

EXECUTIVE SUMMARY

The inland capture fisheries and aquaculture sectors in the Republic of Kazakhstan have gone through a dramatic decline in production, which lasted until 2001 for capture fisheries and continues up till today for aquaculture production. While in 1989 some 89 000 tonnes of fish were produced within the Kazakh Soviet Socialist Republic (SSR), the production in 2007 was around 43 000 tonnes. The upward trend in capture fisheries production is remarkable, as in 2001 production amounted to just 21 000 tonnes. Aquaculture production is almost insignificant, with production accounting for less than 400 tonnes of marketable fish in 2007. By comparison, at global level, aquaculture accounts for nearly 50 percent of food fish production.

The Caspian Sea is a major source of fishery productions to the Kazakh people. Other main sources are a number of lakes (e.g. Balkash, Alakol, Tengiz) and reservoirs (e.g. Bukhtarma, Shardara, Bogen). The North Aral Sea has restarted to be a source of fisheries products in recent years. The main fisheries areas can be divided into basins: Ural-Caspian basin, Aral-Syr-Darya basin, Balkash-Alakol basin and Irtysh-Zaisan basin. Fish fauna is diverse, but was more diverse in the past. There are a number of species endangered, for example, various sturgeon species in the Ural-Caspian basin. Apart from commercial capture fisheries in reservoirs and lakes, recreational fisheries (particularly in the Lake Balkash region) is also important. The registered catches from recreational fisheries were higher than the official aquaculture production figures in 2006 and 2007.

The aquaculture sector was hit hardest by the collapse of the Soviet Union; virtually all its support infrastructure and facilitating services have disappeared in the last 15 years. While aquaculture production reached nearly 10 000 tonnes in 1994 (thus after independence), in recent years production has dropped to less than 1 000 tonnes. High-quality fish feeds, fingerlings, hatchery, culture equipment, and chemicals and drugs required in fish culture activities are not, or are barely produced, in Kazakhstan, and most of them have to be imported.

Illegal, unreported and unregistered (IUU) fishing continues to be a major problem in the fisheries sector in Kazakhstan; as a result, maybe only less than one-third of fish production is reported.

In recent years, the contribution of the fisheries sector (including capture and culture) to GDP has been less than 0.8 percent. Imports of fishery products in 2006 were some 44 000 tonnes, while exports added up to 32 000 tonnes. There are five large processing enterprises that are European Union (EU) certified for exporting fish to Europe. The large majority of fish processing facilities in the country are however not certified by Hazard Analysis and Critical Control Points (HACCP) or the International Organization for Standardization (ISO) at present.

The apparent per capita fish supply was 16.7 kg (live weight equivalent) at global level in 2006. In comparison, the current per capita consumption of fish of some 3 kg in Kazakhstan shows that fish and fishery products are only small contributors to the diet of the Kazakh people. The tradition of eating fish at least once a week, as was the practice under Soviet rule, does not exist anymore in Kazakhstan. In rural areas fish is generally consumed as a fresh product, as frozen and canned products are less available there. In urban areas many kinds of fish are available at the market; however, prices in urban areas are slightly higher than those in most rural areas, mostly because many urban centres (including the capital Astana) are located rather far away from the main reservoirs and lakes.

The employment provided by the sector may be over 17 000 jobs, but various state agencies and sector experts use different employment figures. In any case, the contribution of fisheries to employment is limited in Kazakhstan.

In recent years, the Ministry of Agriculture of Kazakhstan, with support from its Fisheries Committee, has made many improvements to the legal framework for the fisheries sector. It is however recognized that there are still many gaps in the policy and legal framework for the sector and that enforcement of rules and regulations needs more attention. The country still lacks a proper long-term fishery and aquaculture sector policy and a strategy which is carried out by all key stakeholders in the sector.

State programmes have been developed, but because of limited funding and limited involvement by the private sector these programmes have not reversed the downward trend in aquaculture production. Kazakhstan is however party to a number of international conventions and agreements that relate to fisheries resources, wetlands and the Caspian Sea environment. Implementation of these conventions and agreements is key to the sustainable development of the sector, something which is well-recognized by Kazakhstan's Ministry of Agriculture.

Fishery management plans, like those commonly used by other nations, do not exist as such in Kazakhstan. Although the country is lagging behind in terms of design and application of modern fishery management approaches, some fishery management tools such as total allowable catch (TAC) and quotas are applied in fishery management.

On paper, the human resources available at the Fisheries Committee, Kazakh Fisheries Scientific Research Institute, universities, fisheries organizations and fishery-sector related institutions cover all aspects that are needed for proper capture fisheries management and sustainable aquaculture development. But there is a limited inflow of young and competent experts in the sector at present; and as most experts were educated under the Soviet regime they have hardly received updates of their knowledge since.

International collaboration (e.g. through the United Nations Development Programme [UNDP], FAO and the World Bank) with the Kazakh fisheries sector has increased in recent years, particularly on sturgeon issues and at regional level. The staff of the Fisheries Committee and the Kazakh Fisheries Scientific Research Institute have participated in many international and regional events and workshops. International collaboration has increased awareness and built capacity on a range of issues, although it should be noted that only a few staff of both institutions have benefited from the participation in international events.

Small- and medium-scale enterprises in the fisheries and aquaculture sectors in Kazakhstan generally do not have access to credit or microfinance services. Insurance of aquaculture production processes is not possible at present.

The sectoral diagnosis that was prepared by key fisheries and aquaculture sector stakeholders in 2008 shows that with a sector-wide approach, which is carried out by all key stakeholders, the sector would be able to grow considerably, making better use of the available conditions and reaping the opportunities offered.

This FAO Fisheries and Aquaculture Circular aims to increase general understanding and awareness of the current status of the fisheries and aquaculture sectors in Kazakhstan. It provides, where data were available, a historical overview of the sector. The diagnosis may give entry points for public and private support to the sector, as well as provoke some guidance to international agencies in their assistance to the sector. The document presented in this Fisheries and Aquaculture Circular was cleared for publication by the Fisheries Committee of Kazakhstan in February 2009.

Chapter 1

INTRODUCTION

The capture fisheries and aquaculture sectors produced some 110 million tonnes of fish for human consumption in 2006. The accompanying apparent per capita supply of 16.7 kg (live weight equivalent) was the highest on record. Aquaculture accounted for 47 percent of the total fish supply worldwide in 2006 (FAO, 2009).

In contrast, per capita availability of fish in Kazakhstan was just around 3 kg in 2006 and the aquaculture share of total production was less than 1 percent. Inland capture fisheries and aquaculture sectors in Kazakhstan have been going through a dramatic decline in production, which started after independence in 1991 and lasted until 2001 for capture fisheries and continues until today for aquaculture production. Reasons for the decline are numerous and include, among others, poor water management, reduced state funding, fragmentation of authority over the sector, limited access to fish feeds, unsuitable pond systems, limited policy guidance, and incomplete and obsolete legal frameworks for the sector (Thorpe and van Anrooy, 2009).

Recognizing the availability of water resources for capture fisheries, capture-based fisheries and aquaculture, the Ministry of Agriculture of Kazakhstan has been trying to mediate the above situation by lifting constraints to sectoral development and providing guidance on management and development aspects. The limited contact between Kazakhstan and the western world in terms of fisheries in the first decade after independence however is still being felt. For many years, few experts were trained in fisheries or aquaculture subjects, and developments in other parts of the world (particularly in the field of aquaculture) were not followed suit in Kazakhstan. As employment opportunities decreased, experts who worked in the sector left. Reduced production by the sector meant less state attention, and financial support to the sector nearly dried up towards the end of the 1990s. In addition, the reduced attention to collection of data and information (statistics) on the sector made it difficult for policy-makers to identify the problems and opportunities and design and implement proper management systems for the sector. The increased contact between Kazakh fisheries experts and those of other countries around the Caspian Sea and the rest of the world has started a process of catching up on production and management aspects. There is however still a long way to go before the Kazakh fisheries sector can be regarded as sustainable and can apply modern standards and practices that are common in other parts of the world.

It should be noted that Kazakhstan is not an exception in terms of fisheries sector decline in Central Asia. All Central Asian republics have seen similar (or even worse) declines in the last 15 years, and all are only slowly recovering from the crisis the sector was in for years (Thorpe and van Anrooy, 2009).

The Food and Agriculture Organization of the United Nations started to develop strategic partnerships in the Central Asian region towards joint to sustainable development and management of the capture fisheries and aquaculture sectors in 2007. This report on the fisheries sector in Kazakhstan was a first step in the ongoing process towards increasing the understanding of policy-makers on fisheries and aquaculture issues. The information presented can be regarded as a kind of baseline information on the current situation of fisheries and aquaculture in the country. The historical information provided will allow stakeholders in Kazakhstan and abroad to identify and support actions needed to rehabilitate the fisheries sector (in particular, the aquaculture sector) and bring it up to international standards.

STRUCTURE OF THIS REPORT

This report contains eight chapters. Chapter I briefly introduces the fisheries sector in Kazakhstan. Chapter II provides historical background on the situation of the fisheries sector up to the first years of this millennium. Chapter III offers an overview of the current status and the potential of the current natural resources for fisheries sector development in Kazakhstan, describing the status of inland capture fisheries and aquaculture. Chapter IV focuses on the situation regarding fish-storage facilities, processing, distribution, marketing and fish consumption. Chapter V describes the fishery administration in the country, with particular attention to training, research and extension, fishery statistics, associations of fishery enterprises and international relations of the fisheries sector. Chapter VI provides an overview of fisheries policy, legal and regulatory frameworks, and management issues. Chapter VII discusses the social and economic aspects of the fisheries sector and credit and investment issues. Chapter VIII concludes with a diagnosis of the current situation using a strengths, weaknesses, opportunities and threats (SWOT) analysis.

