC – Kyrgyzstan “Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity” was the first foreign-donor-funded project to address some of the needs of the Kyrgyz fisheries sector since independence in 1991. This review study was one of the activities carried out with support of this project (cost: US\$124 000) implemented between July 2007 and March 2008.

As at April 2008, there are two donor-funded fisheries-sector projects in the pipeline. The first project is aimed at rehabilitation of the Ton hatchery. The TIKA has been approached for financial support to this project (above). The second project is under formulation and is provisionally titled: “Support to Fishery and Aquaculture Management in the Kyrgyz Republic”. No donor has yet been approached officially for this project.

Kyrgyzstan participates in many transboundary (Central Asian) projects on water resources management (e.g. projects on conservation of the Aral Sea, and integrated management of water resources in the Fergana Valley), but most of these consider the allocation of water for irrigation, ignoring biodiversity issues and services provided by aquatic ecosystems (including fisheries and aquaculture).

Projects with some relationship to the fisheries and aquaculture sector are:

- Central Asia Transboundary Project of Global Environment Facility/World Bank and the preservation of biodiversity of the western Tian-Shan (Kazakhstan, Kyrgyzstan and Uzbekistan) (2000–06);
- the Euron-Aid Project on the preservation of biodiversity of the western Tian-Shan (Kazakhstan, Kyrgyzstan and Uzbekistan) – the financial support is from the European Union (EU) (technical assistance for the CIS) (2000–05);
- the GEF–UNEP–WWF Project “The creation of long-term preservation of biodiversity in the ecosystems of Central Asia” (2003–06);
- the FAO project on reconsideration and harmonization of the legislation on specially protected territories and conservation of biodiversity in Kazakhstan, Kyrgyzstan and Uzbekistan (2005–06);
- the project of the Gesellschaft für Technische Zusammenarbeit (German development agency – GTZ) on the biosphere territory of Lake Issyk Kul (since 1997);
- Financing from the United Nations Development Programme (UNDP) for the conservation of biodiversity of endemic fish species in Lake Issyk Kul is awaited.

Chapter VIII

SECTORAL DIAGNOSIS

In June 2007, the DOF organized a participatory meeting at the MAWRPI to diagnose the situation in the fisheries sector of Kyrgyzstan. A so-called “strengths, weaknesses, opportunities, threats” (SWOT) analysis was used for this diagnosis as this tool is commonly used to analyse a situation, create understanding and assist future decision-making processes in a simple manner. Moreover, it is widely used in fisheries-sector policy and strategy development. The following sections present the outcomes of the meeting and provide some clear entry points for policy development and planning activities carried out by the MAWRPI.

STRENGTHS

Kyrgyzstan has a favourable climate and suitable natural conditions for certain fisheries and aquaculture activities, allowing it to develop highly profitable lake and pond culture practices. A long summer, a favourable temperature for cold-water fish, the salinity of water, the concentration of hydrogen ions, insolation and other hydrological conditions, and a good natural nutrition base (phytoplankton and benthos) in most lakes and rivers all contribute to the suitability of the country for increasing the surface area of ponds, enhancing lake exploitation, and using capture fisheries capacity more fully. The availability of water resources is considerable, particularly owing to the Issyk Kul, Son Kul and Kara-Suu lakes, several large impoundments (such as Toktogul, Bazarkorgon, Ortotokoy and Kirov), and hundreds of hectares of ponds. In 1991, the total volume of fish produced (by catch and culture) exceeded 1 400 tonnes. In 2006, the officially reported fish production was 71.4 tonnes in 2006.

In the time of the former USSR, the production and breeding potential was developed and a technical base (in terms of human capacity) was established for pond culture (Chui, Uzgen and Talas plants) to cover all regions of the country. The Ton and Karakol fishing plants and 15 private commercial fishing plants were built and functioned properly.

Kyrgyzstan has the capacity to provide fry and fingerlings for restocking the lakes and reservoirs. Recently, some 623 000 trout fingerlings, 13.5 million whitefish fingerlings and 2.5 million small carp have been introduced into Lake Issyk Kul; 4.1 million syrok fingerlings have been introduced into Lake Son Kul; and 635 000 young fish have been introduced into the drainage reservoirs and various pond systems. In 2005, the hatcheries produced inter alia 26 million whitefish eggs and 6.6 million syrok eggs. Two million whitefish eggs were produced for Lake Issyk Kul, and these were incubated at the Ton, Karakolbalygy Ltd. and Balykchylar hatcheries. Fishery reservoirs were stocked with 9.3 million small syrok, whitefish, carp and trout, which is about 3 million more than in previous years. Since 2004, there has been a moratorium on fish catch in the Issyk Kul and Son Kul lakes, which will be in place until 2008. However, some catches in these lakes have been made for fish reproduction purposes.

There is investor interest. One company has built two trout production systems of 150 tonnes a year at Lake Issyk Kul, with support from other investors. The sale of the cultured trout has begun, and two more production systems have been constructed. It is planned to set up 10 cage systems in the next 2 years and to produce about 1 000 tonnes of fish annually.

The legal basis for fisheries has been established. The Fishery Law (Government of the Kyrgyz Republic, 1997), Fauna Law (1999) and Nature Preservation Law (1999) were passed in

the 1990s. Fishery and biological norms and the rules for fish breeding in reservoirs have been prepared and ratified. The following bills are currently with the Government for approval:

- “Amendments and Additions of the Fishery Law envisaging the regulation of licence issuing for the catching and breeding of fish”.
- “Programme for fishery development of the Republic 2007–2016”. This programme is the internal programme of the DOF and aims to increase budget allocation from the central budget for the work of the department in support of the fisheries sector.

An institutional base is available in support of the fisheries sector. A decision of the Government of Kyrgyzstan created the DOF of the MAWRPI. In 2006, the DOF was ratified within the new structure of the MAWRPI. The Fishery Board of the DOF was also created. It includes members of the government, National Academy of Science, ministries and local authorities.

By the order of the President of Kyrgyzstan, the Republican Meeting on Fishery was held on 22 March 2007. The heads of regional state administrations, ministries and offices, scientists, businesspeople and NGOs took part. The problems of the sector were discussed and some decisions were made. Following item 9 of the Meeting Decisions, “the provision of reservoirs and fishing areas for long-term lease with the aim to culture fish and provide breeding material”, the government has started to lease out the fishing areas on a competitive basis – a decision announced in the mass media.

Sport and amateur fishing is regulated by the Kyrgyzohotrybolovsoyuz, which leases out the reservoirs that are of interest to recreational fishers.

In 2007, the Kyrgyz Association of Pisciculturists was created.

Fisheries inspectors were trained and certified in 2006. The capacity building and certification system was prepared by the National Academy of Science of Kyrgyzstan; training was held at Lake Issyk Kul.

The Issyk Kul region has been included in the world network of biosphere reserves. The order the Government of Kyrgyzstan ratified the creation of the Issyk Kul biosphere reserve in 1998. The objectives are to preserve Lake Issyk Kul as a unique natural environment and to maintain its biodiversity.

WEAKNESSES

The average consumption of fish is only 0.5–0.9 kg/capita per year. When taking into consideration the imports of fish from the neighbouring countries, the national fish production only provided for 0.01 kg/capita in 2006.

Poaching of fish is widespread. The number of such poachers is estimated at 500–1 000 in the Issyk Kul region, for a daily catch of about 10–50 kg. If 100 poachers catch an average of 25 kg of fish a day for 100 days in a year, then they will catch 250 tonnes, which is several times the official figure for production. According to information of the DOF, the catch of fish by recreational fishers is also important. It is estimated that no more than 100 recreational fishers fish once or twice per week, and that their catch averages 3.5 kg, or about 17 tonnes/year. In sum, illegal and unreported catches are estimated at more than 260 tonnes of fish a year. However, this figure is probably still conservative.

In 2006, more than 100 fishers were caught poaching and more than 1 000 nets were forfeited. However, the real extent of poaching is much larger as many poachers are not caught. It appears that some poachers are supported by the employees of the state bodies.

The increase in the cost of fishing licences cost (currently, som4 [about US\$0.11]) for 1 kg of fish) makes legal fishing practices less profitable.

The state fisheries companies and fish hatcheries are suffering from an acute shortage of finances. As a result, the state of the equipment used is poor, and the technical capacity of staff is

low. There are not enough transportation means, boats, boat engines and fish breeding equipment. It is estimated that some 2.0 million/year (about US\$56 000) is required in order to reproduce and preserve fishery resources, to conduct fish stock research in state reservoirs, and to build capacity for fish breeding and fishery biology. Fish culture (grow-out) facilities under state control are short of funding and unable to buy modern fish-breeding equipment, special compound feeds, etc.

The absence of a government scheme to finance the work of fishing inspectors constrains their protection activities.

The actions of the national government and regional authorities are poorly coordinated. In 2004–05, the Issyk Kul and Naryn regional state administrations accepted moratoria on predatory pikeperch and the cleaning of the Son Kul and Issyk Kul lakes from old nets without studying the state of these lakes and without taking into consideration scientific recommendations.

There are contradictions and ambiguities in normative legal acts that lead to the duplication of permissive control functions by the MAWRPI and the State Agency on Environment Protection and Forestry.

Inadequate management of fishery resources and variable efforts are main reasons for the reduction in fish catches. Fishery efforts have been distributed irregularly along Lake Issyk Kul and negatively affected the spawning and pre-spawning of fish in certain areas of the lake. Individual measures regulating the catch include the order of annual alternation between even-numbered and odd-numbered fishing areas (which was applied in the 1970s) and a complete moratorium on one of the areas (which transferred the efforts to others). As a result of an intensive fishery in some limited areas, the volume of certain stocks fell significantly (e.g. the Semenov stock of ide).

Irrational fishery in the spawning period broke the structure of fish stocks. For example, because of its fractional maturing, the males of Issyk Kul moroco stayed longer in the spawning areas. As a result, they were caught in larger volumes than females, causing alterations in normal sex ratios. A net with a mesh size of 17 mm (mostly used in the fishery) can catch fish of 12.5–14.5 cm. A comparison of fish age in moroco showed that mainly four-year-old fish were caught. Thus, the fishery was based on the catch of one age group. Consequently, an unfavourable year could cause an important reduction in stocks and catching plans for moroco.

Most poachers use bow nets with a mesh size of 14–16 mm. Hence, all fish longer than 11 cm are caught without distinction, including young and immature fish.

The introduction of Sevan trout into Lake Issyk Kul took place 75 years ago. There was no fishery of the species until 1971 because of its small stock. The largest trout catches were in the period 1975–1981, and they started to fall in 1985. However, the volume of young fish released into the lake by two hatcheries did not decline in those years. A main cause of the decrease is increased poaching. Poachers vigorously catch trout in the mouths of rivers, where they concentrate before and during the spawning periods. Another cause is the low quality of the released trout and the excessively small sizes of the released fingerlings (causing large mortality and slow growth). A third reason for reduced stocks of trout is the increased food competition with the more numerous zander species, particularly for main foods such as moroco and stone loach.

The installation of a hydropower plant/dam on the Jergalan River caused massive mortality among downstream-migrant young fish and mature fish. Some migrant species could no longer reach their natural spawning areas. Hence, some of the previously most abundant fish almost disappeared.

Non-observance of official fishery rules and catch quotas is constraining fisheries in Lake Son Kul in the fattening period. In this period, whitefish and *Coregonus peled* remain in the same habitats; whitefish aged from 1 to more than 5 years are caught in large numbers (as are *Coregonus peled*).

OPPORTUNITIES

Recently, some measures to attract investment to the sector have been introduced. Investors are exempted from VAT on imported fish-breeding equipment.

The outlook for construction of new (and rehabilitation of old) pond culture facilities is promising. The fish productivity of ponds is higher than that in lakes and impoundments. Using intensive culture methods in the conditions of the Chui Valley will make it possible to attain a production of 2 500–3 000 kg/hectare. Such productivity will allow the country to produce more than 1 000 tonnes of valuable marketable fish (a capacity comparable with the total estimated catch capacity of Lake Issyk Kul). To realize this potential, it is necessary to construct fish-feed-producing facilities, and to produce less-expensive feeds that are balanced in terms of protein, fats, vitamins, etc.

Provided that biotechnical standards are increased and that private investors are attracted, it is estimated that fish ponds can produce some 2 500 tonnes of marketable fish annually in the near future.

There are 3 500 rivers in Kyrgyzstan (including 15 large rivers), a range of small mountain lakes and irrigation systems in which fish breeding and catching is possible if the necessary investments are made. With proper investment support, it is possible to create highly-profitable cage culture facilities near the cascade of reservoirs on the Naryn River. It is also possible to establish trout farms in the mountainous areas of many rivers, where the water is rich in oxygen, clean, and ideal for trout reproduction.

The amendments and additions to the Fishery Law as they concern the functions of the various government entities, the ratification of the programme of fishery development of 2007–2010, and the recent establishment of the DOF will provide an opportunity to increase the governmental budget and to support investment in the sector. For example, under the programme, in 2007 it was possible to catch 108 tonnes, to introduce 18 million fingerlings into lakes and reservoirs, and to increase fish-pond production by 10 percent.

New fish monitoring and surveillance methods make it possible to measure stocks and efforts more accurately. Research will enable determination of the potential biomass of species and of feed availability in natural waters at different trophic levels. Virtual population analysis (VPA) is also possible, enabling determination of the number of individuals of any age group in the previous years of life and its initial mass to be established. Knowing the age of fish, it is not difficult to determine their total biomass. It is necessary to use the figures on mortality factors. The total allowable catch of many species can be now calculated.

The moratorium in the Issyk Kul and Son Kul lakes is still in force. When it ends, it is estimated that no more than 320 tonnes of fish can be caught in the lakes (65 tonnes of moroco, 130 tonnes of ide, 25 tonnes of trout, 40 tonnes of whitefish, and 10 tonnes of other fish). Special cases are pikeperch and bream, which can be caught without limitations.

The population of the Issyk Kul region will increase in the near future to up to 600 000 people, and the number of tourists will rise to 1.5 million people. This population will demand a supply of 7 000–13 000 tonnes of fish annually, which is much more than the present catch. According to various scientists, it is possible to increase the fish catch to 500–700 tonnes. Of that total, 300–400 tonnes would be caught by recreational fishers. Other scientists believe that removing the predatory fish would make it possible to restore production levels to those of the 1960s.

Capacity building and training programmes could be established relatively easily for fishery biologists and fish breeders at the Biology Department of the National University, or at the Arabev University Institute of Ecology and Nature Usage. The Kyrgyz Agricultural Academy (Ecology Department), Karakol University (Biology Department) and the Kyrgyz Agricultural College

(Fishery Department, with 5–10 specialists working at the department) are other possible training and capacity building institutions at national level. Field, practical-time/hands-on training can be organized annually at the Issyk Kul biological station of the Institute of Biology and Soil of the National Academy of Science.

THREATS

The mistakes made by artificially changing the ichthyofauna in waterbodies should not be repeated. In the last 50–70 years, serious changes have taken place in the relationships between the ichthyofauna components of Lake Issyk Kul. As a result of the introduction of new species fish and the irrational fishery of some indigenous fish species, some of the latter have become almost extinct. The number of moroco (*Leuciscus bergi*), which was the predominant species in the last century, has fallen tenfold.

