

Report and introduction to the Aral Sea and its fishery

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Drawing from 1996. 12 years girl from Aralsk (notice the flounder in the net)

Purpose

The purpose of this paper is to introduce a Danish/Kazakstani fishery- and development project to the authorities in Kazakstan, UNDP, USAID, TACIS, The Islamic Development Bank, The Kuwait Fund, The Aga Khan Fund, The Central Asia Enterprise Support Fund, and other parties which might take an interest in the Aral Sea and its problems. For further information about the project and the two partner organizations, we recommend the homepages <http://www.aralsk.net/> (which is at present time under construction) and www.levendehav.dk/uk/aral-fishery-project.htm

Initial remarks

This introduction is exclusively concerned with the Aral Region of Kazakstan. We are very much aware that the serious ecological and social problems, which the Aral Region has met since the disaster, have also struck other regions around the lake. This being certainly true of the Muynak Region in Uzbekistan, where the disaster has influenced the living conditions of the population at least as seriously as in Aralsk. Our personal knowledge of this region is scarce, but we have of course taken cognisance of the situation there.



In 1975, the fishery stopped on the Aral Sea. Year by year it had been set back as the lake had become smaller and smaller and more and more saline, resulting in the disappearance, and in some cases extinction, of fresh water species from Aral. After 1975, the Aral fishermen were compelled to fishing in the Syr Darya river, and in the small lakes east of Aral itself. Through some time, they were also catching fish in other lakes around Kazakstan, and often at significant distance from the Aral Sea, e.g. in Lake Balkhash, and in the smaller lakes in Eastern Kazakstan, the Baytak system in Aktubinsk, and in the Caspian Sea.



The fishery after 1975

In 1979, the Soviet authorities introduced several new species to the Aral Sea, which were considered potential survivors in the now saline environment.



One of these species was the flat fish *Kambala Glossa*, a species that adapts well in both fresh, brackish, and saline waters. This flounder had good conditions of living and breeding in Aral,

where it didn't meet any natural enemies, and where food was abundant in shape of mussels, shrimp, and herring.

Towards the end of the 1980s, and in the beginning of the 1990s, Kazakstani biologists and some fishermen began considering the stock of flounder interesting for commercial ambitions, and some fishermen tried to catch the *Kambala* with the available tackle. In Akbasty, some 230 km. West of Aral'sk, flounder was caught for private consumption, as early as the mid 1980s. This was true also of Akesbe and Tastubek, also situated West of Aral'sk. In the Southern and Eastern parts some flounder was caught as by-catch in the fishery for other (brackish) species.

The Danish/Kazakstani fishery project

In 1994, the Danish partners of the present project established the first contacts to the fishermen West of Aral'sk. The fishermen asked for assistance in catching flat fish – assistance in the shape of know-how and equipment for a type of fishery that they were not familiar with. Kazakstani biologists estimated that it was possible to catch as much as 5,000 Ton flounder per year, and it was (and still is) therefore a very obvious resource to the Aral fishermen.

In 1996, with financial support from Danida, (The Danish Ministry of Foreign Affairs) we carried out the first significant and coherent trial fishery on the Aral Sea.

It took place in the autumn of 1996 at the village Tastubek in the North-Western part of Small Aral. 65 Kazak fishermen participated, using 20 vessels, and with the assistance from 4 Danish fishermen, and a load of new fishery equipment from Denmark.

During the two weeks of the trial fishery, 50-60,000 kg. of very good quality flounder were caught. The trial fishery, and the following catches showed that the flounder stock in Aral was significant, and the conclusion of the work in 1996 was that a larger and well organized fishery with a functioning receiving system ashore, would be of great use to the ca. 600 fishermen and the inhabitants in the Aral region.

This work was initiated in a cooperation with fishery communities and the authorities in the Aral Region, and soon produced notable results. Appreciating this, the interested parties in the

region joined together in the NGO Aral Tenizi in 1998, with the overall aim of reestablishing the Aral Sea, and supporting its fishermen and their families. Since then, any significant initiative in the fishery trade of the region has passed through the office of Aral Tenizi.