Chapter 2 HISTORICAL BACKGROUND

Fisheries and aquaculture up to independence

The larger part of the Caspian and Aral seas was in the territory of the former Kazakh Soviet Socialist Republic (SSR), as were 48 000 lakes (3 041 of which had a surface area greater than one square kilometre) and more than 8 500 permanently or seasonally flowing rivers, among the more important the Syr-Darya, Ural, Irtysh (or Ertis) and Ili. Also located within the national territory were 475 reservoirs, the most prominent being the Bukhtarma, Kapchagay and Shardara reservoirs.

Capture fisheries

Although the water basins within the national boundaries were first developed for fishery purposes at the end of the nineteenth and the beginning of the twentieth century, there is little literature or data on catch for the period. The 1920s saw a sharp intensification of fishing, most notably on the Aral Sea – later, during the Second World War, Aral fishers delivered 50 000 tonnes of fish to the Red Army. Aral landings remained prominent during the 1950s, with the state fishing enterprise Aralrybprom alone processing more than 20 000 tonnes of sturgeon, pikeperch, carp, bream and roach annually.

Agriculture however increasingly took precedence in the Kazakh SSR and almost three-quarters of its national water resources were directed to irrigate over 3.3 million hectares (ha) of land, including 1.1 million in the deltaic region of the Aral Sea. Such excessive water abstraction saw the desiccation and salinization of the Aral Sea, reaching its apogee in 1987 when, having lost 70 percent of its surface area and its water level dropping by 23 metres, the sea split into two. With the main sea port of Aralsk now stranded more than 100 kilometres (km) away from an increasingly saline and toxic sea (due to runoff of lindane, DDT and other agricultural pesticides), fishing effectively ceased in 1983. Though Lake Balkash was less affected, reducing in size by 2 610 km² and water levels dropping two metres between 1970 and 1989, its fish landings also declined markedly (Petr and Mitrofanov, 1998; Thorpe and van Anrooy, 2009). Sturgeon, the country's highest value fish, equally suffered as landings from the Caspian Sea dropped from 26 600 tonnes in 1980 (Kazakhstan's share being 8 100 tonnes) to just 182 tonnes (including scientific quota) in 2006.

Consequently, the dynamics of catch between 1965 and 1990 was, on the whole, characterized by a decrease in the total catch volumes not only in the Aral Syr-Darya and Balkash-Alakol basins, but also in the Ural-Caspian basin and the national reservoirs of the Kazakh SSR as well (see Table 1).

TABLE 1
Total catch in water basins of the Kazakh SSR (1965 and 1990)

Year	Total		Of which			
			Ural-Caspian basin		Inland reservoirs	
	Catch (000 tonnes)	%	Catch (000 tonnes)	%	Catch (000 tonnes)	%
1965	111.9	100	62.7	56.0	49.2	44.0
1990	80.9	100	43.8	54.1	37.1	45.9

Source: Fisheries Committee, Ministry of Agriculture.

The decline in catch was reflected in a rundown in fisheries related industries. The shipbuilding yards in both the cities of Aralsk and Uralsk were closed down, and by the mid-1980s there were 910 registered vessels. These registered vessels were supported by 28 PTS (fish accepting and transporting vessels) of 150 hp and 80 smaller PTS; 5 PTR (fish accepting and transporting vessels equipped with refrigeration capacity); 24 land-based refrigeration facilities with 16 500 tonnes freezing capacity and 7 200 tonnes storing capacity; 19 fish and fishery products smoking establishments; and canneries with a production

capacity of 16 million cans annually. Most of these items were underused, if at all, within the sector.

Fisheries management

The Ministry of Fishing Industry under the former Union of the Soviet Socialist Republics (USSR) approved the “Rules for Fishing in the Water Basins of the Republic of Kazakhstan” (Document No. 225, of 24 June 1969). The rules set down the rights and responsibilities of the fishing industry bodies and the regulations on assigning water basins, as well as the rules for amateur and sport fishing. All citizens were granted the right to fish without a license in any of the water basins – with the exception of commercial fishing areas (fish cages, and areas with gillnets and traps), natural reserves, fish farms and other fish rearing stations. Regions where fishing rules applied, and places, time, terms, devices and means of fishing were determined. Fishing limits were stipulated for each species in each water basin, as well as the permitted mesh sizes for fishing gear. These regulations were enhanced by the Ruling of the Council of Ministers of the Kazakh SSR (Document No. 240 of 7 April 1970) with “Measures for Strengthening Protection of Fish Resources in Water Basins of the Kazakh SSR”. This provided improved protection of water basins, promised to combat poaching and the violation of fishing rules, and set tasks and delineated responsibilities for regional councils, ministries and other administrative bodies. Penalties were introduced for illegal fishing and the capture of endangered species of fish in the Kazakh SSR (Collection of Normative Documents on Protection of Fish Resources in the Kazakh SSR, Almaty, 1971).

The Ministry of Fishing Industry was set up in 1966. It included the following under its jurisdiction:

- Fishing and fish processing facilities
 - Fishing ports and landing sites
 - Fish processing plants
- Aquaculture facilities, including ponds, lakes, nurseries, basins, fish farms, hatcheries and fish rearing stations
- Kazakhrybakkolkhozoyuz – the Union of Fishing Collective Farms
- The Kazakh Scientific Institute for Fishing
- Kazgidrorybproekt – The Institute for Designing Fisheries Facilities
- The Republican Laboratory of Ichtiopathological Control
- The Republican Laboratory of Hydrochemical and Hydrobiological Control
- Planning Bureau

Annex 1 provides a list of fisheries bodies under the Ministry of Fishing Industry of the Kazakh SSR.

In 1988, by Decree of the Presidium of the Supreme Council of the Kazakh SSR, the Ministry of Fishing Industry and all its attendant functions became part of Gosagroprom (State Committee for Agricultural Industry) of the Kazakh SSR.

Aquaculture

Although there were a few aquaculture pilot activities carried out before, aquaculture production started increasing only in the 1970s. Aquaculture production grew swiftly and by 1990 there were 47 enterprises working across 50 reservoirs and 12 pond farms (a total territory of 5 041 ha – out of which 3 313 ha were feeding ponds and 728 ha for growing young fish); the sector employed 1 200 people. Of these 47 enterprises, 17 were either operational or ponds under construction, 16 were commercial lake fisheries and 14 were nursery pond enterprises. Output increased correspondingly, from 692 tonnes to 9 883 tonnes (i.e. 14.2 times) over the period 1970–1990, with yields reaching 1 500–1 800 kilograms per hectare. The main species cultivated were carp (white, silver and grass), rainbow trout, so called cisco species (*Coregonus sp.*, including whitefish, vendance and peled). Annex 2 provides historical trends and background information on pond aquaculture production.

Independent fish processing and trade organizations

Kazakhrybpromsbyt, the Kazakh production, marketing and trading enterprise, was created under

Decree No. 547 of 15 December 1976 (information from Kazakhrybpromsbyt No. 3–205, 26.07.07), and established fish processing and trade centers in all (the then) 19 oblasts of the country, with main branches located in the towns of Balkash, Rudniy, Ekibastuz and Tekeli. At its peak Kazakhrybpromsbyt's total refrigeration capacity reached 713 751 tonnes. The domestic supply and sale of fish and fish products was undertaken by the Ministry of Food Manufacturing Industry of the Kazakh SSR, in conjunction with Kazpotrebooyuz (Kazakh Union of Consumer Associations) and the trading branch of the Ministry of Defense. Trading centres (*okean*) in nine cities and towns sold freshly frozen, frozen, smoked, cured, canned fish and fish products, including *presservs* (preserved fish with short-term storage). As some fish were sold live, the bigger shops were equipped with specially built pools to maintain them.

The annual flow of fish and fish products into the trading network (average for the period 1980–1990) was estimated to include 108 000 tonnes of assorted fish, 12 000 tonnes of herring and 94 million tins of fish.

FISHERIES AND AQUACULTURE 1991–2009

Institutional setting for fisheries

Two years after independence, Gosagroprom was abolished, and on 26 February 1992 Decree No. 159 created the Fisheries Committee as a distinct entity within the Ministry of Agriculture. After three years, the Fisheries Committee merged with the forestry and hunting sectors under the Ministry of Natural Resources and Environment Protection. In the period 2002–2003, responsibility for fisheries was transferred back to the Ministry of Agriculture. The current Fisheries Committee, with its mandates and responsibilities, exists since June 2003. Table 2 presents background information on the Fisheries Committee.