Despite the fact that trout were introduced into Lake Issyk Kul more than 75 years ago and that work on its artificial breeding was carried out for more than 30 years, the species stock is still limited. The main reasons for this are: the limited number of natural trout reproduction environments; the use of river water for irrigation, which leads to drying and oozing of spawning areas; the high mortality among restocked fingerlings; the low quality of fingerlings used for restocking; and poaching. As a result, the quantity of trout has begun to fall. The Jergalan stock (in the region of the Jergalan River), which used to provide the bulk of the catch, is almost insignificant. Stocks have also fallen in the southwest of Lake Issyk Kul.

The epizooties of moroco in Lake Issyk Kul in 1969 and 1976 considerably undermined fish stocks. Moreover, the use of locust poison in the Son Kul region in 1979 caused mass mortality of fish in the lake and a reduction in plankton and benthos. These events could have been entry points for changing the norms and terms of fishing. However, these opportunities were not taken.

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Annex 1

FISHERIES AND AQUACULTURE STATISTICS

Fisheries data provided by the Department of Fisheries.

TABLE A1.1

Fish catches in Lake Issyk Kul

Date	Species							Total
	Ide	Moroco	Zander	Trout	Whitefish	Bream	Other	
	(tonnes)							
1965	32	1 257	20	–	–	–	26	1 335
1968	23	1 010	38	4.5	–	2	12.5	1 090
1975	77	686	112	47	–	2	5	927
1980	36	224	36	40	5	1.5	2	344
1985	14	86	22	13	23	7	1	174
1990	32	163	32	18	21	15	5	278
1992	19	90	21	7	15	0.5	2	169
2003	2.5	5	1.5	–	–	–	0.5	10

TABLE A1.2

Fish catches, Kyrgyzstan, 1965–1992

Species	1965–69	1970–74	1975–79	1980–84	1985–89	1990–92
	(tonnes)					
Pikeperch (zander)	28.32	136.38	89.45	34.04	30.94	29.46
Trout	3.02	10.34	45.74	24.38	23.66	13.06
Osman	0.98	1.30	1.68	1.03	0.16	–
Whitefish	–	–	3.52	10.58	31.47	20.40
Carp (sazan)	9.52	2.94	0.51	0.91	1.18	3.57
Ide	22.48	54.40	49.55	29.19	23.48	26.00
Moroco	1 074.00	915.70	573.64	112.03	126.13	116.26
Marinka	3.90	1.60	2.28	3.42	4.42	0.14
Tench	4.92	5.14	1.48	1.29	3.46	6.50
Silver carp	–	–	–	2.89	1.84	–
Grass carp	–	–	–	0.39	0.59	–
Total	1 147.14	1 126.60	765.85	220.15	216.78	215.39

TABLE A1.3

Technical and economic indices of Chui fish-breeding plant, 1985–1992

Species	Units	1985	1986	1987	1988	1989	1990	1991	1992
Fish catch	Tonnes	241.0	274.0	200.2	415.2	390.4	316.4	545.1	326.1
Production of fish goods	Tonnes	271.1	406.9	401.0	406.2	443.8	250.9	449.1	249.0
Gross output	Thousand roubles	365.8	462.2	335.0	622.2	543.7	445.9	1 920.4	6 695.0
Commodity output	Thousand roubles	365.8	462.2	335	719.3	620.4	507.1	1 920.4	6 695.0
Cost price	Thousand roubles	367.1	299.8	368.1	563.0	570.4	484.7	1 192.0	4 557.0
Profit	Thousand roubles	-2.0	+50.6	-38.8	+153.0	+51.0	+22.4	+442.6	+1 094.0

Note: US\$1 = 0.637 roubles in 1987.

TABLE A1.4

Technical and economic indices of Uzgen fish-breeding plant, 1985–1992

Species	Units	1985	1986	1987	1988	1989	1990	1991	1992
Fish catch	Tonnes	271.1	411.0	408.0	431.0	497.3	380.0	270.0	200.0
Production of fish goods	Tonnes	271.1	406.9	401.0	406.2	444.0	323.0	192.0	150.0
Gross output	000 roubles	386.5	538.6	535.5	545.6	598.3	469.4	832.5	4 070.7
Commodity output	000 roubles	386.5	538.6	535.5	633.8	686.5	546.1	832.5	4 070.7
Cost price	000 roubles	535.0	461.4	427.7	478.0	617.0	535.8	485.5	4 713
Profit	000 roubles	-97.6	+7.0	+121.8	+114.9	+131.6	-36.0	+321.4	-3 058.3

Note: US\$1 = 0.637 roubles in 1987.

TABLE A1.5

Technical and economic indices of Talas fish-breeding plant, 1985–1992

Species	Units	1985	1986	1987	1988	1989	1990	1991	1992
Fish catch	Tonnes	26.7	120.0	132.3	152.0	270.0	274.0	153.8	66.3
Production of fish goods	Tonnes	26.7	120.0	110.4	152.6	190.1	218.4	127.8	27.0
Gross output	000 roubles	38.1	167.0	149.2	207.4	277.2	287.6	497.0	839.0
Commodity output	000 roubles	150.1	235.6	242.0	282.6	-	360.0	663.0	839.0
Cost price	000 roubles	150.1	235.6	242.0	282.6	-	360.0	663.0	1 024.0
Profit	000 roubles	-112.3	-69.2	-92.7	-35.0	+5.0	+17.1	+64.5	-397.0

Note: US\$1 = 0.637 roubles in 1987.

TABLE A1.6

Statistics on trout stocking in Lake Issyk Kul

Date	1989–1991	1992–94	1995–97	1998–2000	2001–03	2004–06
	<i>(million fish)</i>					
Young trout introduced	9.000	4.430	4.890	0.810	1.440	1.923

TABLE A1.7

The fish catch in Lake Son Kul, 1976–1992

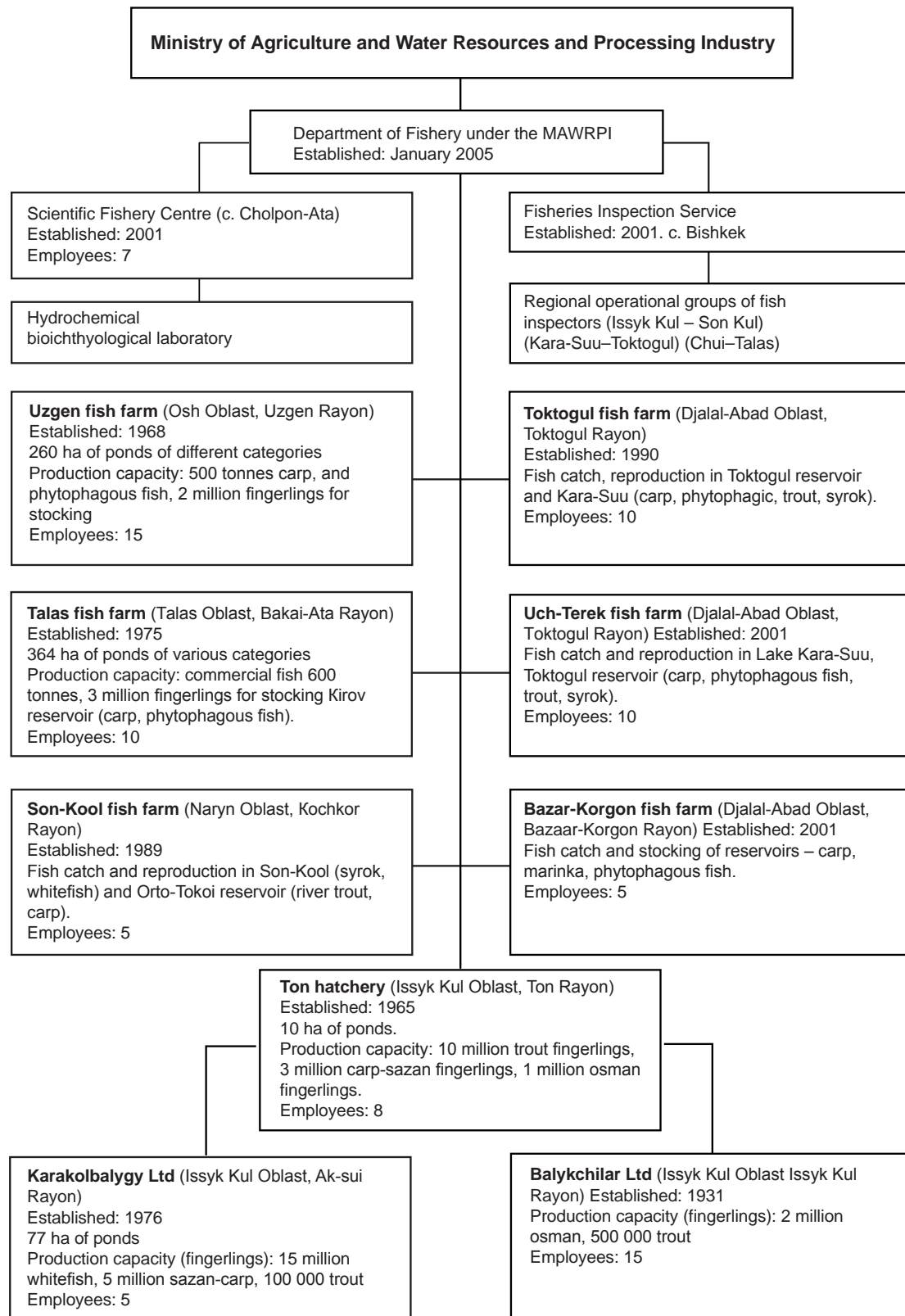
Species	1976	1977–78	1979–1981	1982–84	1985–87	1988–1990	1991–92
	<i>(tonnes)</i>						
Syrok	7.70	107.70	41.66	19.70	37.36	39.50	37.10

TABLE A1.8

The fish catch in the Toktogul impoundment, 1978-1992

Species	1978–1980	1981–83	1984–86	1987–89	1990–92
	<i>(tonnes)</i>				
Marinka	39.63	9.20	7.65	2.13	3.50
Silver carp	1.70	2.99	2.28	3.65	1.27
Grass carp	0.40	0.25	0.64	0.34	1.16
Trout	1.70	0.33	0.12	3.42	15.59
Carp	-	-	0.06	0.83	1.65
Total	43.40	12.77	10.75	10.37	23.17

FIGURE A1.1
Structure of the Department of Fishery under the MAWRPI



Note: Reproduction, incubation of eggs, and growing of young fish are implemented in accordance with the prognosis of the DOF and agreed directly with the Ton hatchery (which has the necessary facilities and equipment for egg incubation and fish rearing).

TABLE A1.9
The fish catch of fishery organizations, 1993–2004

Years	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
	(tonnes)													
Total catch	350.2	197.7	185.7	204.4	101.2	85.3	44.46	51.02	201.6	187.8	93.9	13.3	42.7	71.4
Lake	133.1	129.3	123.6	143.2	89.2	85.3	44.46	51.02	180.0	151.2	67.2	–	13.5	8.14
Pond	201.2	64.0	56.3	44.2	4.7	–	–	0.40	12.3	23.8	19.1	13.3	16.5	34.2
Impoundment	15.9	4.4	5.8	17.0	7.3	–	–	–	9.3	12.8	7.6	–	12.7	29.1

TABLE A1.10
List of private fish farms in the fisheries industry

Title	Year of formation	Activity	Notes
Ekos International Ltd.	2005	Commercial cage aquaculture of rainbow trout	Operating since 2006
Peasant farm Abyl	2007	–	Since 2007
Balykchylar Ltd.	1994	Reproduction of Issyk Kul trout	Since 1994
Karakolbalygy Ltd.	1994	Reproduction of Issyk Kul trout, whitefish, carp; fishery	Since 1994
New-Tek Ltd.	2007	–	Since 2007
Incubatory Plant Ltd.	2005	Reproduction of whitefish; fishery	Since 2005
Ladoga Ltd.	2007	Fishery	Not operating
Dolon Ltd.		Fishery	
Toktogul Tuzu Ltd.	2006	–	Not operating
Balyk Farm		Pond aquaculture	Since 1994
Aura Agricultural Production Cooperative	2002	Fishery	Operating
Jetymen Service Agricultural Production Cooperative	2007	Pond aquaculture	Not operating
Janysh &Co Ltd.	2006		Not operating
Kolmoch company Ltd.	2002		Operating
AquaDa Ltd.	2007	Cage aquaculture	Not operating
Forel Camp	2002	Trout fishery trout	Operating
Kyrgyzohotrybolovsoyuz		Sport, amateur and recreational fishery	Operating

TABLE A1.11
Number of employees in commercial, sport and recreational fishery as at 1 November 2007

Staff	Commercial fishery		Sport and recreational fishery
	Lakes	Reservoirs	
Men			
Full-time	11	32	32
Part-time	–	–	–
Women			
Full-time	–	–	8
Part-time	–	–	–
State sector	6	18	–
Private sector	5	14	40

TABLE A1.12

Number of people working in reproduction of fish stocks and commodity (commercial) aquaculture as at 1 November 2007

Staff	Reproduction			Commodity (commercial) aquaculture		
	Lakes	Reservoirs	Ponds of other category	Lakes (cage)	Reservoirs	Ponds of other categories
Men						
Full-time	56	2	46	15	3	53
Part-time	–	2	–	–	–	–
Women						
Full-time	17	–	9	–	–	3
Part-time	–	–	–	–	–	–
State sector	19	–	26	–	3	26
Private sector	54	–	29	15	–	30

TABLE A1.13

Data on fish catch and reproduction of the Department of Fisheries, 2005–07

Indexes	Unit	2005	2006	2007	Notes
		<i>(9 months)</i>			
1. Fish catch total:	tonnes	42.7	71.4	102.0	
Pond	tonnes	16.5	34.2	37.0	
Reservoir	tonnes	12.7	29.1	13.1	
Lake	tonnes	13.5	5.04	1.2	Moratorium since 2004
Cage (EKOS International)	tonnes	–	3.1	50.0	Functioning since 2006
2. Stocked waterbodies total:	million	9.97	15.7	23.406	
Young trout	million	0.85	0.623	0.706	
Young whitefish and syrok	million	6.47	11.2	9.2	
Young carp-sazan	million	2.55	3.052	10.2	
Young phytophagic	million	0.10	0.83	3.3	

TABLE A1.14

Aquaculture production by main producers in Kyrgyzstan, 2006–07

Enterprises	2006		2007 (9 months)		Total	
	Trout, whitefish	Carp and other	Trout, whitefish	Carp and other	Trout, whitefish	Carp and other
<i>(tonnes)</i>						
EKOS International Ltd.	3.1	–	50.0	–	53.1	–
Kolpoch Company Ltd.	–	–	–	15.0	–	15.0
Jetymen Service	–	–	–	12.0	–	12.0
Balykchylar Ltd.	0.2	–	–	–	–	–
Toktogul tuzu Ltd.	1.5	–	–	–	1.5	–
Karakolbalygy Ltd.	–	0.8	–	1.3	–	2.1
Dolon Ltd.	–	1.0	–	–	–	1.0
Balyk Farm	–	3.5	–	3.0	–	6.5
Chui-Bishkek	–	26.3	–	13.1	–	39.4
Balyk JSC	–	35.0	–	3.0	–	38.0
Total	4.8	66.6	50.0	47.4	54.8	114.0

TABLE A1.15
Statistics on reproduction and fish catch, 1989–2004

INDEX	Unit	FD, PU, RPU			KYRGYZBAILYGY JSC					DOF UNDER THE MAWRPI				FI			FISH INSPECTION	
		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
1. Total fish catch	tonnes	1 442.0	1 308.9	1 361.1	939.8	350.2	197.7	185.7	204.4	101.2	85.3	44.46	51.02	201.6	187.8	93.9	13.3	
Lake	tonnes	304.0	317.9	359.9	229.6	133.1	129.3	123.6	143.2	89.2	85.3	44.46	51.02	180.0	151.2	67.2	–	
Pond	tonnes	1 130.0	270.4	274.5	685.4	201.2	64.0	56.3	44.2	4.7	–	–	0.40	12.3	23.8	19.1	13.3	
Reservoir	tonnes	8.5	26.6	26.7	24.8	15.9	4.4	5.8	17.0	7.3	–	–	–	9.3	12.8	7.6	–	
2. Total stocked waterbodies:	million	7.0	7.8	11.82	6.76	3.32	0.75	1.19	2.45	3.54	0.28	–	1.73	2.55	3.33	8.06	5.25	
Young trout	million	4.0	3.0	2.0	2.06	1.62	0.75	1.19	0.81	2.89	0.28	–	0.53	0.60	0.58	0.26	0.45	
Young whitefish and syrok	million	3.0	4.1	8.2	–	–	–	–	0.12	–	–	–	1.20	1.70	2.75	7.8	4.0	
Young carp	million	–	0.7	1.6	4.7	1.7	–	–	1.51	0.65	–	–	–	0.25	–	–	1.8	
Young phytophagic	million	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

Note: FD – Fishery Directorate; PU – Production Union Kyrgyzyba; RPU – Republic Production Union Kyrgyzybkhoz; JSC – Joint Stock Corporation Kyrgyzbalygy (state share 49%); DOF – Department of Fisheries under the MAWRPI; FI – Fishery Industry, the Directorate on Livestock and Veterinary under the MAWRPI, Fish Inspection under the MAWRPI.