Since 1998, the NGO Aral Tenizi has received equipment, computers, copy machines, printers, paper and many other things, and it has been possible also to provide the schools in the area with some 50 computers. The fishery project "From Kattegat to Aral Sea", which is financially supported by Danish funds, now has 6 local employees, and in all ca. 20 people are working as employed or volunteers in and around Aral Tenizi. Connected to Aral Tenizi two new NGOs have been founded; "The Aral Women", and "The Young Ecologists".

These experiences have led to the background of this document

(Ref. from the agreement between Kazakstan and The World Bank as of Feb. 2002)

Donors listed in the report: UNDP, USAID, TACIS The Islamic Development Bank, The Kuwait Fund, The Aga Khan Fund, The Central Asia Enterprise Support Fund. And "*the Danida assisted Aral Tenizi NGO, or its incorporated equivalent, which may be the preferred channel to operate the credit scheme for capture fisheries and processing and provide training to fishermen. The total estimated cost (US\$ 6,0 million) for the necessary interventions has been included in the project costs and US\$ 4,63 million would be financed from the loan*"

The following arguments and list of results and equipment will be the input from The Danish Society For A Living Sea and Aral Tenizi to the implementation of the plan for the development of the fishery in Small Aral, and in the Aral Region.

Recommendations in this proposal

- to work with a de-central fish treatment plan
- to invest in receiving stations for fish
- to invest in improved security at sea through better vessels
- to invest in bridges
- to secure general investment capital for fishermen
- to improve fishermen's organisation

The co-operation between Denmark and Kazakstan

From 1996 and to the present day (2002), the fishery project "From Kattegat to Aral Sea" has – with a total financial support of US\$ 900,000 from Danida, public and private foundations, companies, and private persons – been able to establish an organized fishery on the Aral Sea.



The project is carried out as a partnership between the NGO Aral Tenizi, and the Danish Society For A Living Sea, with the latter as project responsible. The work has had many aspects, which have in general been successfully managed because of a strict focus on the fundamental common understanding of the aims: To support the Aral fishermen in organizing and developing a sustainable fishery on flat fish (flounder) on the Aral Sea. Roughly, the following has been achieved.

- The fishermen are now organized in 90 cooperatives and brigades.
- In 1998, the Kazakstani NGO Aral Tenizi was founded, and today it counts 1,000 paying members.
- Until today, the fishermen have received some 3,000 nets for flounder fishery, and materials for maintenance of the nets.
- 100 smaller fibre glass vessels have been repaired.
- 5 larger shipments of fishery equipment, working clothes, boots, gloves etc. have been send to Aralsk.
- 4 receiving stations have been established around Small Aral; stations consisting in refrigerated containers, generators, plastic boxes, et.al.
- The fishermen have themselves been responsible of and taken care of the

construction and the necessary infra structure, and in one village Karateren, a larger centre for treatment of fish has been re-established and reconstructed with Danish support.

- Near the village Zhanakurilis in the Southern parts of the project area, Danish support (50 % of the expenses) has contributed to the re-establishing of 3 lakes, each ca. 100 hectares, and 10 smaller ponds for fry. It is expected that the village will soon be supplied with fish from these lakes.
- Each year the project provides interest free micro credits for the cooperatives and brigades, in order to enable them to start the autumn fishery on Aral, i.e. credits for purchase of oil, gasoline, and victuals.

The project itself has been in charge of the treatment and sale of flounder in 1998 (30,000 kg), and in 2000 (140,000 kg). These experiments have been made in order to obtain experience and updated knowledge in this area, and to introduce the flounder to the larger cities in Kazakstan. Credits have also been given for purchase of motors, boats and vehicles. The criteria for receiving credit are that full information is provided to the project about how much fish is caught, where it is caught, who buys it and at what price. These credits must be returned at the end of the season.

During the 7 years the project has lasted, some 20 Danish delegates have worked for shorter or longer periods in the Aral Region. The project coordinator has visited the region 15 times, in a total duration of ca. 1,5 year. Another participant has spend ca. 1 year total in the region, while two volunteers have lived and worked in Aralsk through a six month period. Other delegates have worked in the region on two occasions each.



The project has hosted 8 Kazakstani delegations in Denmark, with the purpose of education and promotion of the project in the Danish public. In all, more than 40 persons have visited Denmark on shorter or longer stays since 1995.

The relationship between the Danish participants and the population and authorities in the region.