TABLE 2

Fisheries Committee of the Ministry of Agriculture

Date	Name of organization	Juridical background
26 February 1992	Fisheries Committee was created as an entity of the Ministry of Agriculture	The resolution of the Cabinet of Ministers of the Republic of Kazakhstan, No. 159 of 26 February 1992
2 May 1994	“Balyk” State Joint-Stock Company was established on the basis of all enterprises and companies related to the Fisheries Committee	The resolution of the Cabinet of Ministers of the Republic of Kazakhstan, No. 472 of 2 May 1994
14 February 1995	Fisheries Committee under the Ministry of Agriculture of the Republic of Kazakhstan became part of the Committee on Forestry, Fishery and Hunting	The resolution of the Cabinet of Ministers of the Republic of Kazakhstan, No. 157 of 14 February 1995. The Ministry of Natural Resources and Environment Protection
15 November 2002	The fishing industry was removed from the Committee on Forestry, Fishery and Hunting and placed under the jurisdiction of the Ministry of Agriculture	Decree of the Government of Kazakhstan No. 1216 of 15 November 2002
4 March 2003	The Fishery Department was established	Order of the Ministry of Agriculture of 4 March 2003
18 June 2003	Fisheries Committee was re-established under the Ministry of Agriculture of the Republic of Kazakhstan	Decree of the Government of Kazakhstan No. 714 of 18 June 2003
6 April 2005	The Fisheries Committee created the interregional basin and district territorial departments	The Decree of the Government of Republic of Kazakhstan No. 310 titled “Pending issues concerning the Ministry of Agriculture of the Republic of Kazakhstan” of 6 April 2005

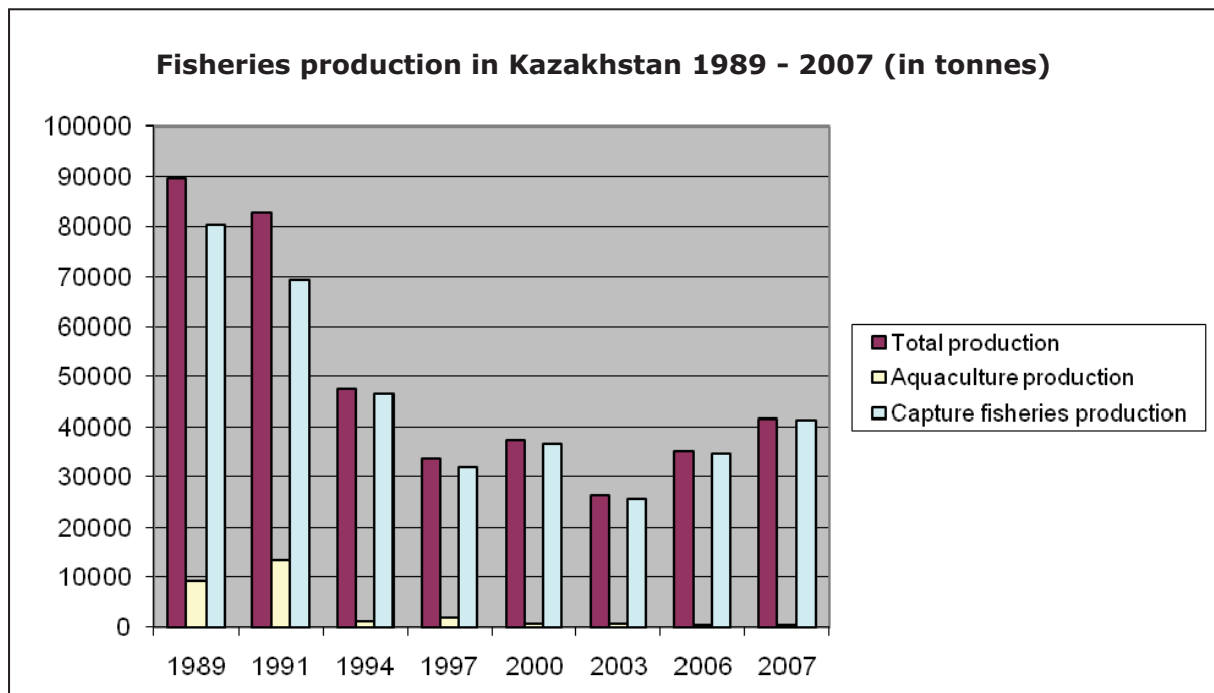
Aquaculture and fisheries production

Capture fisheries

The World Bank (2004) noted that the immediate post-independence harvest of 82 690 tonnes was worth over 280.5 million rubles (around US\$14.4 million) and generated profits of around 79.3 million rubles (US\$3.8 million), making the sector one of the most profitable and developed in the country. However, a combination of reduced funding (subsidy removal and the termination of fisheries extension services), an uncoordinated approach to water management in the newly independent republics (which saw the Syr-Darya's water – and fish – released into depressions without an outflow; increased water pollution; large-scale environmental and hydrologic changes from the construction of dams and reservoirs; and a lack of replacement equipment, particularly in aquaculture) – allied to a surge in under or no reporting of catches – saw a steady decline in the level of catches.

Capture fisheries production in Kazakhstan is however on the rise again, as shown in Figure 1 below, which uses information from the FAO FishStat Plus 2009 dataset.

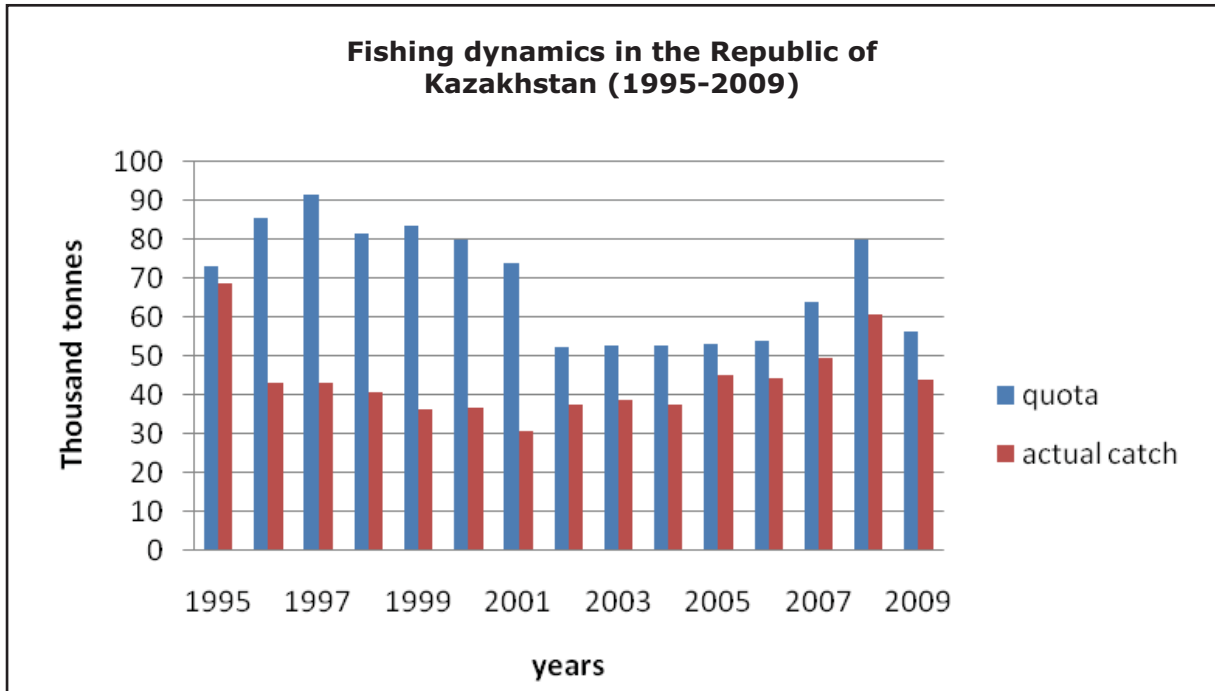
FIGURE 1
Fisheries production in Kazakhstan 1989–2007 (in tonnes)



While fish production declined until 2001, the increase in the capture of freshwater bream, pikeperch and crucian carp could indicate an upward trend. In 2001, capture fisheries production was at just 23 000 tonnes, climbed to 36 000 tonnes in 2005, and then decreased slightly in 2006 to 34 000 tonnes. Figure 1 shows that capture fisheries production in 2007 was estimated at just over 41 000 tonnes. The flounder catch rate in the North Aral Sea, which will become visible in the statistics of 2008, will add to this increase. Unfortunately, aquaculture production continued to decline over the 1989–2007 period. Common carp production decreased from 800 tonnes in 2005 to 80 tonnes in 2006, and a reduction also was noted in silver carp production in both 2006 and 2007. Silver carp production accounted for 262 tonnes in 2007, down from 424 tonnes in 2006. Overall, aquaculture production in Kazakhstan was estimated at 386 tonnes in 2007, which is less than 1 percent of the total fisheries production by the country in the same year.

Figure 2 below presents the dynamics in total quota availability and actual catch in the period from 1990 to 2009. It shows that officially recorded catches were significantly lower than the quota given to the fishers.

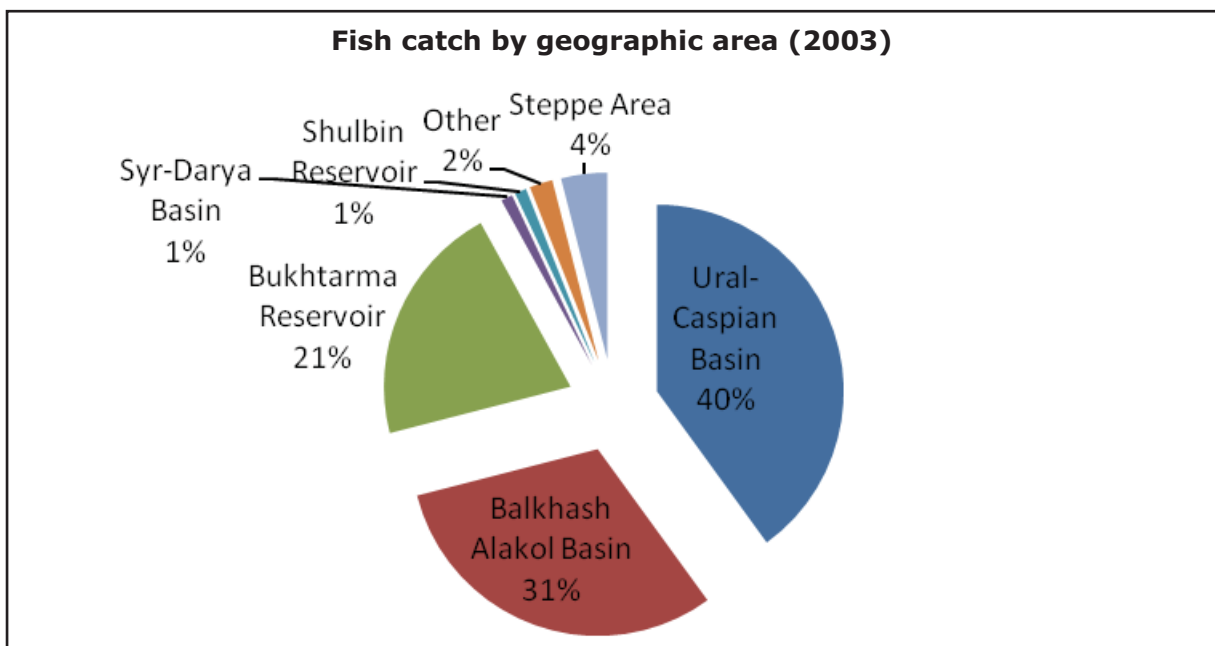
FIGURE 2
Fishing dynamics in the Republic of Kazakhstan



Source: Fisheries Committee of Kazakhstan.