TABLE A1.16
Indicators on Chui fish farm (Balyk Joint Stock Company)

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (9 m)
Catch (tonnes)	241.0	274.0	200.2	415.2	390.4	316.4	545.1	326.1	250.0	54.1	66.9	21.5	27.7	21.4	28.7	30.3	37.5	32.2	38.5	44.1	40.4	35.0	3.0

TABLE A1.17
Indicators on Uzgen state fish farm

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (9 m)
Catch (carp, silver carp, grass carp)	271.0	411.0	408.0	431.0	497.3	380.0	270.0	200.0	31.0	–	5.8	5.2	5.0	–	–	0.4	12.3	23.8	19.1	13.3	6.0	13.0	7.7

TABLE A1.18
Indicators on Talas state fish farm

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (9 m)
Catch (carp, silver carp, grass carp)	26.7	120.0	132.3	152.0	270.0	274.0	153.8	66.3	74.0	16.0	–	–	–	–	–	–	–	–	–	–	10.5	21.2	15.0

Note: Indicators on fish catch of the Talas fish farm are absent owing to the fact that ponds were not used in 1995–2004. Since 2005, areas of ponds have been rented by private entrepreneurs on the basis of agreements with the DOF.

Annex 2

THE FISH SPECIES OF KYRGYZSTAN AND THEIR DISTRIBUTION

TABLE A2.1
Fish species of Kyrgyzstan and their distribution

Scientific name	English name	Status	Lakes			River basins			
			Issyk Kul	Son Kul	Kara Su	Naryn	Chu	Talas	Kara-Darya
ACIPENSERIDAE									
<i>Acipenser baerii baerjii</i> (Brandt, 1869)	Siberian sturgeon	(Introduced)				X			
SALMONIDAE									
<i>Coregonus migratorius</i> (Georgi, 1775)	Baikal Omul/Arctic cisco	(Introduced)							
<i>Coregonus lavaretus</i> (Linnaeus, 1758)		Introduced							
<i>Coregonus lutokkka</i> (Kottelat, Bogutskaya et Freyhof, 2005)	Common whitefish	(Introduced)	X	X	X				
<i>Coregonus peled</i> (Gmelin, 1789)	Peled	Introduced		X	X			X	
<i>Oncorhynchus mykiss</i> (Walbaum, 1792)	Rainbow trout	(Introduced)	X						
<i>Salmo ischchan</i> (Kessler, 1877)	Sevan/Issyk Kul trout	Introduced	X			X			
<i>Salmo trutta oxianus</i> (Kessler, 1874)	Amu-Darya trout	Indigenous				X	X	X	X
ESOCIDAE									
<i>Esox lucius</i> (Linnaeus, 1758)	Pike	Indigenous						X	
CYPRINIDAE									
<i>Abramis brama</i> (Linnaeus, 1758)	Bream	Introduced	X					X	
<i>Alburnoides taeniatus</i> (Kessler, 1874)	Striped bystranka	Indigenous	X			X			X
<i>Aristichthys nobilis</i> (Richardson, 1845)	Bighead carp	(Introduced)				X	X	X	X
<i>Aspiolucius esocinus</i> (Kessler, 1874)	Pike asp	Indigenous				X			
<i>Aspius aspius</i> (Linnaeus, 1758)	Asp	Indigenous						X	
<i>Barbus capito conocephalus</i> (Kessler, 1872)	Turkestan barbel	Indigenous				X		X	
<i>Barbus brachycephalus brachycephalus</i> (Kessler, 1872)	Aral barbel	Indigenous				X		X	

TABLE A2.1 (Cont.)

Scientific name	English name	Status	Lakes				River basins			
			Issyk Kul	Son Kul	Kara Su	Naryn	Chu	Talas	Kara-Darya	
<i>Capoetobrama kuschakewitschi kuschakewitschi</i> (Kessler, 1872)	Sharpray	Indigenous					X			
<i>Capoetobrama kuschakewitschi orientalis</i> (Nikolskii, 1934)		Indigenous					X			X
<i>Carassius gibelio</i> (Bloch, 1782)	Goldfish/Prussian carp	Introduced	X			X	X	X	X	X
<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Grasscarp	Introduced				X	X	X		
<i>Cyprinus carpio carpio</i> (Linnaeus, 1758)	Common carp	Indigenous	X			X	X	X	X	X
<i>Diptychus maculatus</i> (Steindachner, 1866)	Scaled osman	Indigenous				X	X			
<i>Diptychus sewerzowi</i> (Kessler, 1872)		Indigenous	X			X	X			
<i>Gymnodiptychus dybowskii</i> (Kessler, 1874)	Naked osman	Indigenous	X	X		X	X	X		
<i>Gobio gobio gobio</i> (Linnaeus, 1758)	Issyk Kul gudgeon	Indigenous	X			X	X	X	X	X
<i>Hemiculter leucisculus</i> (Basilevsky, 1855)	Sharpbelly	Introduced				X	X			
<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	Silver carp	Introduced				X	X	X		X
<i>Lagowskiella demenjevii</i> (Turdakov and Piskarev, 1954)		Indigenous						X		
<i>Lagowskiella poljakowi</i> (Kessler, 1879)	Balkash minnow	Indigenous						X		
<i>Leuciscus baicalensis</i> (Dybowski, 1874)	Dace	Indigenous								
<i>Leuciscus bergi</i> (Kashkarov, 1925)	Issyk Kul Dace	Indigenous	X							
<i>Leuciscus idus</i> (Linnaeus, 1758)	Ide/Orfe	Indigenous								
<i>Leuciscus lindbergi</i> (Zanin and Ereimejev, 1934)	Talas dace	Indigenous							X	
<i>Leuciscus schmidti</i> (Herzenstein, 1896)	Schmidt's dace	Endemic	X							
<i>Mylopharyngodon piceus</i>	Black Amur	(Introduced)								
<i>Petroleuciscus squaliusculus</i> (Kessler, 1872)	Syr-Darya Dace	Indigenous								X
<i>Phoxinus brachyurus</i> (Berg, 1912)	Short tailed minnow/ Seven River's minnow	Indigenous								
<i>Phoxinus issykkulensis</i> (Berg, 1912)	Issyk-kul minnow	Indigenous	X							
<i>Pseudorasbora parva</i> (Terminck and Schlegel, 1846)	Stone moroko/False harlequin	Introduced	X			X	X	X	X	X

TABLE A2.1 (Cont.)

Scientific name	English name	Status	Lakes				River basins			
			Issyk Kul	Son Kul	Kara Su	Naryn	Chu	Talas	Kara-Darya	
<i>Rhodeus sericeus</i> (Pallas, 1776)		Introduced					X			
<i>Rutilus rutilus</i> (Linnaeus, 1758)	Roach	Indigenous					X			
<i>Scardinius erythrophthalmus</i> (Linnaeus, 1758)	Rudd	Indigenous					X			
<i>Schizothorax intermedius eurycephalus</i> (Berg, 1932)		Indigenous								X
<i>Schizothorax intermedius intermedius</i> (McClelland, 1842)	Common marinka	Indigenous				X		X		X
<i>Schizothorax intermedius talassi</i> (Turdakov, 1955)		Indigenous								X
<i>Schizothorax pseudoaksaiensis issykkuli</i> (Berg, 1907)	Issyk-kul marinka	Indigenous	X							
<i>Schizothorax pseudoaksaiensis pseudoaksaiensis</i> (Herzenstein, 1888)		Indigenous						X		
<i>Schizothorax pseudoaksaiensis tschuensis</i> (Pivnev, 1985)		Indigenous						X		
<i>Tinca tinca</i> (Linnaeus, 1758)	Tench	Introduced	X					X		X
BALITORIDAE										
<i>Dzihunia amudariensis</i> (Rass, 1929)	Bukhara stone loach	Indigenous								
<i>Dzihunia turdakovi</i> (Prokofiev, 2003)		Indigenous								
<i>Nemacheilus kuschakewitschi</i> (Herzenstein, 1890)	Kuschakewitsch loach	Indigenous				X				X
<i>Nemacheilus oxianus</i> (Kessler, 1877)	Amu-Darya stone loach	Indigenous				X				X
<i>Nemacheilus paradoxus</i> (Turdakov, 1955)	Talas stoneloach	Indigenous				X			X	
<i>Triplophysa coniptera salari</i> (Turdakov, 1954)	Ters stoneloach	Indigenous							X	
<i>Triplophysa dorsalis</i> (Kessler, 1872)	Grey loach	Indigenous	X	X				X	X	X
<i>Triplophysa stoliczkaei</i> (Steindachner, 1866)	Tibetan stoneloach	Indigenous	X					X	X	X
<i>Triplophysa strauchii strauchii</i> (Kessler, 1874)	Spotted thicklip loach	Indigenous	X							
<i>Triplophysa strauchii ulacholicus</i> (Anikin, 1905)	Issyk-kul naked loach	Indigenous	X							

TABLE A2.1 (Cont.)

Scientific name	English name	Status	Lakes				River basins			
			Issyk Kul	Son Kul	Kara Su	Naryn	Chu	Talas	Kara-Darya	
COBITIDAE										
<i>Sabanejewia aurata aralensis</i> (Kessler, 1877)	Golden spined loach	Indigenous				X	X			X
SILURIDAE										
<i>Silurus glanis</i> (Linnaeus, 1758)	Wels catfish	Indigenous					X			
SISORIDAE										
<i>Glyptosternon reticulatum</i> (McClelland, 1842)	Turkestan catfish	Indigenous				X				X
POECILIDAE										
<i>Gambusia holbrooki</i> (Girard, 1859)	Eastern mosquitofish	Introduced					X			X
GASTEROSTEIDAE										
<i>Pungitius platygaster</i> (Kessler, 1859)	Southern ninespine stickleback	Indigenous					X			
PERCIDAE										
<i>Perca fluviatilis</i> (Linnaeus, 1758)	River perch	Indigenous						X		
<i>Perca schrenkii</i> (Kessler, 1874)	Balkash perch	Introduced						X		
<i>Sander lucioperca</i> (Linnaeus, 1758)	Pike-perch/Zander	Introduced							X	
ODONTUBUTIDAE										
<i>Micropercops cinctus</i> (Dabry de Thiersant, 1872)		Introduced							X	
GOBIIDAE										
<i>Rhinogobius similis</i> (Gill, 1859)		Introduced							X	
CHANNIDAE										
<i>Channa argus waiyachowskii</i> (Berg, 1909)	Amur snakehead	Introduced						X		
COTTIDAE										
<i>Cottus gobio jaxartensis</i> (Berg, 1916)	Chatkal sculpin	Indigenous					X			X
<i>Cottus spinulosus</i> (Kessler, 1872)	Turkestan sculpin	Indigenous					X			X
Total			20	4	3	28	40	18	16	

Annex 3

MAP OF THE KYRGYZ REPUBLIC



Annex 4

CHARTER OF THE KYRGYZ ASSOCIATION OF PISCICULTURISTS

Approved by: General Assembly of the Association Founders, 10 May 2007

Charter

Association of Legal Entities

Kyrgyz Association of Pisciculturists “Balyk Resources”

1. GENERAL REGULATIONS

The union of legal entities the Kyrgyz Association of Pisciculturists “Balyk Resources”, hereinafter referred to as “the Association”, is a non-commercial organization that is established and carries out its activity in accordance with the Constitution of the Kyrgyz Republic (KR), Civil Codex KR, Law KR “On non-commercial organizations” and other legal acts of the KR and current Charter.

The Association is a voluntary union of legal entities unified in the procedure stipulated by legislation in order to coordinate the activity, presentation and protection of interests of fish farms and their members to render legal, informational and other services as well as to create the necessary production and social infrastructure of fish farms in the Kyrgyz Republic.

The Association is established without limitation of its longevity.

2. TITLE AND LOCATION OF THE ASSOCIATION

Full and short title of the Association:

- In state language: Balyk-Resources Kyrgyz balyk osturuuxhulor assotsiatsiyasy Uyridikalyk jaktardyn birikmesi;
- In official language: Objedinenie uyridicheskikh lits “Kyrgyzskaya Assotsiatsia rybovodov “Balyk Resoursy”; short title OUL “KAR Balyk-Resoursy”.

The location of the Association: 77 house, Chui-4 Str, Ak-Bosogo residential area, Bishkek

3. OBJECTIVES AND TASKS OF THE ASSOCIATION

The Association carries out its activity in accordance with general principles of self-regulation in the fish sector in order to consolidate efforts of pisciculturists, fish farms and members of the Association in order to develop the institute of self-regulation in fish culture activity through the establishment of infrastructure and the implementation of professional, informational objectives of pisciculturists, protection of rights and legal interests of members of the Association as well as for other purposes that do not contradict the legislation of the KR and the current Charter.

The main objectives and tasks of the Association are the following:

- coordination of activity of the Association members in developing the activities of fish farms and protection of their interests;
- rendering assistance in the establishment and functioning of an effective system of self-regulation in fishing;
- rendering assistance in organizational, legal, methodological and advisory support to members of the Association in undertaking their professional activity;
- attracting and spending financial resources on developing of the Association members’ activities;

- establishment and maintenance of international relations and direct contacts on issues of fishing within and outside the KR;
- study and distribution of local and international experience in fishing;
- presentation and protection of rights and legal interests of the Association in state, public, judicial and other bodies within and outside the KR.

In order to reach its objective and perform its tasks, the Association:

- cooperates with international organizations, non-commercial and commercial organizations, centres, associations, natural and legal entities, and state entities within and outside the KR;
- organizes and conducts as well as participates in workshops, “round tables”, conferences and other arrangements in agriculture, particularly in the fish sector;
- coordinates efforts of the Association members in establishing and introducing new methods and technologies in the fish sector;
- cooperates with local and foreign non-commercial and commercial organizations in order to have direct contacts and attract financial resources and grant assistance for the development of fisheries;
- considers claims, complaints of natural and legal entities on violations of legislation of the KR in relation to fisheries, norms and rules on self-regulation, procedures on activity in the fish sector approved by the Association;
- provides fish farms with appropriate proposals and recommendations;
- develops and supports principles of honest competitiveness in activities of fish farms;
- prepares, issues and distributes information (hard copy, electronic, audiovisual) about fisheries;
- implements other activities that do not contradict the legislation of KR and are related to implementation of objectives and tasks of the Association.