The project has, in our view, an excellent relationship to the authorities, as well as to the population more generally in the Aral region. This relationship is founded on trust between the Danish and Kazakstani partners. From Danish side, we have emphasized persistence and patience, and we have been careful to get familiar with Kazak history, before, during and after the Soviet Union. In the same way, several Danish participants have been integrated into Kazak culture and traditions – we understand most of the "rules of the game", and know how to live by them.

We have been active in the region for many years, and have very rarely met foreign groups, delegations, project workers who had a positive view of the city Aralsk and the region. For most visitors, the area appears to be a sad place



without future, and generally foreign visitors have a tendency to want to move on, more than anything else.

We do not share this view. The impression of hopelessness, which seems to be shared by most foreign observers, is easily overcome, once you get in close contact with the people. This is one reason why we are always visiting private houses during our work in the region – and it would be no exaggeration to say that we have lived in hundreds of homes during the project period. It is these experiences, homes, households, family ties, we have our faith in. We know why the streets and the towns sometimes appear rough to visitors – they do so, because the population is working industriously to keep the private sphere strong and colourful. The community is functioning well, but based on families and direct connections, more than on immediately visible traits.

The Danish participants in the project have obtained significant experience in Kazakstan, in Kyzylorda Oblast, and in the Aral Region. And the Kazakstani participants have build a body of knowledge about Denmark and about international cooperation.



The fishery in the Aral Region

The project has build a cooperation with all the fishermen (ca. 600) of the region. Until 1995, they didn't catch fish on Aral itself - today nearly all are fishing on Aral in shorter or longer periods during the flounder season, which begins in September and lasts until May.

Thereby the project has succeeded in limiting the unsustainable fishery which took place earlier in the river Syr Darya, as well as in the many natural and artificial lakes in the region.

Today the majority of the fishermen know the basics of flounder fishery, until 1995 they knew practically nothing of flat fish catching. They also know the necessary techniques of treating the fish for optimal quality. But there are however still needs of more experience in the fields of the biology, spawning and migration of the flounder. Most importantly though, the fishermen are at present day able of delivering a good quality flat fish.

The fishermen are organised and partly educated to catch flounder. They know how the fish must be treated in order to ensure quality.

Investment:

- The cooperatives still need development and their capacity should be strengthened through counselling and courses.

The equipment today and for the coming 5 years



The fishermen need to make their ca. 100 vessels more safe at sea. They are very much limited from the capacities of the boats, and have to keep the catching close at shore, even when the fish is in deep sea. In the bad vessels, they have no options to cross the Small Aral, e.g. from Tastubek to Akbasty. And this mobility is of great

importance, since the migration and spawning change from year to year.

Investments:

- The future investments in the fishery must answer the need of complete overhauls of the best of the old vessels (ca. 40 pcs.), and construction of new.

We estimate that the flounder fishery on Small Aral and in the Northern part of Big Aral should take place in 60-70 units in year 5, after the initiation of the construction of the dams. A unit consists in min. 5 fishermen, one larger vessel with a good engine and two smaller vessels, and a minimum of 50 good quality flounder nets. To such a unit belongs necessary support at shore for transportation, treatment, and freezing of the fish. In all, such a unit would be fit for employment of at least 8 men.



The fishermen have ca. 3,000 flounder nets of good quality, and they will be maintained in the coming years. They also have life jackets, oilskins, boots, warm clothes, gloves etc., and this equipment will also be completed and maintained in the coming years. They have ca. 100 vessels, which are in a bad condition, and from the ca. 90 cooperatives and brigades existing today, some 2/3 have means of transportation, truck, tractor, motorcycle or other.



Investments:

- We estimate that a maximum US\$ 10,000 must be invested per unit during the 5 years of the project. At least 50 % of this it will be possible to give as credits.



Receiving stations have been established in Tastubek, Bugun, Karateren and Akbasty, and in 2002 the last station will be put up. Each station is equipped with a 20 T refrigerator container, and a 35 kW diesel generator. Each station has at its disposal 350 plastic boxes (capacity 50 kg), and some equipment for transportation and washing of the fish. In Karateren, besides the cooling container, there exists a freezer for freezing the fish. It is the plan to install freezers in Tastubek and Akbasty during 2002.