To arrest this trend, the Government of Kazakhstan recently made the decision to reorganize – and hence privatize – the capture, processing and distribution of fish and fish products within the country. Access to fish resources, defined by access to quotas based upon calculated TAC, were “auctioned” off to interested bidders. Geographically, the bulk of the catch was now coming from three basins: Ural-Caspian, Balkhash-Alakol and Zaysan-Irtysh (which includes the Bukhtarma reservoir) (Figure 3).

FIGURE 3
Fish catch by geographic area (2003)



Source: World Bank, 2004.

The main provider – the Ural-Caspian Interregional Basin Department (comprising Atyrau, Mangistau and Western-Kazakhstan oblasts) – has always been the major supplier of fish and fish products in Kazakhstan, with a total production share ranging from 45.1 to 61.3 percent. The main stocks of sturgeon are also concentrated in this basin.

The Balkash-Alakol Interregional Basin Department (oblasts of Almaty, and parts of Zhambyl, Karaganda and Eastern-Kazakhstan) has historically provided an output of 12 000–17 000 tonnes per year, although this has declined over time, while the Zaysan-Irtysh Interregional Basin Department (Eastern-Kazakhstan and Pavlodar oblasts) has recorded catches in the region of 11 000–12 000 tonnes per year.

While the Aral-Syr-Darya Interregional Basin Department (Kyzylorda and Southern-Kazakhstan oblasts) was posting landings of 15 000–20 000 tonnes from 1940 to 1965, the abstraction of water from the Aral Sea and its increasing salinization saw catches dwindle to near zero by the 1990s. Recent efforts to restore water levels in the North (Small) Aral Sea are beginning to pay off, however, though it is unlikely that historic catch levels will ever be replicated. Catch levels elsewhere are low.

Aquaculture

Aquaculture activities were most profoundly affected by the dissolution of the Soviet Union. While during the Soviet era governmental support had seen output grow from 672 to 9 883 tonnes, the withdrawal of subsidies and extension services and the inability to source feed, and other essential inputs, saw most hatcheries and fish farms halt production within three to four years after independence. The Aktyubselmash plant (100 tonnes capacity) in Aktyubinsk city, for example, produced fry and fingerlings for the growing of commercially valuable fish; however, production ceased after 1990. Even attempts to cultivate sturgeon via the construction of two hatcheries (capacity of 6 million fingerlings) in 1998 met with limited success in the first decade of independence.

Annex 4 presents the main reasons for the decline in fisheries production in Kazakhstan after independence from the Soviet Union in 1991.

Aquaculture activities still remain depressed – in 2006 only 190 tonnes of fish were produced. The major impediments to a resurrection of the sector appear to be: (i) funding – no more than 8–10 percent of the funding designated for the sector is directed to financing fish farming and the development of new technologies; and (ii) the absence of an appropriate regulatory framework which incentivizes such activities.

Chapter 3

THE CURRENT STATUS OF CAPTURE FISHERIES AND AQUACULTURE

Natural resources and potential of the fisheries sector

Geography and climate

Kazakhstan, the ninth largest country and the largest landlocked country in the world, is located in Central Asia. Bordered to the north and west by Russia (6 846 km), the south by the Kyrgyz Republic (1 051 km), with Uzbekistan (2 203 km) and Turkmenistan (379 km) lying to the west, and the Xinjiang Uygur Autonomous Region in the People's Republic of China (1 533 km) to the east, Kazakhstan's 2 717 300 km² makes it more than double the total size of the other four Central Asian republics. Part of its international borders traverse major regional waterbodies: the Caspian Sea (1 894 km – fishing rights are shared with the Republic of Azerbaijan, the Islamic Republic of Iran, the Russian Federation and Turkmenistan) and the Aral Sea (1 070 km – shared with the Republic of Uzbekistan).

The sheer size of the country ensures considerable topographical variation. The highest peaks in the country lie in the Tien Shan mountains along the Kyrgyzstan border (including the highest point – Mount Khan-Tengri at 7 010 metres above sea level) and the Altay mountains further north, which stretch across Kazakhstan, the Russian Federation and China. Glacial runoff from these ranges provides the major water source for most of Kazakhstan's rivers. In sharp contrast, the Karagiye Depression lying east of the Caspian Sea, in Mangistau, the country's poorest oblast, is 132 metres below sea level. Most of the country's elevation varies between 200 and 300 metres above sea level.

The climate is generally characterized as continental, but exhibits sharp seasonal variations –summer temperatures can reach as much as 53 °C, while in the winter period temperatures as low as -58 °C have been recorded in parts of the Tien Shan mountain range. While these high summer temperatures contribute to high rates of glacial melt – and are causing concern about the likelihood of growing water scarcity across the country as global mean temperatures continue to rise – they also contribute to high rates of evaporation, with many smaller lakes and glacial streams drying up in the high summer. As a consequence, much of the national territory is either classified as desert (44 percent) or semi-desert (33.2 percent), with the Kyzylkum (298 000 km² – the eleventh largest desert in the world, and stretching into the Republic of Uzbekistan and Turkmenistan) and Moyunqum deserts in the west and central-southern regions being key topographic features.

Desertification was exacerbated by Khrushchev's Virgin Lands Program in the 1950s and 1960s, which introduced large-scale wheat farming into the north and central steppes of Kazakhstan. With limited water availability (despite the implementation of an extensive irrigation programme), ploughing simply triggered wind erosion and much topsoil was simply blown away. In the Semey region in the north-east, Soviet testing of nuclear weapons (456 tests, 116 above ground) until 1990 at Kurchatov on the Irtysh River has resulted in high levels of radioactive contamination locally, and instances of radiation poisoning, birth defects, severe anaemia and leukaemia are common in the vicinity.

The latest census, of March 2009, placed the population of the country at 16.4 million people, with the urban population (54 percent) outnumbering the rural. Ethnic Kazakhs dominate (67 percent) with Russians (21 percent) a sizeable minority, and a number of smaller ethnic groupings. Three of the fourteen oblasts (Almaty, Karanganda and Southern-Kazakhstan) have populations that surpass a million people, while the poorer oblasts of Mangistau and Atyrau which border the Aral Sea have populations of less than 400 000.

Rivers

The arid and semi-arid nature of much of the country accounts for its relatively low number of rivers, despite its immense size. The country has an estimated 8 500 rivers of note (neighbouring Kyrgyzstan, with a surface area barely one-thirteenth of Kazakhstan, has almost 30 000). Seven of these, the Ural, Emba, Syr Darya, Irtysh (or Ertis), Ischim (or Esil), Tobyl (or Tobol) and Ili, are over 1 000 km in length, a further 155 rivers are over 100 km long, and around 6 000 extend for over 10 km. With the exception of the Irtysh, Ischim, Tobyl rivers, the remainder of the country's rivers form part of landlocked river systems. River flow changes considerably during the year, with flows being greater in the early summer period. The rivers are currently of limited importance for commercial fisheries, although a number are important for recreational fishing (including the Ural, Irtysh, Shelek, Tekes, Syr-Darya, Ili and Kigach). Table 3 lists the major rivers in Kazakhstan.

TABLE 3
Water resources of Kazakhstan

Major rivers	Average annual discharge (km ³)		Available water resources under different levels of supply (%)		Current use of water (km ³)
	Total	From neighboring countries	75	95	
Total in Kazakhstan, of which	110.9	43.9	32.6	26	36.6
Syr-Darya	17.9	14.2	9.8	9.3	12
Ili	17.8	11.1	4.3	3.4	5.2
Karatal, Lepsy, Ayaguz, etc.	10	0.3	2.7	2	3.6
Irtysh	33.8	7.8	10.8	8.4	5.4
Ischim (Ishym)	2.3	-	0.4	0.1	1
Nura	0.8	-	0.2	-	1.1
Sarysu	0.4	-	0.1	-	0.4
Tobol	0.6	-	0.1	-	0.5
Torga	1.4	-	0.2	-	0.5
Shu	282.4	-	2	1.6	2.7
Talas-Assa	1.4	0.7	1	0.7	1.4
Ural	9.5	6.5	0.6	0.3	2
Emba, Sagiz	0.8	-	0.2	-	0.2

Source: Ismukhanov and Mukhamedzhanov, (2003).

Lakes

There are an estimated 48 000 lakes in Kazakhstan, although a number of them dry up in the hot summer period. The most important lakes are Lake Balkhash, Lake Alakol and Lake Tengiz.

Lake Balkash, a 605 km long, 9–19 km wide lake, with a drainage basin of 501 000 km², lies to the east of Almaty, the former capital of Kazakhstan. It holds 112 km³ of water and covers a surface area of 17 000 km², though this is shrinking due to the diversion of water flow in its river tributaries; its depth varies between 5.8 and 25.6 metres. The lake is fed by seven rivers, the main source being the Ili, and has variable salinity levels – the shallower west is more fresh, the slightly deeper east is more saline, with levels ranging from 3 to 6 ppt (parts per thousand).