4. LEGAL STATUS OF THE ASSOCIATION

The Association becomes a legal entity from the moment of its state registration. The Association has the right to have its own and working capital, independent accounts, settlement accounts (in som and foreign currency) in banks and credit agencies within and outside the KR. The Association is the sole owner of the assets, registered in independent accounts, including funds transferred by its members as payment of entrance and membership fees. The Association acting on its own behalf and in its own name may obtain and exercise property rights and related personal non-property rights, incur obligations in accordance with the legislation of the KR, sue and be a defendant in any court.

The Association has its state seal and stamp with full name of the Association in Kyrgyz and Russian languages. The Association has the right to have its own letterhead as well as other markings.

The Association undertakes its activities on the principles of voluntariness, equality for all members, legitimacy and transparency, without aiming at deriving a profit as its main task.

The Association has the right to join international, public, non-commercial and commercial organizations, to maintain direct international connections, and to conclude appropriate agreements.

The Association is not responsible for the obligations of the state, and the state is not responsible for obligations of the Association. Interference by state bodies or officials into the activity of the Association as well as interference by the Association into the activity of state bodies or officials is prohibited except in the cases provided for by legislation.

The Association is liable for its obligations with its funds and property. The Association is responsible for the obligations of its members.

The Association has the right to carry out other types of activities in observation of legal requirements of the KR that do not contradict the current Charter.

The Association is not responsible for obligations of its members. Members of the Association bear subsidiary responsibility for its obligations in the amount of fee contributed.

5. PROPERTY AND FUNDS OF THE ASSOCIATION

The Association exercises possession, use and disposal of the assets and funds in accordance with the purposes of its activity and legislation of the KR.

Sources of the Association's assets and funds are:

- regular and targeted receipts of funds through the Association members' payment of obligatory and voluntary contributions;
- voluntary monetary contributions in national and foreign currency, grant aid, subsidies and other material resources from natural and legal entities of the KR and foreign countries;
- other contributions not prohibited by legislation of the KR.

Monetary funds and contributions are paid into settlement and foreign currency accounts of the Association.

The assets and funds of the Association are used for the following:

- achieving the objectives and undertaking the tasks stipulated in its Charter;
- payment of salaries for the Association's employees;
- purchase of assets, stationery, equipment and others necessities for the functioning of the Association;
- charitable and other purposes that do not contradict legislation of the KR and the current Charter.

Land plots, buildings, constructions, trade brands, patents, licences, transport, equipment, telecommunications, copiers as well as other equipment and assets necessary for the activity of the Association can be its property.

6. MEMBERS OF THE ASSOCIATION, THEIR RIGHTS AND DUTIES

Members of the Association are legal entities and private entrepreneurs that have voluntarily joined, have the appropriate certificate, support the objectives and tasks of the Association, recognize its Charter and take active part in the activity of the Association as well as contribute their fee in accordance with the Charter of the Association.

Members of the Association have the right:

- to participate in the activities of the management and control bodies of the Association including participation in voting and decision-making at the General Assembly of the Association members on the "one- member-one vote" principle;
- to elect and be elected to the management and control bodies of the Association;
- to participate in the activities and measures implemented by the Association;
- to use services, possibilities, support and assistance of the Association;
- to retain their legal independence;
- to obtain information about the activity of the Association as well as accounting records and other documentation of the Association;
- to call for an extraordinary General Assembly of the Association members in accordance with the procedure and under the conditions as required by the legislation of the KR, current Charter and other internal regulations and standards;

- to make proposals for consideration by the management bodies of the Association and participate in discussion of issues related to the activities of the Association;
- to cancel their membership of the Association in accordance with the procedure and under the conditions specified by legislation of the KR and current Charter.

Obligations of the members of the Association:

- to observe the current Charter;
- to implement the decisions of the management and control bodies of the Association;
- to submit to the Association the information necessary for decision-making, related to the activity of the Association;
- to pay on time the membership fee in accordance with the procedure and amount determined by the General Assembly of the Association members;
- not to act (non-action) where the result of acting would be violation of the laws of the KR.

Admission to membership of the Association is on the basis of a written application form, submitted to the Chairperson of the Supervisory Board of the Association. A written application form is to be considered by the Supervisory Board within one month. In the event of approval, it has to be presented at the General Assembly. In the event of rejection, notification has to be issued with reasons for the rejection.

The decision on admission to membership of the Association has to be taken at the General Assembly of the Association meeting by a simple majority of votes of members present, and this has to be registered in the minutes of the General Assembly of the Association's members.

Applicants for membership of the Association receive the status of Association member from the moment of admission fee payment.

Membership of the Association has to be recorded in the registration book, which is under the responsibility of the Secretary of the General Assembly of the Association's members.

The procedure on admission and the membership fees are to be determined by the Chairperson of the Supervisory Board and to be approved by the General Assembly of the Association's members.

Member of the Association can be excluded from membership in the following cases:

- violation of the Charter, Founders Agreement;
- failure to pay membership fee on time;
- failure to implement decisions of the management and control bodies of the Association;
- action (non-action) resulting in financial and non-financial damage for the Association;
- violations, implying criminal and other responsibility, in accordance with the legislation of the KR.

The decision on exclusion from membership of the Association is to be taken by a simple majority of votes of members present at the General Assembly and it is to be registered in the minutes of the General Assembly of the Association members. In relation to responsibility and contribution of assets of the excluded member, the rules on withdrawal from the Association are to be applied in accordance with the legislation of the KR.

Each member of the Association has the right to leave free of charge membership of the Association at the end of year by providing 30 calendar days advance notice thereof to the Supervisory Board. In this case, he/she bears subsidiary responsibility on obligations of the Association proportionally to their contribution for two years from the moment of leaving. The Association is not responsible for the obligations of its members. Withdrawal from membership of the Association has to be by written notification submitted to the Chairperson of the Supervisory Board of the Association.

The moment when the written notification of withdrawal from membership of the Association is received and registered by the Chairperson of the Supervisory Board of is to be considered as the moment of effective withdrawal from membership.

7. MANAGEMENT AND CONTROL BODIES OF THE ASSOCIATION

The management bodies of the Association are the following: General Assembly of the Association members, the Supervisory Board of the Association.

The control body of the Association for its financial and business activities is the Audit Committee of the Association.

The executive body of the Association is the Board of Directors.

8. GENERAL ASSEMBLY OF THE ASSOCIATION MEMBERS

The highest management body of the Association is the General Assembly, which consists of all its members. The General Assembly has the right to make decisions on any issues in relation to the activity of the Association.

The General Assembly is to be conducted according to the procedure established by legislation of the KR, the current Charter and other internal regulations and standards of the Association.

The General Assembly is to consist of all members of the Association, and it has to be convened as required but no less than once per year.

The General Assembly has a quorum and has to be considered as valid if at the moment of the meeting of the General Assembly more than half of all registered members are present.

The Chairperson of the Board of Directors of the Association moderates the meeting of the General Assembly. In the event of absence of the Chairperson, the meeting is to be moderated by a member of the Board of Directors (appointed by the Chairperson of the Supervisory Board).

The General Assembly shall be called and conducted by the Secretary of the General Assembly elected for the period of one year at the General Assembly from among the members of the Association by a simple majority of the members present.

The Secretary of the General Assembly is responsible for:

- making arrangements for the General Assembly;
- sending the agenda, work programme and other documents required to conduct the General Assembly to the members of the Association;
- registering members of the Association and their representatives for participation in the meeting of the General Assembly of the Association;
- preparing a list of speakers and rules of work of the General Assembly;
- keeping minutes of the General Assembly;
- keeping a single book of minutes of the General Assembly meeting.

The members of the General Assembly shall be informed about the call to the General Assembly in writing indicating the agenda, time and venue of the General Assembly at least 30 days before the meeting.

The General Assembly of the Association shall be called in order to determine long-term directions of work, summing-up of previous activities, and solutions to other issues that are the competence of the Association.

The exclusive competence of the General Assembly includes:

- introduction of amendments and supplements to the Charter of the Association;
- approval of main directions of the Association's work, principles and procedures of the formation and use of its assets and funds;
- election of the Chairperson and the Secretary of the General Assembly of the Association and early termination of their powers;
- election of the Chairperson and Board members, and the Auditors of the Association;
- early termination of powers of the members of the Supervisory Board of the Association;

- approval of rules, procedures and other documents of the Association, its organizational structure, list and salary of staff of the Association (on recommendation of the Chairperson of Supervisory Board of the Association);
- affiliation and expulsion of members of the Association;
- approval of amount, procedure and period of payment of membership fees of the Association on recommendation of the Supervisory Board;
- approval of entering into a contract exceeding 20 percent of the cost of the total asset of the Association;
- hearing and approval of the accounts, financial plan and budget, and annual report on a status of affairs of the Association;
- hearing and approval of reports prepared by the management and control bodies of the Association;
- organization and approval of external audits of the Association, creation of conditions for hiring an external auditor;
- making and approving decisions about cooperation, participation of the Association in activities of other legal entities, determining the form of such cooperation and participation;
- taking decisions on the reorganization and liquidation of the Association, creation of a liquidation commission, and approval of interim and final liquidation balances of the Association, solution of other issues related to the Association.

The issues at the General Assembly shall be resolved by voting under the one-member-one-vote principle. The decisions at the General Assembly shall be accepted where the majority of members of the Association present at the General Assembly vote for them. In the case of a tie, the Chairperson of the General Assembly has the casting vote.

The extraordinary General Assembly can be convened at the request of the members of the Association and other management bodies of the Association.

The General Assembly has no right to take decisions on issues not included on the agenda. The agenda shall be distributed at least 20 days before the beginning of the General Assembly.

The decisions of the General Assembly shall be recorded in the minutes and signed by the Chairperson and the Secretary of the General Assembly.

9. SUPERVISORY BOARD OF THE ASSOCIATION

The Supervisory Board of the Association, hereinafter “the Supervisory Board”, is a supervisory body of the Association.

The Supervisory Board shall consist of two members and the Chairperson.

The Supervisory Board shall be elected for the period of one year by the General Assembly of the Association by a simple majority of votes of members present at the General Assembly.

The Chairperson of the Supervisory Board shall be elected for the term of one year from among the members of the Supervisory Board by a majority of votes of the members present at the General Assembly.

The Supervisory Board shall be entitled to resolve issues submitted for its consideration where no fewer than three members attend the meeting of the Supervisory Board. The decisions of the Supervisory Board shall be taken by a simple majority of votes of the total number of members. In the event of a tie, the Chairperson of the Supervisory Board has the casting vote.

The Supervisory Board is responsible for:

- control over implementation of objectives, tasks stipulated by the Charter, and execution of decisions taken by General Assembly;
- consideration of prospective and current issues of the Association;

- development of rules, procedures and other documents of the Association, its organizational structure, list and salary of staff of the Association, and submission for approval by the General Assembly;
- determining of the amount, procedure and period of payment of membership fees of the Association and their submission for approval by the General Assembly of the Association;
- consideration of the annual report and accounts of the Association and submission for approval by the General Assembly;
- approval of rules of work of the Association;
- consideration of other issues submitted for discussion at the initiative of the Chairperson of the Supervisory Board or individual members of the Association.

The Supervisory Board also has the right to take decisions on other issues of organization and activity of the Association, except for issues that are the sole competence of the General Assembly of the Association.

Each meeting of the Supervisory Board shall be recorded in the minutes.

The Supervisory Board shall be accountable to the General Assembly of the Association.

In accordance with the decision of General Assembly, members or the Chairperson of the Supervisory Board may be excluded, and their powers may be terminated early.

The decision on exclusion or early termination of powers of the members and the Chairperson of the Supervisory Board shall be taken at the General Assembly by a simple majority of vote of the members present and recorded in the minutes of the meeting of the General Assembly of the Association.

The members of the Supervisory Board shall have the right to resign by his/her own will at any time by submitting written notification to the Chairperson of the Supervisory Board. The moment of resignation of the member of the Supervisory Board shall be that of receipt by the Chairperson of the Supervisory Board of said notification.

In this case, the Chairperson of the Supervisory Board shall be obliged to notify members of the Association in writing and raise a question about a call of the General Assembly and election of new members of the Supervisory Board.

The Chairperson of the Supervisory Board shall have the right to resign by his/her own will at any time, notifying all members of the Association in writing.

In this case, the Chairperson of the Supervisory Board shall be obliged to call an extraordinary (regular) General Assembly of the Association members in order to resign and elect a new Chairperson of the Supervisory Board.

The opening of the meeting of the General Assembly of the Association shall be considered as the moment of resignation of Chairperson of the Supervisory Board.

10. BOARD OF DIRECTORS OF THE ASSOCIATION

The Board of Directors of the Association, hereinafter the “Board of Directors”, performs the functions of an executive body.

The Board of Directors shall be headed by its Chairperson.

The composition of the Board of Directors shall be elected for the period of one year, at the General Assembly of the Association by a simple majority of members present, three members in number.

The competences of Board of Directors include:

- entering into financial and other agreements related to use and dispose of assets (non-property) and funds of the Association up to the cost of 20 percent of the total capital of the

Association, in excess of this fixed amount, with the consent of the Supervising Board and General Assembly;

- preparation of reports and estimates of administration and production costs and their submission for consideration and approval by the General Assembly and Supervisory Board;
- preparation and submission of annual report and accounts of the Association for pre-approval by the Supervisory Board before the General Assembly;
- preparation of regulations of the Association;
- execution of decisions of the General Assembly and Supervisory Board;
- resolution of issues related to improvement in performance of the Association's members;
- ensuring the bookkeeping of the Association's work, submission of accounting and other reports to the state statistical agencies;
- submission of estimates of administration and economic costs of the Association for approval by the Supervisory Board;
- submission of annual report and accounts of the Association for approval by the General Assembly;
- preparation of other issues submitted for discussion by initiative of the Chairperson of the Supervisory Board or individual members of the Association.

The competences of the Chairperson of the Board of Directors are:

- organization of call, work and signing of minutes of the meeting of the Steering Committee;
- ensuring the economic activities to achieve the objectives of the Charter of the Association;
- opening of settlement and other accounts with banks;
- representation of interests of the Association without power of attorney;
- disposal of assets and funds of the Association, as well as settlement of various transactions within his/her powers with the right to sign financial documents of the Association;
- publication of orders, instructions and other acts regulating labour activity of staff of the Association;
- establishment of a procedure of employment according to labour agreements, order and amount of their salary;
- issues of power of attorney to the Association staff;
- employment and dismissal of employees of the Association according to the approved staff list;
- preparation of issues submitted for consideration of the General Assembly and the Steering Committee of the Association.

11. AUDITOR OF THE ASSOCIATION

The Auditor of the Association is the controlling organ of the Association carrying out control over financial and economic activities, execution of budget and expenditures (internal audit) of the Association.

The Auditor shall be elected for the period of one year from among the members of the Association by a simple majority vote of the members present of the General Assembly of the Association.

The Auditor shall have the right to demand from officials of the Association and members of the management bodies of the Association any information required for the execution of duties; and the officials of the Association are obliged to provide such information.