Besides the equipment, the project has provided means for shorter employments at the stations. This has meant that the local users have become familiar with the technical equipment, and that minor repairment can be made at site. The station at Bugun was in a poor shape, but through own initiatives, the Bugun responsible have managed to make it work at 100 %.

We estimate that 5 stations will suffice around Small Aral, and that one additional should be established at the Northern part of Big Aral, ca. 100 km. South-West of Akbasty. The 5 stations

should be developed to a level in year 5, where they have each at least 2 refrigerator containers, and a freezing facility for freezing of 5 T of flounder. For each station there should be a vacuum pack system, and each should dispose of at least 500 plastic boxes. Organisation wise, each station should be established as a professional cooperative, where the cooperatives can buy the fish from the fishermen or the fishermen can, against payment, have their own fish frozen at the station. For each station, 10-15 persons should be employed.

Investments:

- We estimate that during the 5 years, US\$ 20-25,000 should be invested in each station. Here too, part of the investments will be possible in the shape of credits.

**Management through NGO Aral Tenizi (AT)**

The project has since the establishing of AT in 1998 supported this with salaries for max. 6 employees, with equipment such as computers, copy machines, printers, office furniture, etc. Aral Tenizi has shown that it is capable of managing the tasks concerning the organisation of the fishermen, and taking charge of the local obligations in the Danish/Kazakstani fishery project. i.e. contact with fishermen, collection of information from the fishery, inspiring fishermen, establishing a yearly meeting of Aral Sea fishermen in the Society's General Assembly. AT has build a well functioning book keeping, and is presenting its accounts every year for the local activities – in 2001 for a total sum of 7 million Tenge. AT has also been able to attract funds from other international institutions and foundations – in all, some US\$ 80,000.

Aral Tenizi is capable of solving all relevant tasks connected to improving the Aral sea fishery from Kazakstan.

Investment:

- AT lacks the capacity to a more targeted providing of credits – credits that are provided with interests and with collateral in equipment, vessels, vehicles, nets, stations et.al. The society has started the examinations of how to build such a banking function, but until further notice only interest free credits are provided with small amounts to be paid back at the end of each season. With a larger project, there will be need of larger capacities in economical managing. There will also be need of more office space, as well as storing facilities.

Danish Investments:

- The Danish Society For A Living Sea intends to continue supporting and strengthening Aral Tenizi as an independent NGO in the Aral Region to 2004. We expect to be able to find the necessary means for this work in the coming years as well.

Database, statistics, names, geography

Since 1998 the project has actively been collecting data. We now have a complete overview of the fishery in the region. We have registered 90 fishery cooperatives and brigades, and we have the names of the ca. 600 active fishermen. We have a good overview of the development in the fishery on the Aral Sea since 1996 – how much has been caught, where it was caught, and by whom. (A significant part of the catches is sold outside the official system with licences and taxes). This traffic has grown over the years, and in 2001 we estimate that close to 80 % of the catches were realized outside the system

Through smaller projects in selling of fish, e.g. in 2000, where the project made an experiment of buying, freezing and selling 140,000 kg. flounder, we have build a knowledge of the distribution, and the many problems accompanying selling flounder.

The project has full knowledge of the infra structure in the Aral Region. The roads and the problems along them. The fishing grounds and landing places, i.e. places suitable for camps

and fishing. Around Small Aral there are several places, which are very suitable for fishery, and much more which are definitely not: Mud and long stretches of old sea bottom often stand in the way of a reasonable fishery. We now know more about which areas of Small Aral the flounder prefers to use for spawning, and where e.g. they eat mussels or herring.

In 2002, we have started building a database with the ambition of covering all areas, names, geography, companies etc. in the fishery of the Aral Region.



Infra structure in the Aral Region

The roads to and from the fishing places are very bad, and the transportation problem has been one of the significant challenges to the project. With the new project, it will be crucial to solve a number of these transportation problems. With a rising water level towards a stabilization in year 5, it would be a clear advantage to exploit the possibilities of ship transportation of fish and equipment across and along Small Aral.

With a smaller quay system near Tastubek, it would be possible to benefit from transportation of the fish to Tastubek from the fishing grounds in the Western part of Small Aral. The fish caught in the Eastern parts and in the delta area, do not cause the same problems, since these places are situated relatively close to the main road from Aralsk to Kyzylorda. Here, it is more important to maintain and improve the smaller roads from the Eastern villages to the lake.