Alakol, or (more properly) the Alakol lake system, consists of four large lakes (Sasykkol, Koshkarol, Alakol and Zhalanashkol) and a number of smaller basinal lakes located on the Balkhash-Alakol plain on the border of Almaty and Southern-Kazakhstan oblasts. Lake Alakol encompasses 2 696 km² (including islands), has a drainage basin of 65 200 km², and holds 58.6 km³ of water. It is somewhat rectangular in shape – 104 km long and 52 km wide (covering 2 650 km²) with an average depth of 22 metres (maximum depth is 54 metres), and is fed by 15 to 20 rivers. Lake Sasykkol is rather smaller, 50 km long and 15 km (on average) wide, varies in size from 600 to 736 km² (when in full flood), and is very shallow – with an average depth of 3.3 metres and a maximum depth of 4.7 metres. It is fed by the Ili, which provides around 80 percent of its water flow, and a number of smaller rivers. Smaller still is the brackish Lake Koshkarkol. Covering 120 km² and with a depth of up to 5.8 metres, it becomes one with lakes Sasykkol and Alakol during the flood season. Lake Zhalanashkol is the most isolated of the Alakol lakes. Located on the Kazakh-Chinese border, it was the source of a brief Russo-Chinese ownership conflict in 1969.

Lake Tengiz, best known for the unplanned landing of the Soyuz 23 spacecraft in 1976, covers an area of 1 382 km² in the north-central part of the country. With an average depth of 2.5 metres and a deepest point of 6.7 metres, the lake is on the Ramsar List of Wetlands of International Importance – providing a habitat for 295 bird species, 22 of which are on the “endangered” list of the International Union for Conservation of Nature (IUCN) Red Book.

Remainder of the Soviet era Aral Sea fishing fleet (left). Ice fishing on the Northern Aral Sea in the winter season (right)



Pictures courtesy of Mr. A Thorpe and Mr. S. Timirkhanov

Seas

Kazakhstan also has (shared) territorial rights of the region's two seas, although these have suffered contrasting fortunes. The Aral Sea, which housed a vibrant freshwater fishery in the first half of the twentieth century, was the principal victim of the Soviet decision to assign the Steppes of Central Asia the task of ensuring cotton self-sufficiency for the Soviet bloc. As cotton fields proliferated, the demand for water grew and the diversion of water had a profound effect upon the Aral Sea. By 1982, the sea's two sole tributaries, the Amu-Darya and the Syr-Darya (which had emptied 55 km² of water into the sea in the 1960s), failed to reach the sea at all. Water levels dropped 23 metres, the sea shrank 70 percent in area and split into two, and Aralsk, the sea's main fishing port, now found itself stranded 100 km from the increasingly saline North (Small) Aral Sea. Local endeavours to raise water levels in the North Aral Sea – by blocking runoff into the larger (but dead) South Aral Sea by blocking water outflow through the Bering Strait – were subsequently supplemented by the construction of the World Bank-funded 13 km Kok-Aral dyke in 2001. Water levels have since risen 3 metres, causing the North Aral Sea to expand in area by around 500 km², and bringing the waters back to within 25 km of Aralsk (Thorpe and van Anrooy, 2009).

In contrast, the water level of the Caspian Sea – currently around 28 metres below sea level – has been rising steadily since 1978 and, in Atyrau oblast on the northern tip of the sea, more than 10 000 km² of land have been inundated. If Caspian waters continue to rise at the current rate, then there is a high probability that 89 population centres, including Atyrau, Kazakhstan's main Caspian port and home to over 150 000 people and much of Kazakhstan's Caspian oil fields, could be under water within a decade. Currently the sea, which is the largest inland body of water in the world, has a surface area of around 371 000 km² and holds 78 200 km³ of water, with a maximum depth of 1 205 metres. It has variable levels of salinity, ranging from 0.05 ppt near the estuary of the Volga River to 11–13 grammes per litre (= ppt) in the south-east. An endorheic basinal sea, accounting for 40–44 percent of global lacustrine waters, it is fed by 130 rivers. However, just four rivers (the Volga and Terek from the Russian Federation, and the Ural and the Emba from Kazakhstan) supply between 88–90 percent of the annual discharge into the sea.

The northern part of the sea is very shallow, with an average depth of 5–6 metres (less than 1 percent of the total water volume), and much of the coast is too shallow to permit any meaningful fishing. The Middle Caspian has a depth of around 190 metres (33 percent of water volume), while depths reach 1 000+ metres in the south (66 percent of water volume) – although is relatively underfished owing to the lack of appropriate vessels in the Caspian fleet. This depth also explains why the south of the sea only infrequently freezes during winter, while the north is generally caked with ice in winter.

Reservoirs

Kazakhstan has 475 reservoirs and more than 96 000 km of irrigation canals. The major reservoirs are in the south, where there are 75 reservoirs in total, with a combined capacity of 95.5 km³ and a surface area of over 10 000 km² (see Table 4). The great majority of large reservoirs are multipurpose, providing hydropower and irrigation facilities, but they are also important sources of fish catch.

The Bukhtarma reservoir on the river of the same name (a tributary of the Irtysh) is, at 5 490 km², the fifth largest reservoir by area in the world. Constructed in 1960, it flooded and enlarged Lake Zaysan, and contains around 53 km³ of water and extends over 500 km in length (maximum width 35 km), with an average depth of 9.6 metres. The reservoir not only provides hydropower for Eastern-Kazakhstan oblast, but has also helped improve navigation along the Irtysh (to Omsk) by stabilizing water flow. As seasonal drawdown is negligible, its relatively stable level has contributed to the successful spawning of fish.

Shardara reservoir, the second largest in the country, was constructed for irrigation and hydropower production in 1965 on the Syr-Darya River. Like most irrigation reservoirs in southern Kazakhstan, Shardara is filled in the autumn–winter period (October to March) and drawdown takes place in spring

and summer (April–September), with water levels fluctuating by up to 11 metres as a consequence. Full, the reservoir covers 90 km², but spring and summer drawdown can reduce the surface area to 28.7 km², with a similar reduction in volume.

TABLE 4
Major reservoirs in Kazakhstan

Reservoir	Volume in million m ³		Surface area (ha)	
	At full	At minimum	At full	At minimum
	supply	supply	supply	supply
Bukhtarma	49 620	30 810	549 000	306 000
Shardara	5 200	4 200	90 000	28 700
Kapshagay	28 140	6 640	84 700	51 000
Bogun	370	368	68 500	4 900
Ters-Aschibulak	58	58	24 000	2 000
Badam	61.5	59	4 800	470
Samar	260	215	7 500	2 200
Topar	274	233	4 100	3 600
Kengir	319	309	3 740	1 000
Zhezdin	76	73.6	1 760	240
Vyacheslav	410.9	377.6	6 090	980
Sergeev (on the Ishim River)	693	635	11 680	1 920
Seletin	230	200.1	3 630	210
Upper Tobol	816	782	8 740	600
Karatomar	586	562	9 400	675
Kirov (on the Kushum River)	63	60	3 910	290
Dungulyuk	57.4	48	3 150	600
Bitik	106.7	100	5 300	1 430
Karagalinsk	280	262	2 750	500
Charsk	80	75	1 150	1 100
Taschitkul	620	551	7 760	1 670
Storage lakes of the Irtysh-Karaganda canal	273	210	15 600	11 500
Shulbin	263	162	27 500	12 500

Source: Ismukhanov and Mukhamedzhanov (2003).

Bogun reservoir, constructed on the river of the same name in Southern-Kazakhstan oblast, is the second largest reservoir in southern Kazakhstan. The dam is 5 km long and 17 metres high and, while the maximum depth ascends to 15 metres, average depth (when full) is 5.8 metres (1.4 metres when waters are fully drawn down). When full, the reservoir is 13.5 km long and 5.7 km wide, but during the three summer months the reservoir loses 75–80 percent of its accumulated winter water, with its surface area shrinking to be 15–20 of that when full. According to Ismukhanov and Mukhamedzhanov (2003), the

reservoir is a classical example of the contradiction that exists between the needs of irrigated agriculture and fisheries – “irrigation requires drawing water in spring when an increase in water level is in the interest of fishery as fish start to spawn.”

Decree 1137 (3 November 2004) divides these waterbodies into two types based on importance of fisheries sector production (see Table 5 below).

TABLE 5
Fishery waterbodies of importance in Kazakhstan

Fishery waterbodies of national and international importance	Fishery waters (sections) of local importance
<ol style="list-style-type: none"> 1. Aral Sea 2. Lake Zaysan, Bukhtarma and Shulba reservoirs and Irtysh River 3. Caspian Sea 4. Kigach River 5. Syr-Darya River 6. Ural River 7. Ili River and Kapshagay reservoir 8. Ishym River 9. Shardara reservoir 10. Alakol system of lakes 11. Lake Balkash 12. K. Satpayev Canal 	All other waterbodies (sections) included in the lists approved by local district administrations

Catch data are generally reported on a basin basis, with four principal basins (see Table 6) and complemented by the Steppes region of north and central Kazakhstan (around 7 000 lakes are found in this region, the largest about 15 km long).