The Auditor shall conduct a scheduled audit of the financial and economic activities of the Association no fewer than four times a year. An off-schedule audit shall be conducted in cases of:

- decision of the General Assembly of the Association;
- demand of the Chairperson of the Supervisory Board;
- on demand of no fewer than one-third of the Association's members.

12. EXTERNAL AUDIT

The Association, on its own account, may invite specialized organizations to audit and confirm the annual financial reporting of the Association (external audit).

13. MODIFICATION OF THE CHARTER

Amendments and supplements to the Charter shall be approved by decision of the General Assembly of the Association and subject to registration in accordance with the established procedure.

If any provision of the Charter becomes invalid, it shall not affect other provisions. Any invalid provision shall be replaced with another close by implication and admissible in legal terms.

14. REORGANIZATION AND LIQUIDATION OF THE ORGANIZATION

Reorganization (merger, separation, affiliation, division, or reorganization) of the Association shall be carried out by decision of the General Assembly of the Association in accordance with legislation of the KR.

The Association shall be liquidated by decision of the General Assembly of the Association and by decision of court.

If the Association is liquidated, the General Assembly shall create the Liquidation Committee and determine the procedure and period of liquidation of the Association.

From the moment of appointment of the Liquidation Committee, all powers on administration of the Association shall pass to it. The Liquidation Committee shall act on behalf of the Association in relations with third parties.

In accordance with legislation of the KR, the Liquidation Committee shall be liable for damage and harm caused to the Association, its members, and third parties.

If the Association is reorganized, all its rights and liabilities shall pass to the assignee (assignees) in accordance with the procedure envisaged by the legislation of the KR.

If the Association is liquidated, the assets remaining after settlement of claims of creditors and other compensations shall be directed to objectives and tasks for the achieving of which the Association was established.

The liquidation of the Association shall be considered completed and the existence of the Association terminated after this entry is made in the single state register of legal entities by the state registration agency.

The conditions and procedure of reorganization and liquidation not stipulated by the present Charter shall be regulated by the legislation of the KR.

15. ACCOUNTING AND REPORTING OF THE ASSOCIATION

The Association shall keep accounts and submit financial reports according to the legislation of the KR.

The Chairperson of the Board of Directors shall be responsible for proper bookkeeping and submission of financial documents and other forms of reporting to respective agencies.

16. FINAL PROVISION

The Charter shall come into force from the moment of its state registration.

Amendments and supplements made to the Charter of the Association shall come into force from the moment of their state registration.

Issues not regulated by this Charter can be settled by the General Assembly of the Association in accordance with the legislation of the KR.

Chairperson of the Board of Directors of the Association

Annex 5

THE FISHERY LAW, 1997

Bishkek

25 June 1997, #39

LAW OF THE KYRGYZ REPUBLIC ON THE FISH INDUSTRY

This Law shall regulate the legal, economic and organizational fundamentals of the fish-farm industry of the Kyrgyz Republic for the purposes of comprehensive development, preservation and increase of fish reserves, improvement of fish productivity of reservoirs and ponds, and the fullest satisfaction of the needs of the population in terms of fish products.

I. BASIC PROVISIONS

Article 1. Legislation on the Fish Industry

The legislation on the fish industry shall be based on the Constitution of the Kyrgyz Republic and shall be comprised of this Law and other normative acts passed in accordance with this Law.

Article 2. Subject-Matter of Regulation of This Law

“Fish industry” shall mean a system of fish farming, fishing, reproduction and protection of fish reserves aimed at improvement of species, fish reserves, water reservoirs and ponds, and fostering the activity of fish-farming entities regardless of their form of ownership that breed fish for sale, produce planting and pedigree material, extract, protect and process it.

This Law shall regulate the relations arising in possession, use and disposal of the natural and artificial fish reserves in fish farming water reservoirs and reservoirs of common use of the Kyrgyz Republic.

Natural fish reserves in reservoirs of any category located on the territory of the Kyrgyz Republic shall be owned by the Kyrgyz Republic.

Fish-farming reservoirs shall mean reservoirs that are used or may be used for fishery and are significant for the preservation and reproduction of reserves of marketable fish, and artificial reservoirs constructed specifically for fish farming.

Reservoirs of common use shall mean rivers, lakes, ponds, basins and their influx waters, except for reserves that are not meant for marketable fishing, and for organization of amateur and sport fishing.

Article 3. Fundamentals of Running Fish Farms

Fish-farming entities, regardless of the form of ownership, while running fish farms must secure:

- fish reproduction ability;
- preservation of productivity of water reservoirs;
- protection of living environment, conditions of reproduction and paths of fish migration;
- prevention of unwanted changes in water ecosystem, in the event of artificial fish farming (hereinafter fish farming);
- effective and rational use of pond areas to breed fish for sale, planting and pedigree materials.

II. MANAGEMENT OF FISH RESERVES OF WATER RESERVOIRS

Article 4. Management of Fish Farms

The Government of the Kyrgyz Republic shall supervise fish reserves in fish-farming reservoirs of government significance:

- the Issyk Kul, Son Kul, and Kara-Kul lakes;
- the Toktogul, Bazar-Korgon, Kirovsk, and Orto-Tokojsk water basins.

Other reservoirs may also be referred to reservoirs of government significance upon the decision of the Government of the Kyrgyz Republic.

The Government of the Kyrgyz Republic shall assign the main user of fish-farming reservoirs of government significance. In accordance with the programme approved by the Government of the Kyrgyz Republic, Kyrgyzbalygy Corporation shall carry out coordination of the activity on performing uniform fish-farming policy in the Kyrgyz Republic.

The Ministry of Environment Protection of the Kyrgyz Republic shall supervise only fish reserves of reservoirs of common use.

The owner of the reservoir held in private ownership shall dispose of fish reserves in this reservoir.

Article 5. Record of Fish Reserves

Fish reserves and fish bred in artificial reservoirs shall be subject to record, which is carried out separately on reservoirs and fish species according to the procedure established by the legislation.

Article 6. Settlement of Disputes

Disputes related to the use of fish reserves in reservoirs and their protection shall be settled under the court procedure according to the existing legislation of the Kyrgyz Republic.

III. ORGANIZATION OF FISHING AND FISH FARMING

Article 7. Transfer of Reservoirs and Their Areas for Use

The main user of reservoirs of the Kyrgyz Republic may transfer fully or in part reservoirs (fishing areas) for use for purposes of fishing or fish farming to other legal entities and individuals according to the procedure established by the existing legislation of the Kyrgyz Republic.

The procedure for fish farming shall be set forth in fish water biological norms approved by Kyrgyzbalygy Corporation of the Kyrgyz Republic upon coordination with the Ministry of Environment Protection of the Kyrgyz Republic and the National Academy of Science of the Kyrgyz Republic.

The main user of reservoirs shall assign reservoirs and their areas to legal entities and individuals for fish farming based on the scientific justification for their subsequent economic fish development, structure and organization of fish farms subject to measures on reproduction, fish farming, protection and extraction of fish.

A contractual user of reservoirs (areas) may transfer the use right to another person unless prohibited by the contract.

The main user of the reservoir shall carry out record, registration of fishing areas and issuance of permission for fish extraction in fish farming reservoirs.

In the event of systematic violation of fishing rules or the contract for the fishing right, the contract may be annulled according to the procedure established by law; and until the annulment of the contract, its effect may be suspended.

Article 8. Amateur and Sport Fishing

The procedure and conditions for amateur and sport fishing shall be established in the Regulations on Fishing Rules developed and approved by the Government of the Kyrgyz Republic.

The contractual user shall issue a permit for amateur and sport fishing, and in the event there is no such user, the permit shall be issued by the main user of the reservoir or its area.

Article 9. Priority Right of Use of Reservoirs

Special fish-farming entities engaged in extraction and fish husbandry shall have the priority right to receive a reservoir area for use to carry out fish-farming activity.

Article 10. Fishing for Scientific Purposes

The main user of a reservoir shall provide the reservoir for fishing for scientific purposes.

Article 11. Fishing in Reserve Zones of Reservoirs

Fish-farming entities that carry out marketable fishing shall have the right to extract fish in reserve zones of reservoirs upon coordination with the Ministry of Environment Protection of the Kyrgyz Republic.

Article 12. Erection of Industrial and Other Facilities Affecting the Condition and Reproduction of Fish Reserves

Erection of industrial and other facilities affecting the condition and reproduction of fish reserves shall be carried out upon coordination with the Ministry of Environment Protection of the Kyrgyz Republic.

Article 13. Use of Water in Artificial Reservoirs

In the event that a fish farm is run in an artificial reservoir that is constructed specifically for fish farming and that uses water potential for filling up, the relations with agencies fostering the protection of the government water fund shall be regulated by Articles 15, 31 and 41 of the Law of the Kyrgyz Republic on Water.

IV. PROTECTION OF FISH RESERVES AND ITS LIVING ENVIRONMENT**Article 14. Fish Protection Agencies**

Fish inspection agents of the main user shall carry out fish protection and control over performance of rules of fishing and fish farming in fish-farming reservoirs of government significance.

The Ministry of Environment Protection of the Kyrgyz Republic shall organize protection of fish reserves of reservoirs of common use.

Fish inspection agents shall carry out their activity in accordance with the Regulations on Fish Inspection developed and approved by the Government of the Kyrgyz Republic.

Article 15. Liability for Violation of Fishing Rules

Individuals and legal entities violating the fishing rules or fishing illegally shall be held liable in accordance with the legislation of the Kyrgyz Republic.

Illegally extracted fishing objects and products made thereof, and the instruments of illegal fishing, including floating means, shall be subject to confiscation according to the procedure established by the legislation of the Kyrgyz Republic.

V. RESTRICTION OF USE OF FISH RESERVES

Article 16. Establishment of Restrictions

In the event of a threat to the condition of fish reserves (mass fish death, disease, poisoning and pollution of water environment, etc.), the Ministry of Environment Protection of the Kyrgyz Republic or the main user of a reservoir shall have the right, as an exception, to impose restrictions on fishing for the specified period.

Article 17. Acclimatization of Specific Species of Fish

Acclimatization of specific species of fish in fish-farming reservoirs of the Kyrgyz Republic, the introduction of new species of fish into these reservoirs shall be allowed only where there is the scientific justification and approval of the governmental institution of the veterinary service.

VI. FUND FOR FISH-FARMING DEVELOPMENT

Article 18. Designation of the Fund for Fish-Farming Development

In order to organize the reproduction and protection of fish reserves, fish production in the Kyrgyz Republic, and to solicit additional financing for fish-farming research, targeted government and non-government funds for fish-farming development may be established.

Article 19. Formation of the Fund for Fish-Farming Development

The fund for fish-farming development shall be formed by utilizing:

- contributions from the Republican and local budgets to implement targeted fish-farming programmes;
- voluntary donations of individuals and legal entities for fish-farming development;
- other contributions not prohibited by the existing legislation of the Kyrgyz Republic.

Article 20. On Effectuation of This Law

This Law shall come into effect from the time of its official publication.

A. Akaev, President of the Kyrgyz Republic

Adopted by the Legislative Assembly of Jogorku Kenesh of the Kyrgyz Republic as of 13 June 1997

Annex 6

POVERTY LEVELS IN KYRGYZSTAN

TABLE A6.1
Poverty levels in Kyrgyzstan

	1999	2000	2001	2002	2003	2004	2005
				(%)			
Kyrgyzstan	–	62.5	56.4	54.8	49.9	45.9	43.1
Batken Oblast	–	68.9	54.5	62.5	84.9	77.8	59.1
Jalal–Abad Oblast	–	76.5	68.0	66.8	57.7	50.1	55.9
Issyk–kool Oblast	–	70.9	62.6	53.9	52.1	54.1	51.5
Naryn Oblast	–	90.9	89.1	84.6	72.1	66.3	51.2
Osh Oblast	–	70.7	66.7	63.9	56.4	57.0	55.9
Talas Oblast	–	80.8	72.3	65.5	55.4	51.3	44.4
Chui Oblast		34.6	33.1	32.0	27.7	21.7	22.0
Bishkek (city)		40.6	31.5	31.7	22.5	16.5	10.8

Part II

**Strategy for fisheries and aquaculture sector
development and management
in the Kyrgyz Republic
(2008–2012)**

Ministry of Agriculture, Water Resources and Processing Industry

Bishkek

January 2008

Chapter I

INTRODUCTION

This strategy for fisheries and aquaculture sector development and management in the Kyrgyz Republic (Kyrgyzstan) provides an outline for the development of the sector until and including 2012. The strategy was prepared by the Department of Fisheries (DOF) of the Ministry of Agriculture, Water Resources and Processing Industry (MAWRPI) of Kyrgyzstan and representatives of many fisheries and aquaculture sector stakeholder groups, with support from the European Commission (EC) and the Food and Agriculture Organization of the United Nations (FAO) under the Project EC/FAO Facility GCP/GLO/162/EC – Kyrgyzstan “Development of inland fisheries and aquaculture in the Kyrgyz Republic to reduce rural food insecurity”.

This strategy has been the subject of an intensive and complex policy development and planning process, which has included recognition of the need for policy development, adoption of a process approach, a review study of the sector, and consultations and discussions with all relevant fisheries and aquaculture sector stakeholders. The strategy should be considered a framework of policy guidance prepared by a core group of Kyrgyz fisheries and aquaculture experts, with inputs from national workshops held in Bishkek in June and September 2007 and on the shores of Lake Issyk Kul in November 2007. The draft strategy was distributed at various stages to all concerned with fisheries and aquaculture in Kyrgyzstan, and additional comments were received from a wide range of officials, experts and producers involved in the sector. These comments were taken into consideration, discussed and (where relevant) incorporated in the final draft strategy. After finalization, this was submitted by the DOF to the MAWRPI for approval. The strategy was approved by Minister A. Nogoyev on 25 February 2008, and the director of the DOF was instructed to lead the implementation of the strategy.

Chapter II

THE NEED FOR A STRATEGY

THE POLICY AND STRATEGY DEVELOPMENT PROCESS

Fisheries and aquaculture can contribute to the national economic development of Kyrgyzstan, and help to increase food security and alleviate poverty in rural areas of the country. Before independence, fisheries and aquaculture produced more than 1 300 tonnes of fish annually. However, since 1991, fish production has declined dramatically owing to: (i) the privatization of fishery activities, fish hatcheries and aquaculture farms; (ii) the withdrawal of Soviet investment; and (iii) the consequences of the transition of the country to a market economy.

The transition from a centrally planned economy to a market economy did not go as smoothly in fisheries and aquaculture as in some other sectors. Reasons for this include:

- the lack of experience and skills in essential disciplines needed for fisheries and aquaculture;
- the lack of fisheries education;
- limited access to credit;
- limited use of innovative techniques;
- the lack of an effective fish-health monitoring scheme.

As most of these issues are interrelated, it is important to address them in a coherent, comprehensive and structural manner.

The DOF of the MAWRPI has the mandate within the Government of the Kyrgyz Republic to organize, participate in and provide technical inputs to the development of national strategies on fisheries and to support the implementation of the sectoral development strategy. The DOF recognizes that, in the last decade, the fisheries and aquaculture sector has not received the attention it deserves from the state in order to enable the sector to develop sustainably.

The fisheries sector stakeholders in Kyrgyzstan, including private entrepreneurs and government institutions, also recognize that the above issues are detrimental to the sustainable development of the sector. Clear and comprehensive guidance is needed in order to: (i) develop the sector sustainably; (ii) enable Kyrgyz fishers and aquaculturists to develop their businesses profitably; and (iii) increase collaboration between government and private-sector entrepreneurs. Therefore, the DOF requested international assistance and started the process of formulating a strategy for the sustainable management and development of fisheries and aquaculture in Kyrgyzstan.