Investments:

- We do not have the necessary in depth knowledge of the needs of improvements of the roads, when considering the new plan. Most roads can be used more or less at the

present condition. With closed vehicles and vacuum packed fish, the problems of dust and dirt will be solved. Regarding pontoon bridges, we have experience from the construction of 250 meter bridges, placed in three different places. Until the water level has stabilized in year 5, it will still be an advantage to use pontoon bridges. They will at a later stage be possible to use also as parts of more stable quay systems, which would be rationally placed at Tastubek and near Bugun in the Eastern part of Small Aral. It seems realistic that a total investment of US\$ 20,000 should be enough to cover most needs in this field.

The estimation of the possible catches

In the reports, which have been drafted for the agreement between Kazakstan and The World Bank, the estimation of the annual catches are in our view too low. We have therefore tried to prognose the development from the initiation of the construction work, until they are concluded five years later, with a stable water level. We have also attempted to estimate the prices, we believe to be reasonable as the price for the fishermen when the fish has been treated as described – and when compared with world market prices. It is likely that someone will doubt these figures, and we must say that they are optimistic, but in view of our experiences, and given that the restoration of the Small Aral will proceed as planned – they are not unrealistic.

Fish, vacuum packed and frozen at the receiving station

Year 1.	1000 Ton flounder	150 Ton fresh water fish
Year 2.	1500 Ton flounder	250 Ton fresh water fish
Year 3.	2000 Ton flounder	500 Ton fresh water fish
Year 4.	2500 Ton flounder	750 Ton fresh water fish
Year 5.	2500 Ton flounder	1000 Ton fresh water fish
Value (1 US \$ = 150 Tenge (T)/2002)		
Year 1.	50 T 100 T = 50.000.000 + 15.000.000 = 65.000.000 = 450.000 US\$	
Year 2.	60 T 120 T = 90.000.000 + 30.000.000 = 120.000.000 = 800.000 US\$	
Year 3.	75 T 150 T = 150.000.000 + 75.000.000 = 225.000.000 = 1.500.000 US\$	
Year 4.	100 T 200 T = 250.000.000 + 150.000.000 = 400.000.000 = 2.600.000 US\$	
Year 5.	125 T 250 T = 310.000.000 + 250.000.000 = 560.000.000 = 3.700.000 US\$	

These estimations and projections of the catches and of the value are based on the assumption that all construction work is finished in year 5, and that the water level in Small Aral, has stabilized at a level 10 -12 m. higher than today.

The numbers also depend on that a channel is dug between Small and Big Aral, in the Western parts, where there originally was a natural separation of Kokaral from the mainland. Such a channel would mean that the Western part of Big Aral will receive water from the Syr Darya river, while at present day the water in the Eastern, shallow parts of Big Aral is literally running out into the sand. This channel is crucial to make our estimations of the flounder catches valid. If the channel is not constructed, we estimate that the catches total should be reduced by 40 %, since the North-Western parts of Big Aral will face significant problems without the channel. These problems however will only be manifest after the five years. Our trial fisheries in the Big Aral have shown a very big stock of very big flounder, but they have also revealed an alarming salinity, which is why it is paramount that water from Syr Darya be led out into the Western parts of Big Aral.

In case of such a significant increase of the fresh water supply to the Western part of Big Aral, the flounder fishery in the Tiganak Bay and South of this, could be quite significant.

A solution with such a channel in the Western part has since 1994 been part of the overall plan for Small Aral. And even though it seems now to be planned to establish the channel in the Eastern parts in connection with the establishment of the dam, there is every reason to suppose that the original plan will be preferred as the construction planning moves forward.

If the "Western solution" is not opted, Small Aral will be divided into a Western part with a relatively high salinity, and a more fresh Eastern part, which will damage the fisheries – we know this from the Balkhash Lake in the Eastern part of Kazakstan.

If the outlet will be placed in the Western parts, Small Aral will be functioning as a vast lake along the Syr Darya river with a significantly larger stock of fish. The flounder would then probably move out to the Western parts of Big Aral, and this solution could also prove beneficial to the fisheries in Uzbekistan.