TABLE 6
Main fishing areas in Kazakhstan

Basin	Waterbody	Administrative district (region)	Species
Ural-Caspian basin	Caspian Sea	Atyrau	Sturgeons, roach, pikeperch, caspian shad, kilka, carp species, bream, etc.
		Mangistau	
	Ural River	Atyrau	
	Kigach River	Atyrau	
	Local water ponds	West Kazakhstan district	Carp species, perch
Aral-Syrdarya basin	North (Small) Aral Sea	Kyzylorda	Flounder, bream, asp, pikeperch, aral roach, rudd
	Shardara reservoir	South Kazakhstan	Crucian carp, asp, common carp, pikeperch, roach, catfish
	Syr-Darya River (lake systems of the delta)	Kyzylorda	Dace, rudd, white eye bream, roach, river perch, pike, ide, ziege
	Local water ponds	South Kazakhstan	Dace, rudd, white eye bream, roach, river perch, pike, ide, ziege
Balkash-Alakol basin	Kapshagay reservoir	Almaty	Bream, pikeperch, asp, catfish, roach, common carp, silver carp, crucian carp

Basin	Waterbody	Administrative district (region)	Species
	Lake Balkash	Karaganda, Almaty, Zhambyl	Bream, pikeperch, asp, roach, catfish, common carp, crucian carp, Volga pikeperch, grass carp
	Ili River delta	Almaty	Bream, pikeperch, asp, roach, catfish, common carp, crucian carp, Volga pikeperch, grass carp
	Lake Sasykkol	Almaty, West Kazakhstan	Bream, pikeperch, Balkhash pikeperch, crucian carp
	Lake Koshkarkol	Almaty	
	Lake Alakol	Almaty, West Kazakhstan	
	Local water ponds	Almaty	
Irtysch-Zaysan basin	Bukhtarma reservoir	West Kazakhstan	Bream, pikeperch, roach, river perch, pike, ide, vendace, common carp, crucian carp
	Shulba reservoir	West Kazakhstan	Roach, river perch, bream, crucian carp, pike, pikeperch
	Irtysch River	West Kazakhstan, Pavlodar	Bream, roach, river perch, pikeperch, pike, ide, crucian carp, burbot
	Local water ponds	West Kazakhstan, Pavlodar	Bream, roach, river perch, pike, crucian carp, pikeperch, tench, dace

Fish fauna

The Caspian Sea was, historically, a major source of the global sturgeon catch, but overfishing in recent years has threatened sturgeon stocks to such an extent that severe controls over landings have been introduced so as to support stock recovery. Six sturgeon species inhabit the Caspian Sea basin: Beluga (*Huso huso*), Starry sturgeon (*Acipenser stellatus*), Russian sturgeon (*A. gueldenstaedtii*), Sterlet (*A. ruthenus*), Persian sturgeon (*A. persicus*) and Fringebarbel sturgeon (*A. nudiventris*). Practically all the Caspian sturgeons ascend the Ural River for spawning, with three of them, the Beluga, Russian and Starry sturgeon having high commercial value. A ban on commercial fishing of Fringebarbel sturgeon in the Ural River was imposed in 2002 because there was a very low abundance of these Caspian sturgeon species. There is an exception for catch for restocking and research purposes (Kim, 2009).

While Caspian Sea sprats dominate the catch, there are several other species and subspecies endemic to the waters of the Caspian, including the Caspian inconnu, Caspian roach, Caspian bream, and a Caspian “salmon” (a subspecies of trout, *Salmo trutta caspiuss*, which is critically endangered). The sea is also home to the Caspian seal, *Phoca caspica*, one of the few inland freshwater seal species.

The Aral Sea was much less fortunate. A combination of increasing salinity (Petr *et al.*, 2004, suggest levels reached as much as 34–37 g/litre in 1992) and toxicity of its waters – due to pesticide runoff from the cotton fields – had wiped out all the sea’s endemic species by the 1980s. A Soviet saltwater fish restocking scheme paid limited dividends, with only flounder acclimatizing to its new saline climate. While flounder catches currently underpin local fishing activity, the recent rise in water levels (as local irrigation systems are scaled back/made more efficient and releasing more of the Syr-Darya’s waters into the sea) has started to reverse salinity levels and brought pikeperch, snakehead and carp back into the sea, albeit, it seems, at the likely expense of flounder (Thorpe and van Anrooy, 2009).

After construction of the Bukhtarma dam, initial reservoir fauna mainly consisted of low value fish such as roach, rudd, perch and related species (70 percent plus of total catch). These were supplemented

by the introduction of higher value fish in the 1960s and 1970s, including zander (*Sander lucioperca*), bream (*Abramis brama*), vendace (*Coregonus albula*), which thereafter became an integral component of commercial catches. Fish food organisms from the Caspian Sea and the Onega and Baikal lakes were also introduced and now form an important element in the reservoir's food chain.

In the case of the Shardara reservoir, its construction was accompanied by the introduction of 33 fish species. While 21 species failed to thrive, 12 – including common carp, crucian carp, bream and zander (pikeperch) – are commercially important. The most important factor influencing the presence and abundance of ichthyofauna in the reservoir is the hydrological regime, which is determined by alternative water uses, and the hydrochemical regime. Water drawdown reduces the surface area and leads to shallower water thereby reducing the number of spawning areas and causing high spawn mortality during the spring breeding period, which takes place from 1 April to 20 May. Drawdown also sharply reduces the habitat available for benthic organisms (and changes their species representation), while the proliferation of blue-green algal blooms in the summer months raises fish mortality rates because of the low concentrations of dissolved oxygen present. In autumn, the drop in water temperature causes plankton die-off, further exacerbating the food situation, and the sector is not helped by the loss of zander, roach and bream fry – which is carried out into the Kyzylkum Canal (Ismukhanov and Mukhamedzhanov, 2003, suggest fry losses in May alone could ascend to a million a day).

In total, 155 species and subspecies have been recorded in Kazakh waters (Annex 5). The Government of Kazakhstan acknowledges and seeks to protect the 18 species and subspecies which appear in the Red Book of the Republic of Kazakhstan (Annex 6). Commercial species – defined as those being developed by the local industry for commercial purposes – are distinguished from non-commercial species (small aboriginal and introduced species which are either low value or exist in insufficient quantities to support the commercial harvesting thereof). However, despite stocks of Caspian salmon declining sharply, and the Balkhash perch (in Lake Alakol) being included in the Red Book of the Republic of Kazakhstan, both remain on the government listing of commercial fisheries.

Inland capture fisheries

Fleet

The size and type of vessels have not changed since independence, and fishers and fishing enterprises mostly continue to use vessels constructed in the pre-independence period. The Aral Sea fishery has benefited from the provision of second-hand Danish boats (and around 1 000 nets) during the last 20 years through a project funded by the Danish Society for a Living Sea (DSLS).

The most common fishing vessels are:

- Fibreglass boats (most of which date from the 1970s), approximately 8 metres long, powered by outboard motors of 8–30 hp, with a capacity of 1 tonne maximum.
- Small wooden boats, mostly powered manually with oars, with a capacity of 1.5 tonnes or less.

The Register of Shipping suggests 710 vessels were registered in 2007 (140 state owned, 570 private), with a further 130 vessels registered for passenger and freight use. However, it is likely that the total fleet is rather larger as many small boats are unlikely to have been registered. Of the 710 vessels registered, 483 have been granted permission to tender for fishing quotas. There is no information as to the geographic distribution of the fleet, but evidence suggests that there are around 100 fibreglass vessels operating on the North Aral Sea.

Current production of capture fisheries

Recent production data are available by basin. The sharp increases evident in recent years are attributable to a combination of an improved reporting system, greater clarity regarding fishing rights and reservoir access, reduced salinity and an enlarged fishing area (as with the North Aral Sea, which recorded a

fivefold increase in catches between 2005 and 2006). The Ural-Caspian and Balkash-Alakol basin fisheries (accounting for 30–40 percent of total catch apiece) dominate, with lesser contributions from other regions (see Table 7).

TABLE 7
Fisheries production – by water basin in tonnes, 2005–2006

Name	2005	2006
Aral-Syr-Darya basin	585.1	2 811.1
Balkash-Alakol basin	14 152.6	16 530.7
Zaysan-Irtysh basin	9 326.6	7 327.4
Ural-Caspian basin	16 151.4	13 630.9
Other	2 048.5	2 446.6
Total	42 264.2	42 746.7

Illegal, unreported and unregulated fishing

Despite the government’s efforts, illegal, unreported and unregulated (IUU) fishing is widespread in Kazakhstan. The World Bank (2004) reports that “most landings go unrecorded; the majority of activity in the fisheries sector takes place in the underground economy and does not register in official data.” The same document estimates that actual production levels could therefore be three to four times higher than those officially recorded, with a potential resource rent loss of between tenge 220 million and 335 million (US\$1.5 million–US\$2.3 million). The extent of such fishing can be gleaned from data on the number of fishers. While FAO (2004) reports that there are around 5 200 active fishers in the sector, official 2006 Ministry of Agriculture statistics cite a number of 17 300 (Timirkhanov *et al.*, 2007) – with the World Bank estimating that the real number could ascend to as many as 110 000 fishers.

Examples of fishing vessels used in the Northern Aral Sea



Picture courtesy of Mr S. Timirkhanov

Recreational fisheries

The main areas for recreational fishing are near the big settlements or industrial cities. Recreational fisheries includes both amateur fishing and sport fishing in Kazakhstan. Although some foreign visitors come to Kazakhstan for sport fishing, there are no collated data on the numbers of fishers or on target species. The registered catch by recreational fishers in 2008 is estimated by the Union of Societies of Hunters and Fishermen of Kazakhstan (Kazokhotrybolovsoyuz) at 916 tonnes (van Anrooy *et al.*, 2010), of which 40 percent originated from Lake Balkash.

While some 1 000 recreational fishers are officially registered as sport fishers, there are no data available about the total number of recreational fishers in the country. It is also not possible to estimate how many people fish in support of household food security. It is widely known however that such “subsistence” recreational fishing is conducted in all waterbodies of Kazakhstan where fish exist. In this respect it should be noted that the extent of subsistence fishing is much smaller in Kazakhstan than in other Central Asian republics, such as Kyrgyzstan, Tajikistan and Uzbekistan (van Anrooy *et al.*, 2010).

Sport fishing can be undertaken using fishing rods of any style or type with up to five rods per fisher; spinning rods and spoon baits are allowed. Harpoon guns can also be used outside recreational areas. Other methods such as fishing with gill and trawl nets, electrofishing, fishing with dynamite or poison are not allowed.

The main areas where recreational, sport and subsistence fishing takes place are:

- Ural River (downstream)
- Syr-Darya River (downstream and estuary lakes)
- Ili River (near the Kapshagay reservoir down to Balkash lake)
- South-west part of Lake Balkash
- South-west part of Lake Akakol
- Irtysh River
- Shelek River (upstream)
- Tekes River (and its inlets)
- The western side of Djungar Alatau
- Various rivers that flow through the Kazakh part of the Altai mountain range

The main fish species targeted are catfish, pikeperch, pike, asp, members of the salmon family (rainbow trout, grayling, lenok), sturgeons and carp (crucian, silver and grass), and scaleless and scaly osman in mountain areas.