The DOF, like private entrepreneurs, needs to show that it is performing well, i.e. carries out the responsibilities assigned to it by the government in an efficient and timely manner. The achievements of the DOF and the impact of its work should be clear to society. In order for society to pronounce judgement on the MAWRPI, and the DOF in particular, measurable quantitative and qualitative targets that are timely, achievable, suitable and justified need to be set.

These targets or objectives are generally written into a policy document, where not only the rights and obligations of the ministry are detailed, but also those of the private sector and other stakeholders involved in fisheries, showing the synergy and coherence between them. Such a policy, where the government and the private sector collaborate, may be considered a kind of contract between the two.

A policy is a document, generally for the long-term, describing what should be achieved. It includes objectives and recommendations for the sustainable development of the sector. In the fisheries sector, a policy often provides an outline for development, including all subsectors (e.g. inland capture fisheries, aquaculture, fish processing, and fish trade and marketing). At present, Kyrgyzstan does not have a national fisheries policy. The only document developed by the DOF is the Draft Programme for Fishery Industry Development of the Kyrgyz Republic 2008–2012, which has been submitted for consideration and approval to the Government of the Kyrgyz Republic.

Within the process of policy development and planning, a policy document is generally prepared first, while a mid-term strategy and implementation programme for the strategy follow in subsequent steps. The goals, values and criteria generated in the policy document formulation earlier are reduced to more operational terms. For example, the goals are reduced to objectives – intermediate (with respect to goals as main objectives) or partial (with respect to goals as specific objectives). Objectives should be measurable, attainable, relevant and time-bound.

A strategy is an important part of the planning process, it lays out clearly the defined objectives and how the objectives are to be reached. A strategy is generally focused on the mid-term and includes a review and monitoring component. A strategy also identifies the appropriate resources – human, natural and financial – required and indicates how these may be combined and used to achieve the objectives.

THE STRATEGIC PLANNING PROCESS

This strategy for the sustainable management and development of fisheries and aquaculture in Kyrgyzstan was formulated in a participatory manner with key sectoral stakeholders, including the DOF of the MAWRPI, the State Agency for Environment Protection and Forestry, the Kyrgyz Hunting and Fishing Union (Kyrgyzzohotrybolovsoyuz – HFU), the Kyrgyz Aquaculture Association, the Ichthyology Laboratory of the National Academy of Science, and representatives of private fish farmers, fisherfolk, the retail sector and potential bilateral and international donor agencies. As such, the strategy includes the visions and aspirations of those involved in sectoral development. International technical assistance in the formulation of this strategy was provided by the EC and FAO.

The process started with a review study of fisheries and aquaculture in Kyrgyzstan, aimed at providing information and analysis to allow for the formulation of the strategy. While the review study did not cover the official government perspective, this strategy does include the viewpoints of the state and, therefore, represents the commitment by the MAWRPI to the development of the fisheries and aquaculture sector and to the pertinent objectives outlined in this strategy.

In the formulation process of the strategy, the existing national and international relevant laws and regulations were taken into account, specifically the following laws of Kyrgyzstan: Fishery (June 1997); Nature Preservation (June 1999); Specially Protected Areas (May 1994); Steady Development of Ecologic and Economic System of Lake Issyk Kul (August 2004); Fauna (June 1999); Veterinary Affairs (March 1992). The 1995 FAO Code of Conduct for Responsible Fisheries was also taken into consideration.

The planning process started in June 2007, with the organization of a national strengths, weaknesses, opportunities and threats (SWOT) analysis workshop. At around the same time, a review study of fisheries and aquaculture in Kyrgyzstan started. The review study was aimed at diagnosing the sector and providing a basis for policy development and sectoral planning. The SWOT analysis workshop was held at the premises of the DOF. It was very useful for the fisheries and aquaculture sector as it was able to bring together key stakeholders from the sector, including

representatives from both public and private sectors, to exchange views on the current status and issues of fisheries and aquaculture in the country. The SWOT analysis identified strengths, weaknesses, opportunities and threats for the fisheries and aquaculture sector in Kyrgyzstan, which was a good start for the formulation of the strategy.

The first workshop was followed by a second strategic planning workshop held in Bishkek on 13 September 2007, where 50 key experts discussed a first draft of the review study of fisheries and aquaculture to be used for the draft of the fisheries and aquaculture development and management strategy in Kyrgyzstan. Following on from this second workshop, a seminar on the formulation of a fisheries and aquaculture sector development and management strategy was held on 14–15 September. This seminar was attended by 57 key experts from the public and private sectors as well as civil society. The outcomes of the seminar, plus those of the SWOT analysis, were used to prepare key elements for the formulation of the strategy. These were discussed at the seminar. At the seminar, it was decided to combine the policy and strategy for fisheries and aquaculture sector development and management into one planning document. Following the seminar, a draft strategy was prepared and distributed in advance to the participants in a final workshop on the technical adoption of the strategy, held in Issyk Kul on 29–30 November 2007, with the participation of representatives from the government, fisheries and aquaculture producers, fishery scientists, and fisheries and aquaculture social organizations. The comments received before the final workshop and its outcomes were incorporated in the final version of the strategy.

THE PURPOSE OF THE STRATEGY

The strategy, as well as the strategic planning process itself, has three overriding purposes:

- Support and guide the long-term fisheries and aquaculture sector development process.
- Mobilize financial resources for sectoral development from government sources, international cooperation (donors), and private-sector investors.
- Capacity building and increasing the efficiency of involved state institutions for the development and management of the fisheries and aquaculture sector.

This planning document consists of various chapters. Chapter III provides a summary overview of fisheries and aquaculture in Kyrgyzstan, followed by the actual strategy for the sustainable management and development of fisheries and aquaculture in Kyrgyzstan. Chapters IV–XII address: the vision and principles for the fisheries and aquaculture sector; the time frame; monitoring and implementation mechanisms of the strategy; overall goals; main and specific objectives; and performance indicators for the development of the sector and monitoring of the strategy. Annexed to this strategy document is the Priority Fisheries and Aquaculture Action Plan, which details the priority areas for intervention for the period up until 2012.

Chapter III

SUMMARY OVERVIEW OF FISHERIES AND AQUACULTURE IN KYRGYZSTAN

Fisheries started to develop in Kyrgyzstan in the nineteenth century, mainly in the principal lakes and rivers of the country, and exclusively for local consumption. In the 1930s, when Kyrgyzstan was a Soviet Republic, the government started to take measures to develop industrial fisheries and aquaculture. The first steps were the organization of fishery and aquaculture cooperatives, the introduction of exotic species, and the stocking of Lake Issyk Kul, which produced more than 80 percent of the fish harvested at that period in the country. The Issyk Kul fish factory in Grigorievka, established in 1931, enabled increased fish production, up to some 1 000–1200 tonnes/year in the 1960s.

Although the Issyk Kul endemic species (ide, moroco, carp, Issyk Kul marinka, and naked osman) were abundant, it was decided in the 1930s to introduce Sevan trout (from Lake Sevan in Armenia), which had formed a local fish population by 1960. In the 1960s, a complex of trout hatchery and fish-processing facilities was built around Lake Issyk Kul, with the objective of producing trout eggs and fingerlings for restocking the lake, and for processing the fish caught there.

In the same period, work started on the artificial reproduction of whitefish species at the Ton hatchery located on the southern shore of Lake Issyk Kul. In the period 1966–1988, it produced more than 90 million fingerlings of eastern bream, pikeperch, silver carp, tench, syrok and Baikal omul, most of which were released into Lake Issyk Kul to support a sustainable fishery. However, the introduction of these species did not produce the expected results. Currently, it is thought that the introduction of predator fishes, e.g. trout and pikeperch, had a negative impact on the indigenous fish fauna of the lake. The average fish catch in the lake was about 1 000 tonnes/year in the period 1965–1976, falling to 300 tonnes/year in the period 1979–1984. At present, the catches from Lake Issyk Kul consist of carp, bream, tench, ide, moroco, Issyk Kul marinka and Issyk Kul trout. Since 2004, there has been a moratorium on fish catches at the lake. In 2008, in accordance with a presidential decree, a moratorium on catches for all species was introduced for 2 years.

The culture of carp and other species in ponds reached their highest production levels in the final decade before independence. The hatcheries, the rearing ponds and the processing facilities built in the aquaculture complex of Chuy, Uzgen, Talas and Ton were used fully in the 1980s and were highly profitable. In this period, total aquaculture production exceeded 1 000 tonnes/year.

The changes that occurred after independence in 1991 affected the fisheries sector. The sector stopped receiving financial support from government. About 90 percent of the state fish farms were privatized as part of the transition of the country to a market economy. Fishery production fell to 44 tonnes in 1999 and has continued at the same low level (official recorded production [capture and culture] was 71 tonnes in 2006).

The fish produced in the Issyk Kul and Son Kul lakes is sold mainly in Bishkek markets. Fish originating from other waterbodies, e.g. Toktogul, Bazar-Korgon, Kirov, Orto-Tokoy and Kara-Suu, is generally sold locally or in nearby towns and villages. There are no facilities for transporting frozen or chilled fish over long distances. Only the relatively large markets of Bishkek, Alamedin, Orto-Say and some other cities have special fish halls. They are equipped

with freezers and refrigerating boxes to freeze and cool fresh fish. At the markets, fresh fish is sold from counters. Specialized fish shops in Bishkek, such as “Antey” and “Ocean”, have special refrigeration counters, which allow the buyers to choose the fish products. Most fish, both national production and imports (mainly from neighbouring Kazakhstan), is sold as fresh fish. Small quantities of salted and dried fish and some smoked fish are brought to the Bishkek market from the Issyk Kul area. Most of the processed fish is processed and sold without sanitary controls being applied. The supply of fishery products (national production and imports) is far from sufficient to satisfy national demand for these products at present.

Kyrgyzstan has the necessary natural and climate conditions and water resources for fish culture, enabling it to develop profitable lake and pond culture practices. The country has a relatively long summer, a favourable temperature for cold-water fishes, suitable salinity levels of main waterbodies, appropriate concentration of hydrogen ions and other environmental conditions. There is also a good natural food base (phytoplankton and benthos) in many of the lakes and rivers, which will allow the country to increase fish exploitation in the lakes if the fisheries are managed properly. Important fisheries waters are the Issyk Kul, Son Kul and Kara-Suu lakes. There are several large reservoirs, e.g. Toktogul, Bazarkorgon, Ortotokoy and Kirov, and hundreds of hectares of ponds – and there is a scope to increase the pond culture area significantly.

In 2005, the combined hatcheries produced *inter alia* 26 million whitefish eggs and 6.6 million syrok eggs. Fishery reservoirs were stocked with 9.3 million small syrok, whitefish, carp and trout (about 3 million more than in previous years). Since 2004, there has been a moratorium on fish capture in the Issyk Kul and Son Kul lakes, which will remain in force until 2008. The only catches allowed in these lakes are aimed at obtaining broodstock for the restocking programme.

Interest in investing in aquaculture is growing again. Various companies, with support from foreign and national investors, have established trout production cage culture systems with an annual capacity of hundreds of tonnes at Lake Issyk Kul. Sale of cultured trout has begun, and more cage culture systems are being constructed. It is planned to produce about 1 000 tonnes of trout annually in the near future.

The legal basis for fisheries has been established. The Fishery Law (1997), Fauna Law (1999) and Nature Preservation Law (1999) were passed in the 1990s. The “Fishery and Biological Norms” and the rules for fish culture breeding in the reservoirs of Kyrgyzstan have been ratified. Furthermore, bills to amend and complement the Fishery Law, a programme for fishery development of Kyrgyzstan 2007–2010, and new regulations for the issuing of licences for fishing and fish culture are with the government for approval.

An institutional basis is available in support of the fisheries sector. The government has created the DOF of the MAWRPI as the main institution responsible for fisheries and aquaculture development and management. In 2005, the DOF was ratified within the new structure of the ministry, and the Scientific Fisheries Board to advise the DOF was established. The Scientific Fisheries Board includes among its membership representatives from the government, state organizations, the private sector, and scientists.

At present, fish consumption in Kyrgyzstan is less than 1 kg per capita per year, while specialized nutrition institutions recommend 12 kg per capita annually. Such consumption levels would require a supply of some 60 000 tonnes of fish a year to the Kyrgyz population.

The poaching of fish is common in most of the lakes and rivers of the country. Poachers vigorously catch trout in the mouths of rivers where the species concentrates before and during the spawning periods. Poaching is a major issue facing the DOF and other fisheries sector

stakeholders. Dealing with it requires new fisheries management approaches, improvements in fishing inspections, and greater financial support to the fisheries administration. The legal catch of fish by recreational fishers is also significant.

The state fisheries companies are suffering from an acute shortage of finances. As a result, the old equipment (from the Soviet period) has not been replaced, and the technical capacity of their staff has not been updated for many years. The companies lack means of transport, boats, boat engines and fish reproduction equipment. It is estimated that some 2.0 million (about US\$55 500) a year is required in order to reproduce and preserve fishery resources, to conduct fish stock assessments in state waterbodies, and to build capacity for fish breeding and fishery biology. Apart from the above entities, fish hatchery facilities under state responsibility are also short of finances. This means they are unable to buy modern fish hatchery equipment, aqua feeds and other essential inputs for aquaculture production. As a consequence, research into fish breeding is being undertaken at low levels.

The actions of the national government and regional authorities are not coordinated. There are contradictions and ambiguities in normative legal acts that are leading to the duplication of control functions by the DOF and the State Agency on Environment Protection and Forestry.

One factor that concerns the development of the fisheries sector in Kyrgyzstan is the repetition of mistakes committed in relation to the artificial change in the fauna of national waterbodies. In the last 50–70 years, serious changes have taken place in the fish biodiversity of Lake Issyk Kul. As a result of the introduction of new species, especially predatory whitefish and trout from Lake Sevan, as well as overfishing of indigenous species, the fish productivity of the lake has declined to 10 percent of what it was before.

In regard to opportunities for the development of the fisheries sector, some measures have recently been taken to attract investment in fisheries and aquaculture activities. In December 2005, the government passed a resolution exempting investors from paying value added tax (VAT) on imported fish-breeding equipment.

The possibilities for the construction of new pond culture facilities, and the rehabilitation of existing ones, are promising. The productivity of ponds is higher than that of lakes and reservoirs. Using intensive culture methods in the Chu Valley in the south of the country will make it possible to attain a production of 2 500–3 000 kg/ha. Such productivity figures will allow the country to produce in aquaculture more than 1 000 tonnes of valuable marketable fish – a production capacity comparable with the total estimated catch capacity of Lake Issyk Kul.

It is estimated that a total of 2 500 tonnes of marketable fish can be produced annually in the country by better use of the currently existing fish ponds, provided that biotechnical standards are increased and private investors are attracted. With appropriate investment support, it is also possible to create highly-profitable cage culture facilities near the cascade of reservoirs on the Naryn River, and to establish trout farms in the mountainous areas of many rivers, whose waters are rich in oxygen, clean and suitable for trout reproduction.

New fishery monitoring and surveillance methods make it possible to measure stocks and evaluate efforts more accurately than in the past. An improved system for collecting, processing and disseminating fishery statistics data and an improved scientific research programme would enable the potential biomass of species to be assessed and the total allowable catch in the main waterbodies to be established.

Population growth and the increase in tourism create new opportunities for fish production development. The population of the Issyk Kul region is estimated to rise in the near future to up to 600 000 people, and the number of tourists visiting the region is estimated to grow to 1.5 million people. These changes will require an annual supply of 7 000–13 000 tonnes of fish.