The estimated increase in the flounder catches has also been based on that some 2/3 will be caught in Big Aral from year 3. This challenges the need of transportation, but such problems can be eased from the rise of the value of the fish in this case, more than prognosis. The value has been adjusted for further transport from the receiving stations.

Is it realistic that it will be possible to catch 3.500 T in year 5? Yes – it is!

With regard to the fresh water fish, the estimations are realistic, and the actual catches might even be higher, towards 2,000 T, incl. the fish added from improved smaller lakes and from well manage ponds. Asd for the flounder the numbers are more un-secure as they will be forced out from the Small Aral, and - we assume – go through the channel to Big Aral. We do not have, and we believe none ohas, a sufficient biological knowledge of the present size of the flounder stock, and how it will react to a more intense fishery. But it is likely that it will still be possible to catch some 1-2,000 T also after the restoration of Small Aral. The figures available today oscil-late between possible catches of 5-10,000 T per year, with some 1,500 T from Small Aral.

Regarding the value of the catches, we estimate that the flounder has a very high value compared with world market standards, because of its fine gastronomic quality. Add to this, that there might very well be a significant interest in flounder roe (300 T) in the Japanese market. Hence, a price in year 5 of \$1,5 is not over-rated, compared with current prices of plaice in the European market, where \$2 on auctions is common. (Prices are not expected to fall in the coming years). The prices of the fresh water fish will depend on the quantities of pike perch.

We assume that the stock of pike perch will grow significantly, since it will chase the smaller flounder in Small Aral, as the salinity in the lake declines. A high quality pike perch, whole or in fillet, is a much wanted item in the world market, where it can easily obtain prices as here indicated. We know less about the prices of other species such as the snake fish and catfish, which are also predators, but they are traded at relatively high prices as smoked fish in the Kazakstani and Russian markets. Towards year 5, there will also be a significant stock of vegetarians, such as several types of carp, from which one is quite valuable on the Kazakstani

market. Add to this a significant catch/production from the countless smaller and bigger lakes and the fishing ponds in the region.

Conclusion: We estimate that the development of catches and value can be presented as above, but on the assumption that the outlet from Small Aral will be placed in the Western part, as it is also presupposed that all parties support the development of the fisheries, the treatment and the selling of fish from the Aral Region. The potential is there in the region – it merely has to be activated in a way that ensures transparency and a very high level of public involvement in the development.

Perspectives for the development of the fishery in and around Small Aral, in the light of the new agreement.

As it is well known, it is not all that many years ago fishery stopped on the Aral Sea, and in the years following the collapse until as late as the earlier 1990s, the fishery that continued in other lakes and in the river, was still managed by the central factory responsible of everything around fishery in Aralsk – the notorious "Aralrybprom". In the past 70 years, the city Aralsk has been under much influence from this big company. Thousands of workers have been employed there, and when the factory was at its peak, it produced more than 20,000 T of fish a year.

Today practically nothing is left from the great enterprise. Still remaining are just a couple of lonely buildings, which will also be destroyed in a few years, and then nothing will be left, except the many people still living in Aralsk, whose life's were closely linked to the Aralrybprom.

Now, significant means for the development of the fishery in the region will be provided, and in this process, many actors will argue that Aralrybprom should be rebuild in a modern shape of course – but still in a shape, which we will term "the centralized model". Facing this is another possibility, which we term "the decentralized model".

The centralized model

Opting for this solution, a company capable of treating ca. 5,000 T of fish per year must be constructed. Even in a relatively modern country as Denmark, this would be a very big job. If the economy of such a plant should be sustainable, it would be necessary for a significant part of the production to be exported for Western countries.



This would be a project, which would have to be decided upon early in the development phase. Broad studies and analysis of a number of factors would have to be carried out – such as the market for Kazakstani fish, the finance involved, Western partners, water purification, energy supplies, infra structure, management organization, education of workers, and much more.

A realistic prognosis would say that such a plant needs at least 2-3 years on the drawing board, before a plan of action would be available for either implementation or rejection.

If a central place for treatment is re-established in Aralsk, as known from Aralrybprom, one of the major problems will be transportation on the bad roads. Such a solution would demand at least either a significant improvement of several roads in several directions, or that a transportation at sea were build, with e.g. a quay system in Tastubek for unloading, and in that case only some 25 km of roads to improve.