The Law of the Republic of Kazakhstan on Protection, Reproduction and Use of the Wildlife (9 July 2004) provides for sport-fishing activities (Chapter 6, page 34). Sport fishing is defined as catching fish and other water animals to meet sport and/or aesthetic needs for personal ends. Article 25 stipulates that all enjoy the right to sport fishing. Decree 246 of 18 March 2005 approved “Fishing Rules” (includes sport fishing), which can be undertaken in all national waterbodies, excluding areas where fishing is prohibited and in the waters of specialized fish farms.

According to the order of the Chairman of the Fisheries Committee (under the Ministry of Agriculture of Kazakhstan, Edict No.16-5/10π of 3 February 2005, titled “The approval of application, permit and fishing log forms”, and Edict No.116-01-07/81π of 18 June 2007), any person wishing to fish has to obtain a commercial and/or sport fishing permit from the authorized territorial body. After the requisite fee is paid, the person receives a fishing permit that allows to fish at designated waterbodies. The standards which regulate recreational fisheries are set by the Ecological Code of the Republic of Kazakhstan, the Law of the Republic of Kazakhstan “About the separately guarded natural territories”, and by the rules of amateur fishing, in support of the needs of the local population living in the protected areas within state natural reserves, as affirmed by Decree No. 79 of the Chairman of the Forestry and Hunting Committee of the Republic of Kazakhstan, dated 27 February 2007.

There are three national level overarching associations or unions that protect the interests of recreational fishers in Kazakhstan. They are:

- The “Union of the Societies of Hunters and Fishermen of Kazakhstan” (Kazakhotrybolovsoyuz). This union was created with a decision of the Council of Ministers of the Kazakh SSR in 1958.
- The “Federation of Sport Fishing of the Republic Kazakhstan” was registered by the Ministry of Justice of Kazakhstan on 28 June 2002. It has the right to enter international organizations and federations on sport fishing and to represent Kazakhstan in international competitions. The Federation is member of the World Sports Fishing Federation (www.wsff.org) and has participated successfully in many international sport fishing competitions.
- The “Association of Fishery, Fishing-process, Fish-farming and Fish-trading Enterprises of Kazakhstan” was recently established, in 2008. Although this association is not directly involved in recreational fishing, it is an important player in the sector as it possesses – through its members – reservoirs fisheries. It is involved in determining the catch quota for commercial and recreational fishers in these reservoirs.

Recreational fishing at trout farm near Almaty



Picture courtesy of Mr R. Van Anrooy

Aquaculture

Aquaculture in Kazakhstan comprises a variety of activities:

- Pond pisciculture
- Lake pisciculture
- Basin pisciculture
- The growing of fish in specialized ponds (one-, two- and three-year cycles)

Table 8 contains information on the status of fish farming in Kazakhstan to 2004. Many of the 18 fish farms listed in the table ended their operations by 2004.

During Soviet times, with government support, the output of fishing farms grew from 672 tonnes in 1974 to 9 883 tonnes in 1994. In the years after independence, however, production dropped sharply as most farms were unable to operate profitably in free market conditions, and by 2006 production totalled 190 tonnes. Even though farms have closed, infrastructure – in many cases – remains and could be reactivated with either state or private investment.

TABLE 8
Large aquaculture production establishments in Kazakhstan

Aquaculture establishment	Oblast	Fish species cultured
Maybalyk Fish Nursery	Akmola	Carp, cisco or white fish
Zerendy Centre	Akmola	Whitefish, carp
Ardak Farm (formerly Karagaly Pond Fish Farm)	Aktyubinsk	Carp, sturgeon, herbivorous fish
Turgen Trout Farm (private)	Almaty	Trout
Bent Almaty Pond Farm (private)	Almaty	Carps, herbivorous fish
Chilik Pond Farm	Almaty	Carps, herbivorous fish; spadefish has been invasive
KazPASS State Enterprise	Almaty	Carps, herbivorous fish
Kapshagay Spawning and Breeding Farm	Almaty	Carps, herbivorous fish
Atyrau Sturgeon Hatchery Erkin Kala	Atyrau	Reproduction of sturgeon
Bukhtarma Spawning and Breeding Farm	Eastern-Kazakhstan	Carp, common carp
Karaganda Fish Nursery	Karaganda	Carp, common carp
Verkhne-Tobol Fish Nursery	Kostanai	Carp, common carp
Kamyshly-Bash Fish Nursery	Kyzylorda	Carp, common carp, herbivorous fish
Petropavlovsky Fish Nursery	Northern-Kazakhstan	Carp, common carp, cisco
Kachirsky Fish Nursery	Pavlodar	Carp, common carp
Shardary Fish Nursery	Southern-Kazakhstan	Carp, common carp, herbivorous fish
Zhivoye Serebro LLC (formerly Uralskoye Pond Fish Farm)	Western-Kazakhstan	Carp, sturgeon, herbivorous fish
Kolos Hatchery	Zhambyl	Carp, phytophagous fish

Akmola oblast has two fish hatcheries. The *Zerendy Centre*, located in the Kokshetau National Park, was created as a pond farm complex covering 224.4 ha in 1967, and subsequently it developed a whitefish and carp hatchery capable of producing 50 million whitefish fries, 30 million carp fries and 1.3 million fingerlings. The *Maybalyk Fish Nursery* on the lake of the same name is capable of producing 50 million carp fries, 20 million whitefish fries, and 800 000 carp fingerlings.

Aktyubinsk oblast used to have one aquaculture operation. Set up in the period 1978–1981 on the banks of the Zhaksy-Kargaly River, the 12-pond complex encompassed 227 hectares. After independence, its pond fish production activities were transferred to the *Ardak Farm*, and production peaked shortly thereafter at 380 tonnes. However, rising costs saw commercial production cease in 2003.

Almaty oblast was home to five aquaculture operations. Three specialized commercial pond operations: *Almaty Pond Farm* (Bent), *Chilik Pond Farm* (Aidyndyn) and *Turgen Trout Farm* (LLP Technoimport) were complemented by three hatcheries. *Kapshagay Spawning and Breeding Farm* covers around 720 ha of ponds, but because of recurrent water shortages the farm only produces on one-fifth of its area – average production in the 1980s was around 700 000 phytophagous and 1.2 million carp fingerlings.

KazPASS State Enterprise is much smaller, with just 32 ponds covering an area of 25.9 hectares and an annual production of 500 000 phytophagous fingerlings. The *Besagash Complex* is the newest. It opened in 2002, and though it is able to produce up to 20 million carp or phytophagous fries on around 150 ha of ponds, it is still not operating.

Sturgeon is the targeted activity of the *Ural-Atyrau* and *Atyrau* sturgeon hatcheries in Atyrau oblast. The former, located on the Ural River, has 51.4 hectares of ponds and an annual production of 3 million sturgeon juveniles. The latter, also on the Ural River, has a smaller pond area (33 hectares), but an identical output level. In February 2007, by government decree (RK No.144), the two firms merged and became the Atyrau Sturgeon Hatchery Erkin Kala. The main enterprise is located at the lower reaches of the Ural River, 7 km from the coastal line of the Caspian Sea. The hatchery's primary activity is the reproduction of sturgeon. The target capacity is 7 million sturgeon fingerlings (average weight 3–5 g) per year using both hatchery locations. The hatchery does not have any domestic sturgeon broodstock at its disposal and implements traditional technology on the basis of the wild breeders captures in the lower reaches of the Ural River during their spawning run.

Russian sturgeon, Starry sturgeon, Beluga, Fringebarbel sturgeon and Sterlet are all reproduced by the Atyrau hatchery, but the prime species is starry sturgeon (65 percent of the released fingerlings). The rearing of fingerlings is performed by a combined method (first in tanks and then in earth ponds). Apart from the common hatchery units, the hatchery contains a facility for long-term holding of breeders at low temperature; is equipped with freezing systems (five tanks with a total volume of 160 m³); has two laboratories for hydrochemical and hatchery control; and has a water treatment unit (three sedimentation tanks of 6.7 ha, equipped with systems of mechanical treatment and filtration). The volume of annual release of sturgeon fingerlings corresponds to target capacity of the hatchery. Over the 2004–2008 period, 35 775 000 fingerlings of different species were released into various sections of the Ural River, including in the Ural-Atyrau area, the Zolotoy Rukav and the Yaitsky Rukav.

In Eastern-Kazakhstan oblast, the major hatchery is at Bukhtarma reservoir, which has released over 175 million carp fingerlings to date (production capacity is 30 million fingerlings annually – of which 2 million can be sold to private fish farmers). The *Semipalatinsk* and *Ust-Kamenogorsk* trout farms were sold to private investors following independence but have since ceased operations.

Zhambyl oblast is home to the *Kolos Hatchery* on the peasant farm of the same name and *LLP "DSU-85"* (formerly *Shuiskoe Pond Farm*). DSU-85 started operations under its former guise in 1985 with an incubation plant that has a 50-million fry capacity. Covering 1 021 hectares, 830 hectares of which were ponds, the plant is capable of producing 50 million pieces of restocking material (carp and phytophagous fish). Kolos Hatchery began operations in 2002. Covering 71 hectares, it has a capacity of 5–10 million carp fries and up to 1 million carp fingerlings; unfortunately, production data of this hatchery are not available.