In order to satisfy this demand, either more fish will have to be imported or aquaculture production will need to increase considerably.

The review study further notes that capacity building and training programmes could be established relatively easily for fishery management and aquaculture specialists at the national universities, colleges and vocational schools. However, regional and international cooperation is required in order to make such capacity building and training programmes successful and sustainable.

Chapter IV

THE LONG-TERM VISION

The long-term vision for the fisheries and aquaculture sector in Kyrgyzstan is to develop a diverse, competitive, economically viable and environmentally sustainable fisheries and aquaculture sector, of which the people can be proud. The aim is to develop a sector that will: (i) deliver high-quality, healthy food to consumers at home and abroad, and social and economic benefits to communities (particularly alternative employment opportunities in rural and remote areas); (ii) use, wherever possible, scientific evidence to operate responsibly, working within the carrying capacity of the environment, both locally and nationally; and (iii) use a supply chain approach.

Chapter V

THE GUIDING PRINCIPLES

The strategy for fisheries and aquaculture development and management in Kyrgyzstan will be based on the following guiding principles:

- Fisheries and aquaculture are important for economic, social, development and public resource purposes. Collaboration among all stakeholders including governments, public institutions and existing private-sector aquaculture and fishing industries is important to achieving environmental sustainability, economic viability and growth.
- Fisheries and aquaculture development and management should be founded on the results of fishery and aquaculture research, scientific advice and expertise. They should also be fostered in partnership (between private entrepreneurs, government agencies, research and education, and others involved in the supply chain), guaranteeing stakeholder participation in planning, implementation and monitoring of this national strategy, as well as in the development and improvement of best practices and standards.
- The Fisheries and Aquaculture Policy Framework of Kyrgyzstan and related programmes and procedures will adhere to international and regional standards and be harmonized on as wide a basis as possible.
- The DOF encourages the fisheries and aquaculture sector to apply sustainable production measures. Such measures include, but are not limited to, the use of best management practices, strengthening of associations, establishment and use of community-based management schemes, health certification, specific pathogen-free and high health stocks, biosecurity, and vaccination protocols. The aquaculture sector in particular should work in harmony with nature and follow the precautionary approach in order to minimize possible negative environmental impacts and avoid irreversible changes to ecological systems.
- Fisheries and aquaculture management will be based on the principles set out in the FAO Code of Conduct for Responsible Fisheries. The management measures will be effective, practical, cost-effective and utilize readily available resources. These resources will allow the development of appropriate national and regional policies and regulatory frameworks as required, increasing investments and reducing the risks incorporated in the fishing, culture, reproduction and movement of aquatic animals.
- Access to relevant national fisheries and aquaculture capacity (infrastructure and specialized expertise as available in the associations active in the sector) is crucial for development and management of the sector. Collaboration with international organizations and foreign countries will be sought wherever possible to further increase the capacity of Kyrgyzstan to develop its fisheries and aquaculture in a sustainable manner.

Chapter VI

THE TIME FRAME

The long-term vision for the sector and the guiding principles above, together with the overall goals (as detailed in Chapter IX) should be regarded as the policy for sustainable fishery and aquaculture development and management of the MAWRPI. This strategy is based on the policy and is designed to guide the development and management of fisheries and aquaculture in Kyrgyzstan for the period 2008–2012.

Chapter VII

MONITORING MECHANISM

The strategy for fisheries and aquaculture management and development in Kyrgyzstan will be monitored by the DOF of the MAWRPI, with the participation and cooperation of other MAWRPI departments and divisions, the State Agency on Environment Protection and Forestry, the relevant local governments, and the fisheries and aquaculture stakeholders associations. Other institutions involved in national economic development and natural resources protection will also cooperate with the DOF in monitoring the strategy.

AS most of these institutions are represented in the Scientific Production Council of the DOF (the Scientific Fisheries Board), established in 2004 and confirmed with renewed mandate in 2007 as the higher national forum to discuss and take decisions on matters concerning fisheries and aquaculture development and management in Kyrgyzstan, the Scientific Fisheries Board will be the main responsible institution for monitoring, reviewing, regulating and coordinating the implementation of the strategy for the period 2008–2012. Hence, the Scientific Fisheries Board will be the main responsible collegiate, advisory and recommendatory institution for the monitoring of the strategy, with the DOF as its lead implementing agency.

The Scientific Fisheries Board will be informed by the DOF, through annual reports, on the implementation of the strategy. The DOF will also be responsible for obtaining essential information on environmental issues from the State Agency on Environment Protection and Forestry for inclusion in the annual reports. The annual reports will also include the progress made towards achieving the goals of the strategy. Progress measurement will be by use of the defined performance indicators (Chapter XII). These performance indicators will be reported and reviewed at annual meetings convened by the Scientific Fisheries Board to monitor progress in the implementation of the strategy. The annual review meetings may also adjust specific objectives for achieving the overall goals in the light of new, revised or additional information that may be collected. These adjustments have to be made through a participatory approach.

Chapter VIII

IMPLEMENTATION MECHANISM

The daily implementation of the strategy will be carried out by the DOF, as the lead implementing agency at national level for fisheries and aquaculture development and management in Kyrgyzstan. The DOF will submit to the Scientific Fisheries Board all important matters concerning the implementation of the strategy (e.g. progress achieved and difficulties faced in the modernization of the capture fishery area; rehabilitation of hatcheries; production of restocking material; newly established aquaculture farms; fishery resources protection; and capacity building in fisheries and aquaculture). In turn, the Scientific Fisheries Board will examine these matters and provide guidance to the DOF and other relevant members involved in executing the strategic activities on issues that require improvement for the successful implementation of the strategy. The DOF will prepare and submit to the Scientific Fisheries Board an annual report assessing progress in implementation. This progress report should be reviewed and endorsed by the Scientific Fisheries Board, indicating the changes and corrective measures that should be taken to ensure the successful implementation of the strategy.

The terms of reference of the DOF will be reviewed and its budget allocation will be improved in order to enable it to carry out its duties in an efficient and effective manner.

With respect to research, the Scientific Production Centre on aquaculture and fishery, with the cooperation of the National Academy of Science of Kyrgyzstan, will be supplied with a budget allocation sufficient to carry out basic research on fishery resources assessment, aquaculture development, and fish-processing and fish-marketing techniques. In order to assist the Scientific Production Centre in its tasks, the DOF will strengthen its capacity by appointing a senior fishery research specialist, assisted by at least three scientific researchers: one specialist in fishery resources; one specialist in aquaculture; and one specialist in fish processing and marketing.

With respect to fisheries statistics, the DOF, with the concurrence of fish restocking plants, fish catch enterprises, fish processors and fish vendors, the HFU and the aquaculture farmers – which are obliged to report on their activities – will gather, process and disseminate statistical data and information on fisheries and aquaculture, according to the performance indicators set forth in Chapter XII of the strategy. In order to carry out these tasks, the DOF will strengthen its capacity to collect process and disseminate fisheries and aquaculture statistical data by appointing a senior statistical specialist, assisted by a junior statistical specialist and a clerk.

Chapter IX

OVERALL GOALS

The overall long-term goals are what the policy aims to achieve and what the strategy will work towards in the mid-term. The strategy itself will not be able to achieve the overall long-term goals but it will contribute towards them. The overall goals for fisheries and aquaculture sector development and management in Kyrgyzstan are:

- Use the aquatic resources of Kyrgyzstan to contribute to the national economy, poverty alleviation and food security.
- Augment the contribution of fisheries and aquaculture in generating socio-economic benefits and improving the well-being of the rural population.
- Improve the economic viability of aquaculture farms through diversification of production in accordance with market demand.
- Increase the availability of high-quality fishery products for the domestic market, including increased production of low-price fish for popular consumption.

Chapter X

DEVELOPMENT OBJECTIVES

The development objectives provide the situation, condition and behaviour that need to be changed in order to contribute to the overall goals. The following development objectives for fisheries and aquaculture sector development and management in Kyrgyzstan are considered:

1. Review and update fishery legislation to introduce reforms enabling modern fishery and aquaculture management and development.
2. Ensure the protection and responsible management of fishery resources in Kyrgyzstan.
3. Ensure implementation and further development of the restocking programme.
4. Develop diversified and multipurpose fisheries and aquaculture enterprises.
5. Improve the market supply chain and processing of fishery products, and ensure the safety and quality of these products.

Chapter XI

SPECIFIC OBJECTIVES

The aim of the specific objectives is to support the achievement of the development objectives of the strategy, within the time frame of the strategy. The following specific objectives are designed to achieve each of the development objectives of the strategy for the development and management of fisheries and aquaculture in Kyrgyzstan.

DEVELOPMENT OBJECTIVE NO. 1. REVIEW AND UPDATE FISHERY LEGISLATION TO INTRODUCE REFORMS ENABLING MODERN FISHERY AND AQUACULTURE MANAGEMENT AND DEVELOPMENT

- 1.1 Review the fishery legislation and introduce changes to make it comply with agreements of CIS and international legislation including:
 - the CIS Agreement on Rational Management and Protection of Transboundary Waterbodies¹, the FAO Code of Conduct for Responsible Fisheries, the Ramsar Convention on Wetlands², the Convention on Biological Diversity³, and the Convention on the Protection of the World's Cultural and Natural Heritage⁴.
- 1.2. Review and introduce changes in fisheries-related legislation to avoid duplications of permissive control functions of different governmental institutions.
- 1.3. Introduce changes in fisheries-related legislation to avoid uncertainty over property or water rights in pond aquaculture.
- 1.4. Improve regulations for the protection of fishery resources and include these in the legislation: closed seasons, establishment of fish reserves, protection of spawning zones, and regulation of fishing gear.
- 1.5. Develop the regulations for the establishing, licensing and registration of aquaculture enterprises.⁵

DEVELOPMENT OBJECTIVE NO. 2. ENSURE THE PROTECTION AND RESPONSIBLE MANAGEMENT OF FISHERY RESOURCES IN KYRGYZSTAN

- 2.1. Establish an adequate national system for gathering, processing, analysing and disseminating fishery data, statistics and information.
- 2.2. Ensure the realization of scientific research as required for fisheries management and aquaculture development.

¹ Regional agreement between: Armenia; Azerbaijan; Belarus; Georgia; Kazakhstan; Kyrgyzstan; Moldova, Republic of; Russian Federation; Tajikistan; Turkmenistan; Ukraine; and Uzbekistan. The treaty covers all transboundary waterbodies that delimit, cross or are located within the boundaries of two or more parties.

² International agreement on the conservation and wise use of wetlands (details available at www.Ramsar.org).

³ International agreement on the conservation and sustainable use of biological diversity (details available at www.biodiv.org).

⁴ International agreement on the conservation of the world's cultural and natural heritage (details at <http://whc.unesco.org/>).

⁵ Information materials that clearly specify and explain all requirements and procedures necessary to obtain a licence must be worked out.

- 2.3 Prepare for and implement management measures that will prevent overfishing and will remove excess fishing capacity.
- 2.4 Promote education and training of government staff and the private sector in all subjects related to fisheries management, aquaculture development and fish processing and marketing.
- 2.5 Improve the coordination of fishery activities between different governmental agencies and between national and local governments, under the leadership of a strengthened DOF.
- 2.6 Unify the system of fishery inspection with the DOF as the leading institution for fishery inspection.
- 2.7 Combat illegal, unregulated and unreported fishing in the lakes, rivers and reservoirs of Kyrgyzstan.
- 2.8 Increase the capacity of fishery inspection by improving the means of transport and monitoring, control and surveillance (MCS) of fishing grounds.
- 2.9 Establish a coordinated monitoring system to record the violations of the fishery law and regulations and the quantity of illegal fishing gear and volumes of fish confiscated.
- 2.10 Increase regional and international cooperation on fisheries and aquaculture issues through membership of Kyrgyzstan in relevant regional and international fisheries bodies, such as the FAO Committee on Fisheries (COFI), and a yet-to-be-established regional fishery body (RFB), EUROFISH or INFOFISH in the field of marketing and trade of fishery products, and in the area of research and general advice on aquaculture through membership of a network of aquaculture centres.
- 2.11 Ensure that water is managed in a way that is compatible with conserving biodiversity and ensuring natural fish production.
- 2.12 Ensure that fisheries stakeholders are consulted when decisions relating to water management are taken.
- 2.13 Preserve fish biodiversity and enhance production by restoring and reconnecting key fish habitats and maintaining natural flow patterns.
- 2.14 Develop cooperative mechanisms for transboundary fisheries management of shared rivers and waterbodies with neighbouring countries, including also stakeholders for other key aquatic resource using sectors such as the irrigation sector, agriculture and tourism.

DEVELOPMENT OBJECTIVE NO. 3. ENSURE IMPLEMENTATION AND FURTHER DEVELOPMENT OF THE RESTOCKING PROGRAMME

- 3.1 Review and amend as necessary the current restocking programme with regard to its accomplishment, economic feasibility, species and financial resources, ensuring that restocking activities are based on scientific evidence.
- 3.2 Optimize the operations of state-owned hatcheries and research facilities according to the revised restocking programme.
- 3.3 Provide support to the private-sector stakeholders (hatcheries and transporters) involved in the restocking programme.
- 3.4 Improve the quality of stocking material (fry and fingerlings) to be produced by state-owned and private hatcheries, through improved selection and introduction of proper broodstock strains.

DEVELOPMENT OBJECTIVE NO. 4. DEVELOP DIVERSIFIED AND MULTIPURPOSE FISHERIES AND AQUACULTURE ENTERPRISES

- 4.1 Facilitate the establishment of aquaculture farms and enhance the production capacity of existing farms.

- 4.2. Collect data and information on the social and economic relevance of small-scale fisheries.
- 4.3. Allocate fishing rights to groups of private small-scale fish business units through comanagement arrangements, and through their representation in the Scientific Fisheries Board.
- 4.4. Facilitate the access of fishery and aquaculture sector entrepreneurs (including also those involved in marketing and processing) to credit, subsidies and relevant financial services in support of the sustainable development and management of the sector.
- 4.5. Introduce low-cost technologies for the production of aqua feeds at local levels, and increase the provision of technical and extension services to aquaculture development.
- 4.6. Increase diversification of species cultured to better address the market demands.
- 4.7. Ensure that aquaculture farms meet environmental standards and avoid pollution from their operations.
- 4.8. Develop and promote the application of best management practices and integrated technologies for aquaculture and fisheries.
- 4.9. Support the improvement of farm-level record-keeping of all operations, fish health and indicators of water quality.
- 4.10. Increase the participation of and collaboration between the private sector and the DOF in support of sustainable development of the sector by involving the representatives of their associations in decision-making processes and bodies at national and local levels, as well as in capacity building and training activities.
- 4.11. Assist the Kyrgyz Hunting and Fishing Union in its aims to improve the habitats for aquatic wildlife, to protect the rights of recreational fishers and to develop codes of good practice for recreational fishing.

DEVELOPMENT OBJECTIVE NO. 5. IMPROVE THE MARKET SUPPLY CHAIN AND PROCESSING OF FISHERY PRODUCTS, AND ENSURE THE SAFETY AND QUALITY OF THESE PRODUCTS

- 5.1. Promote the consumption of fishery and aquaculture products and emphasize the diverse range of fishery products and the health benefits associated with fish consumption to the domestic population.
- 5.2. Establish and promote the application of fish-processing technologies for fisheries and aquaculture products (to increase value addition) suitable for the small-scale entrepreneurs.
- 5.3. Develop and promote national monitoring, quality and safety standards that are in line with international practices.
- 5.4. Promote the supply of aquaculture products to guest houses, hotels, cafeterias and restaurants.
- 5.5. Promote collaboration in the fishery products market supply chain between producers, fish processors, wholesalers and retailers, aiming at developing and introducing innovative technologies, new products and markets, adding value to the aquaculture products, and assuring quality and safety standards.