The decentralized model

The decentralized model focuses on the already existing initiatives in the region. The new receiving stations can be extended and improved to take care of and ensure a high quality first treatment of the fish. This solution requires a

flexible and well informed approach to the concrete situation. And it has the advantage of building a network of smaller and relatively independent links that together can provide an optimal treatment and transportation of the fish, whilst at the same time the "system" is not fragile in relying on one sole actor.

Under all circumstances it is necessary that the fish is washed, vacuum packed and frozen in Tastubek and other places, in order to get as fresh a product as possible. What hereafter happens to the frozen fish is not of that much importance in this connection. It could be delivered to Aralsk for further treatment in a modern plant approved for export of fillet, or the fish could be loaded on to railway wagons of each 50 T, for further treatment in Kazakstan and other countries.

Same strategy could be used in Kulandy and the Northern part of Big Aral. Here, the vacuum packed fish could be transported through Saksaulsk to Aralsk. (This is a longer stretch, which is passable, but has to be examined closer). If it occurs to be a better solution to transport the fish to Akbasty in plastic boxes with ice for sea transport to Tastubek, this could also be a solution.

The Southern part of the region with Bugun and Karateren has some of the same problems, but as for Karateren, we expect that with the building of the dams and dikes and the repairment of sluices, it will be necessary to improve the roads to and from the main road between Aralsk and Kyzylorda (a road which is asphalted). With the at times very bad roads there is no doubt that the solution of sea transportation in the Northern and Western parts of the region will prove cheaper than improvements of roads to make them capable of accepting heavy transports without being rutted. Such improvements in most cases will involve first constructing dikes of a couple of meters, and then place gravel and stones – a technique used everywhere in places with much melt water. Overall, and no matter which solution is chosen, the centralized or the decentralized, the precondition is that the fish be unloaded on the same day it is caught. That it will be kept reasonably aboard the ship, i.e. in clean plastic boxes or compartments with ice when necessary. After unloading the fish will be washed and vacuum packed and then immediately placed in cold store at a minimum 25 degrees below zero. From then on, the fish will not be damaged from transportation.

Conclusions

The situation at the Aral Sea has undergone significant changes during the last 5-6 years. Fishery on the lake itself has been re-established, and fishermen, receiving stations, buyers and organizations are ready to take it to the next level: To secure the sustainability in the fishery, ecologically as well as economically. The former requires organization and involvement, the latter well planned and targeted investments.

- Aral Tenizi is potentially capable of solving all relevant tasks connected to improving the Aral Sea fishery, in the fields of organization and involvement, as well as in implementation of concrete initiatives in the actual fishery and fish treatment process. However, Aral Tenizi lacks the capacity to a more targeted providing of credits, and needs general capacity building especially in the villages.
- The 90 cooperatives and brigades still need development and their capacity should be strengthened through counselling and courses. Further, material investments are required to improve and maintain boats, nets, vehicles and other.
- The four receiving stations need further development to obtain maximum utility.
- Infra structure needs improvement in roads, (pontoon) bridges and quay systems, depending on the development and stabilization of the dam construction.
- We estimate that the development of catches and value can be presented as above, i.e. with a potential total value of the catches in year 5 of 500 mill. Tenge, but on the assumption that the outlet from Small Aral will be placed in the Western part.
- The organized treatment of the fish seems to offer two possible solutions: A centralized or a decentralized. It should be noted that a centralized solution requires a very careful planning and consideration, and we estimate that 2-3 years are needed before an eventual plan can be implemented or rejected. A de-central solution on the other hand has the advantage of already existing initiatives in Akbasty, Tastubek, Bugun and Karateren, as well as minor plants in Aralsk, and with possible additions. These systems can be improved to handle all catches responsibly and

with good quality and decent prices as the outcome. Further, the de-central solution secures a high level of local involvement and responsibility. We therefore recommend this option.

This concludes the information and recommendation from the fishery project "From Kattegat to Aral Sea" at present day, May 2002.

On behalf of the responsible organizations, coordinators Christensen, Kurt Bertelsen, and Makhambetova, Zhannat Zh.

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All the photos (excluded the satellite photo) is from the project, taken in the period from 1995 - 2002.