Zhivoye Serebro LLC (formerly *Uralskoye Pond Fish Farm*) in Western-Kazakhstan oblast has 287 ha of ponds and a 300-tonne capacity (carp and phytophagous fish). The two hatcheries in Karaganda oblast, *Karaganda Fish Nursery* and *Zhezkazgan Hatchery*, merged into the Karaganda complex in 2003. The latter brought 106.4 ha and a production capacity of 2 million carp fingerlings to the partnership, while the much larger Karaganda pond farm (established in 1975) provided 1 516 ha and an incubation plant with 80–100 million pieces capacity (4.5 million carp fingerlings). Kustanai and Northern-Kazakhstan oblasts each have one hatchery. The *Petropavlovsky Fish Nursery* in Kustanai is almost half a century old, since 1964. Extending over 52.7 ha, the hatchery in 2005 produced 108.7 million and 20.8 million whitefish and carp fries, respectively, and 1.3 million carp fingerlings. The *Verkhne-Tobol Fish Nursery* has a pond area of about 300 ha, and a production volume of 2.2 million carp fingerlings.

TABLE 9
Stocking activities of (functioning) aquaculture hatcheries and nurseries in Kazakhstan, 2003–2006 (thousand pieces)

Hatchery or nursery	2003	2004	2005	2006
Maybalyk Fish Nursery	33 900	44 400	45 800	50 800
Kapshagay Spawning and Breeding Farm	1 900	2 800	4 000	6 000
KazPASS State Enterprise	500	800	800	800
Ayrau Sturgeon Hatchery	3 000	3 250	3 350	3 500
Ural-Ayrau Sturgeon Hatchery	3 000	3 250	3 350	3 500
Bukhtarma Spawning and Breeding Farm	6 000	10 000	1 000	1 500
Karaganda Fish Nursery	2 000	3 400	4 600	5 800
Verkhne-Tobol Fish Nursery	1 200	2 000	2 200	2 200
Kamyshly-Bash Fish Nursery	12 000	13 400	14 160	15 220
Kachirsky Fish Nursery	1 000	1 900	2 200	2 200
Petropavlovsky Fish Nursery	10 800	16 000	61 300	101 600
Shardary Fish Nursery	700	800	850	900
Total: Thousand pieces	76 000	102 000	143 610	194 020

At present, Kyzylorda oblast possesses just one fish farm at *Kamyshly-Bash Fish Nursery*, which opened in 1966. It has 213.4 ha of ponds and produces around 8 million carp and 7 million phytophagous fingerlings. Until 1967, a 53-ha sturgeon farm operated at *Tastak* on the Aral Sea, then the farm converted into a breeding complex for carp species for insertion into the local reservoir-lake systems. Pavlodar oblast is home to *Kachirsky Fish Nursery*, where production levels reached 2 million pieces of carp by the late 1960s. Total stocked area extends to around 5 200 ha, with production levels presently approaching 2.2 million pieces. *Shidertinsky Spawning and Breeding Farm* commenced activities in 1977, producing 1.1 million pieces of carp annually.

Three aquaculture operations existed in Southern-Kazakhstan oblast. The *Syr-Darya Pond Farm* opened its doors in 1975-1976 where the waters of the Syr-Darya flowed into Lake Sarykol. The farm with its 824 ha of ponds produced up to 1 000 tonnes of fish in the late 1980s, raising 6.06 million carp and phytophagous fingerlings – it is currently inactive. *Shymkent Pond Farm* was established in 1963. At the end of the 1990s, the farm was split into *LLP Komeshe-Balyk* (158 ha – producing 8 million assorted carp roe in the early years of this century) and *Kamysh-Balyk Meirhan* (119 ha – producing 40 tonnes of commercial fish and 500 000 carp fry in the years of the last century). *Shardary Fish Nursery*, just below the dam of the same name on the Syr-Darya, has 34 ponds and 210 ha, and is the only aquaculture enterprise still operating in the oblast.

Fingerling production tanks at a trout farm near Almaty (left). Sturgeon broodstock tanks at Erkin Kala hatchery near Atyrau (right)



Pictures courtesy of Mr R. Van Anrooy

Facilitating industries

Fishing and aquaculture equipment and accessories (boats, nets, piscine, incubatory units, circulation system equipment, automatic feeders, reed mowers, different type of aerators, live-fish transport trucks, laboratory equipment and reagents) are not manufactured in Kazakhstan. All fishing nets are imported from the Russian Federation, where there is a net weaving factory in Astrakhan city, or from China. While it is prohibited to use monofilament nylon nets made in China, they are however still imported. Safety items are also totally imported, mainly from the Russian Federation. When goods are imported, the amount of dutiable import is based upon the customs value of the imported good, as determined in accordance with Article 220 of the Tax Code of Kazakhstan. The code also specifies the amount of other tax, custom fees and mandatory payments to be made when importing goods to Kazakhstan (in addition to the value added tax levied at a rate of 14 percent). Access to freezing and refrigeration equipment is available only in large cities. Petroleum, oil and lubricants (POL) are supplied by private companies as well. Sometimes natural resources users¹ have their own gas stations to make sure that their fishers do not face fuel shortages, and they even deliver POL to the fishing ground.

Historically, most vessels were imported into Kazakhstan. While a state-owned fibreglass boat factory – Aral Plastic – was established in Aral'sk at the former Soviet ship repair yard in 2004, it was unable to thrive and now stands idle. The main reasons for its failure relates to the unpopularity of its boats among the fishers due to their high price (a boat with a LCC-8 engine cost tenge 1.2 million in November 2006), the lack of comfort and poor seaworthiness (Aral fishers made a number of observations *vis-à-vis* the design of the boat to increase its safety), and the lack of a leasing option.

¹ Natural Resources Users are defined by the law in Kazakhstan. According to the Law of the Republic of Kazakhstan of 9 July 2004 No. 593-II “About protection, reproduction and use of fauna”. Chapter 1, Article 1/25 users of fauna – physical and legal entities, who is given the right of fauna use according to the present Law. According to the Order of the State Fisheries Committee Chairman of the Ministry of Agriculture of the Republic of Kazakhstan of 29 January 2004, N 14-p “About the statement of forms of the typical contract on using fish resources and other water animals in fishery reservoirs (sites) and assigning fishery reservoir (site); passports on fishery reservoir (site); sanctions on fish catches and extraction of other water animals; a logbook on fish catches; and extractions of other water animals (with the changes according to the Order of the Fisheries Committee Chairman of Ministry of Agriculture of the Republic of Kazakhstan of 2 September 2004, N 22-p). A Natural Resources User is a legal or physical entity who has concluded the typical contract on using fish resources and other water animals in fishery reservoirs (sites) of the Republic Kazakhstan and has been assigned a fishery reservoir (site).

All repairs to the current fleet are undertaken by the fishers themselves. This includes importing repair materials from China, and/or using the services of local specialists, especially those who have been involved in the repair services since Soviet times.

Landing facilities

There are few fish landing sides on the Caspian Sea shores in Kazakhstan. In Atyrau in the Ural-Caspian basin, a port there is owned by “Atyrau Balyk”, a company which also has two barges for collecting fish from the boats of fishers. The ownership of Bautino port in Mangistau oblast is split into three entities at present (Agip, Commune of Aktau and Kazmonaygaz). But the majority of fishers however access the sea from the beach, as the fishers from the country’s other three river basins (the Balkash-Alakol, Irtysh-Zaysan and the Aral-Syr-Darya). The port and moorings in Balkash city and Alakol in the Balkash-Alakol basin are owned by the company Balkhash Balyk. Moorings are available to fishers along the Zaysan River in the Irtysh-Zaysan basin, but none are available on the Aral Sea in the Aral-Syr-Darya basin owing to the marshy nature of the shore. An overview of the location of berths and their sizes is presented in Table 10.

TABLE 10
Number of berths at fishing ports and quays in 2006

Oblast	Total units	Including mechanized	Total length of berths, running metres	Including mechanized, running metres
Almaty	3	2	410	160
Atyrau	1	1	210	210
Eastern-Kazakhstan	7	7	1 051	1 051
Karaganda	1	1	100	100
Northern-Kazakhstan	1	1	100	100
Pavlodar	2	2	720	720
Western-Kazakhstan	2		200	
Total	17	14	2 791	2 341

Source: Agency of the Republic of Kazakhstan on Statistics.

Ice supply

In general, those who hold fishing quotas (the so-called Natural Resources Users) provide their subcontracted fishers with ice (if they have an ice-making unit). If not, fishers either buy ice from suppliers or make it by freezing water in plastic bags and bottles.

Aquaculture supplies

Feed production for aquaculture is an established sector in Kazakhstan. About twenty different plants and firms produce fish feeds, which are located in cities and towns such as Almaty, Atyrau, Astana, Balkash, Jambul, Usharal, Stepnogorsk, as well as a few others.

The feed manufacturing industry in Kazakhstan currently produces about 100 formulas of mixed feeds, which necessitates the production of diverse types of raw materials. The number of ingredients or components used in this industry reaches 150. As the production of mixed feeds grows and the range expands, new types of raw materials are used in production, which are subject to preliminary comprehensive studies. Kazakhstan, however, is faced with difficulties in the production of specialized commercial feeds for sturgeons and trout, and hence imports them from abroad. The main suppliers of specialized feeds for the aquaculture sector come from the Russian Federation.

Sturgeon feed production at Erkin Kala hatchery near Atyrau

Pictures courtesy of Mr R. Van Anrooy

Fish feeds are a significant part of total aquaculture production costs, particularly in intensive cultivation. The trade-off between the quality of the feeds and their costs make the manufacturers constantly search for new diets and better feed management approaches. The availability of ingredients in a specific region is of significant importance to the diets used (Isbekov, 2009).

Medical drugs to treat fish diseases are not produced in the country. A specialized agency (“Kazglavvettorg”) imports them from the Russian Federation and other Commonwealth of Independent States (CIS) countries. These drugs can be ordered by the aquaculture sector through the “Zoovetsnab” agency. Any equipment, medicine or other materials required for aquaculture production may be imported into Kazakhstan in strict compliance with customs rules and regulations.