Chapter XII

PERFORMANCE INDICATORS

The performance indicators are means to be used for measuring the extent to which the different components of the strategy are being achieved. They will measure progress towards each of the overall goals for fisheries and aquaculture management and development in Kyrgyzstan. The following performance indicators will be monitored and reported on annually:

- Legal and institutional indicators:
 - number of licences given for fisheries;
 - number of licensed and registered aquaculture establishments;
 - number of environmental investigations and assessments carried out and reported upon;
 - number of standards of water quality for aqua farms established;
 - number of regulations issued for protection of fishery resources.
- Responsible fisheries management indicators:
 - fish production, in tonnes, by type of production (capture fishery, pond aquaculture, cage aquaculture and recreational fishing);
 - number of statistical bulletins issued;
 - number of research projects carried out;
 - number of infractions of illegal, unregulated and unreported fishing;
 - amount of illegal fishing gear forfeited, its number by type of fishing gear;
 - quantity of illicit fish confiscated.
- Restocking programme performance indicators:
 - number of state-owned hatcheries in operation;
 - number of private hatcheries operating;
 - quantity of fingerlings (or fry) released, by species.
- Aquaculture and fisheries development indicators:
 - number of aquaculture farms operating (and licensed);
 - aquaculture production (in tonnes);
 - number of loans issued for fishery/aquaculture sector activities (by type);
 - total volume of the loans to the sector;
 - total volume of subsidies received by the sector;
 - quantity of aqua feed produced nationally;
 - the area of aquaculture ponds (hectares) and productivity (kilograms per hectare);
 - the number and volume or area of tanks, basins and cages for aquaculture and productivity (kilograms per square metre or per cubic metre);
 - use of water in aquaculture enterprises (total and per production unit);
 - nutrient loading (phosphorus and nitrogen) in waterbodies from aquaculture enterprises;
 - number of disease incidences in aquaculture.
- Market for fishery products, and socio-economic indicators:
 - fish and fishery products sold in the domestic market (in tonnes, by species and by product);
 - quantity of fishery product processed, by type of product;

- fish consumption (in kilograms per capita per year) at national level;
- fish imports and exports by volume (tonnes) and value (US dollars or som);
- number of persons employed in capture fisheries and aquaculture;
- number of persons receiving education/training in fisheries and aquaculture;
- number of projects in fisheries and aquaculture carried out by public funds.

These indicators will be assessed on a regular basis and revised when considered necessary for their effectiveness in monitoring and evaluation by the Scientific Fisheries Board and the DOF.

Annex A

PRIORITY FISHERIES AND AQUACULTURE ACTION PLAN

A. TIME FRAME

The Priority Fisheries and Aquaculture Action Plan (PFAAP) will guide the activities of the Department of Fisheries (DOF) and other sectoral stakeholders towards management and development of fisheries and aquaculture for the period 2008–2012.

The PFAAP contains the priority activities to be undertaken by the Ministry of Agriculture, Water Resources and Processing Industry (MAWRPI), the Scientific Fisheries Board and the DOF, private fisheries and aquaculture entrepreneurs, research and educational institutes, and international agencies (donors) involved in providing assistance to sustainable fisheries and aquaculture development and management in Kyrgyzstan.

B. MOBILIZATION OF FINANCIAL RESOURCES

The DOF will need additional funds in order to overcome the challenges involved with implementing the strategy. Although part of these funds must come out of the national budget, it is not realistic to expect that implementation of the strategy will be fully funded this way. Therefore, it is important that the MAWRPI identify alternative sources of revenue. For example, income could come from the sale of licences and services provided by the DOF. Fines collected for violations related to fisheries could be another source of earnings. However, most important is the establishment of public–private partnerships and international cooperation with partners inside and outside the Central Asian Region.

C. MONITORING AND REVIEW

Monitoring and review of the PFAAP will be carried out as stipulated in the Strategy for Sustainable Development and Management of Fisheries and Aquaculture in Kyrgyzstan.

D. PRIORITY OBJECTIVES FOR THE MINISTRY OF AGRICULTURE, WATER RESOURCES AND PROCESSING INDUSTRY

There are three priorities for the MAWRPI with regard to the fisheries and aquaculture sector that outrank all others. Without urgent decision-taking by the ministry on these priority issues, it will be impossible to manage and develop the fisheries and aquaculture sector in Kyrgyzstan. These three priority issues are:

- Confirmation that the DOF will continue to exist in its present structure and will be further strengthened with competent staff to deal with the requirements for fisheries and aquaculture development and management.
- Agreement on and approval of the Strategy for Sustainable Development and Management of Fisheries and Aquaculture in Kyrgyzstan by the ministry and other relevant governmental stakeholders.
- Existing and new (prospective) fisheries and aquaculture entrepreneurs will be assisted in accessing financial resources in a transparent, comprehensive and not unreasonably time-consuming manner.

E. METHODOLOGY OF IMPLEMENTATION

Within the drafting process of the strategy and the PFAAP, use was made of the logical framework approach, which had proved very useful in earlier planning exercises. While the strategy is focused on the medium term and, therefore, includes a medium-term vision, principles and overall and specific objectives, the PFAAP details the concrete and pertinent outputs that should contribute directly to the achieving of the specific objectives.

In order to enable the DOF and other sectoral stakeholders to make progress towards the achieving of the earlier identified specific objectives, the outputs that have the highest priority are listed in the following section. The intended outputs are formulated as projects to facilitate their implementation.

Once the strategy has been approved by the Scientific Fisheries Board and the MAWRPI, clear and comprehensive proposals will be drafted for the priority projects, and the required budget will be calculated in more detail.

The projects in the following section are considered the main priorities for the fisheries and aquaculture sector in Kyrgyzstan for the period up to and including 2012. They are presented in order of priority.

For each of the projects, the following information is listed:

- title of project;
- project aim;
- reference to main or specific objective of the strategy;
- main activities to be undertaken;
- ongoing activities in this field;
- prior activities required;
- inputs required in order to carry out activities;
- responsible agency;
- supporting agencies;
- timetable for project;
- indicators of achievement;
- means of verification of project achievement;
- assumptions (and/or risks);
- priority ranking;
- estimated budget;
- possible source of budget.

F. PROPOSED PROJECTS

Project 1

Title of project: Strengthening fisheries and aquaculture research and improvement of fisheries monitoring, control and surveillance (MCS)

Project aim: Create capacity to carry out research to support the development and management of fisheries and aquaculture and establish a monitoring, control and surveillance (MCS) system in fisheries, jointly with other relevant authorities.

Reference in strategy: Specific objectives: 1.1, 1.2, 1.4, 2.2, 2.3, 2.6, 2.7, 2.8, 2.9 and 4.3.

Main activities:

- a) Allocate funds to activate the Scientific Production Centre on aquaculture and fishery already established jointly by the DOF and the National Academy of Science.

- b) Appoint: one senior fishery research specialist; one research specialist on fishery resources; one research specialist on aquaculture; and one research specialist on fish processing and marketing.
- c) Set up a laboratory with appropriate equipment for fishery, aquaculture and fish-processing research.
- d) Prepare and disseminate reports on fishery and aquaculture research.
- e) Create physical infrastructure.
- f) Review legislation and regulations.
- g) Design a fisheries MCS system.
- h) Appoint staff for implementation of MCS at the DOF.
- i) Acquire land transport and surveillance boats to carry out inspections at the main fishery waterbodies.
- j) Coordinate MCS activities with relevant institutions.
- k) Test the MCS system in Lake Issyk Kul.
- l) Implement the MCS system in other fishery waterbodies.

Ongoing activities: None.

Prior activities required: Institutional changes implemented to avoid duplicate functions.

Inputs required: Laboratory equipment; vehicles and boats; modern equipment.

Responsible agency: DOF.

Supporting agencies: National Academy of Science; Scientific Fishery Centre of the State Agency on Environment Protection and Forestry.

Timetable: 2008–2012.

Indicators:

- a) Staff appointed.
- b) Number of research projects carried out.
- c) Number of reports written and disseminated.
- d) Number of infractions of illegal, unregulated and unreported fishing.
- e) Number and type of illegal fishing gear forfeited.
- f) Quantity of illicit fish confiscated.

Means of verification:

- a) Contracts.
- b) Annual report submitted by the Fisheries Research Centre.
- c) Logbooks.
- d) Number of protocols.
- e) Fines levied.

Assumptions:

- a) Qualified staff available.
- b) There is a demand for fish.
- c) It will be possible to make the necessary changes to the legislation.
- d) Institutional changes will be implemented.

Priority ranking: 1st.

Estimated budget: To be determined.

Source of budget: Donors, state budget.

Project 2***Title of project: Rehabilitation of demonstration fishery facilities***

Project aim: Support the development of fishery and aquaculture through the establishment and rehabilitation of demonstration and training facilities.

Reference in strategy: Specific objectives: 2.4, 3.1, 3.2 and 3.4.

Main activities:

- a) Rehabilitate two pilot demonstration facilities at existing state-owned and private hatcheries for the production of restocking material (including reconstructing ponds, re-establishing water supply, repairing incubation and nursery sections).
- b) Develop a practical training programme for the production of restocking material.
- c) Assist interested entrepreneurs with training, fish reproduction, fish grow-out, pond management, fish health, economic analysis, and business planning.

Ongoing activities: Some activities are already being implemented and the facilities are partly functioning. Staff are already in place.

Prior activities required: None.

Responsible agency: DOF and private fish hatcheries.

Supporting agencies: Ministry of Finance and local state administrations.

Inputs required: Equipment.

Timetable: 15 months (Ton hatchery); 12 months (Karakol hatchery).

Indicators:

- a) Fish production at demonstration plants.
- b) Number of entrepreneurs trained.
- c) Number of fingerlings (or fry) released, by species.

Means of verification:

- a) Annual reports submitted by demonstration facilities.
- b) Training reports.

Assumptions:

- a) Rehabilitation of existing plants is feasible.
- b) Private entrepreneurs are interested in receiving training.

Priority ranking: 2nd.

Estimated budget: US\$100 000 per facility.

Source of budget: State budget; donor organizations.

Project 3***Title of project: Fish feed production***

Project aim: Establish domestic production of high-quality fish feed at reasonable prices.

Reference in strategy: Specific objective 4.5.

Main activities:

- a) Assess the demand for fish feed.
- b) Establish a laboratory to test quality of feed.
- c) Train staff.

Ongoing activities:

Prior activities required:

- a) Establish an agreement with a feed production plant (Tokmak).
- b) Restore the ichthyopathological service.

Responsible agency: Private investors and fish farmers.

Supporting agencies: DOF and the MAWRPI.

Inputs required: Equipment for fish feed production.

Timetable: 2008–09.

Indicators: Volume of feed produced.

Means of verification: Statistics on fish feed production.

Assumptions:

- a) There is a demand for locally produced feed.
- b) Pesticide-free raw materials available.
- c) Appropriate plant available.
- d) Feed specialists available.

Priority ranking: 3rd.

Estimated budget: US\$500 000.

Source of budget: Donors and private investors (domestic and international animal-feed companies).

Project 4

Title of project: Strengthening the capacity for fisheries and aquaculture statistics

Project aim: Improve the capacity of the DOF to gather, process and disseminate fishery and aquaculture data and information.

Reference in strategy: Specific objective 2.1.

Main activities:

- a) Appoint: one senior statistic specialist; one junior statistic specialist; one clerk; and field statistics personnel (enumerators or the fishery inspector).
- b) Create capacity for a database on fishery and aquaculture (an office with computer and communication equipment).
- c) Train the statistical personnel in their duties.
- d) Prepare and issue periodic bulletins on fisheries statistics.

Ongoing activities: None.

Prior activities required: None.

Responsible agency: DOF.

Supporting agencies: State Statistical Agency.

Inputs required: Office space, computer and communications equipment.

Timetable: 2008–2012.

Indicators:

- a) New staff appointed.
- b) Staff trained.
- c) Number of statistical bulletins issued.

Means of verification:

- a) Contracts.
- b) Training reports.
- c) Availability of bulletins.

Assumptions: Qualified staff available.

Priority ranking: 4th.

Estimated budget: US\$200 000.

Source of budget: Donor organizations and state budget.

Project 5***Title of project: Development of fish marketing in Kyrgyzstan***

Project aim: Identify and document opportunities for improvement and investment needs in fish marketing, and improve the marketing situation for fish products.

Reference in strategy: Specific objectives: 5.3 and 5.5.

Main activities:

- a) Analyse the current marketing system (structure, conduct and performance).
- b) Analyse the fish supply chain and the opportunities for improving this chain.
- c) Identify shortfalls in regard to international market requirements.
- d) Analyse the investment and policy needs for further improvement of fish marketing.
- e) Establish network of shops.
- f) Improve transportation facilities.
- g) Improve fish storage.
- h) Formulate an investment project proposal for fish marketing.
- i) Become a member of the Globefish fish marketing network.

Ongoing activities: None.

Responsible agency: DOF.

Prior activities required: Establishment of a marketing unit under the DOF.

Supporting agencies: MAWRPI; Investment Department.

Inputs required: Consultant to produce analyses.

Timetable: 5 years.

Indicators:

- a) Analyses performed and reported.
- b) Data on the activities of all fish farms available, by species.
- c) Data analysed.

Means of verification: Availability of reports.

Assumptions: None.

Priority ranking: 5th.

Estimated budget: US\$5 million – depending on the extent of infrastructure improvements; without infrastructure improvements, the estimated budget would be about US\$500 000.

Source of budget: Donor organizations and private-sector investors.

Project 6***Title of project: Increase the fisheries sector's access to financial services.***

Project aim: Provide fisherfolk, fish processors, fish wholesalers and retailers, and aquaculture entrepreneurs with access to credit and insurance.

Reference in strategy: Specific objectives: 4.2 and 4.4.

Main activities:

- a) Carry out a financial services needs assessment in the fisheries and aquaculture sector.
- b) Investigate the constraints on accessing credit and investment, and identify opportunities to increase access to credit, investment and insurance.
- c) Discuss with microfinance institutions and non-governmental organizations (NGOs) the possibilities for fisheries sector stakeholders to access microfinance schemes.
- d) Train fisheries sector stakeholders in financial analysis and business planning for accessing credit and other financial services schemes.
- e) Encourage financial institutions to provide credit and other financial services to the fisheries sector.

Ongoing activities: None.

Responsible agency: Private sector; Ministry of Finance.

Prior activities required: None.

Supporting agencies: DOF, national and international banks, and microfinance institutions.

Inputs required: Training and financial infrastructure, including good financial laws and regulations.

Timetable: 2008–2012.

Indicators:

- a) Needs assessed and constraints identified.
- b) Number of loans and insurance policies issued for fishery/aquaculture sector activities (by type).

Means of verification:

- a) Report on needs and constraints available.
- b) Annual statement from NGO/bank.

Assumptions:

- a) NGOs and financial institutions prepared to cooperate.
- b) Banks and insurers willing to assume some risks and to enter new businesses.

Priority ranking: 6th.

Estimated budget: US\$50 000.

Source of budget: Donor to provide funds to cover research and promote the findings among financial institutions.

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